TECHNICAL

Report

SURVEY OF WASTEWATER TREATMENT FACILITIES
AND RECEIVING WATERS AND PROPOSED
PERFORMANCE SPECIFICATIONS
MCGUIRE AFB AND FT DIX NEW JERSEY

July 1973

EHL(K) 73-12

VOLUME II OF TWO VOLUMES

USAF ENVIRONMENTAL

HEALTH LABORATORY

KELLY AFB, TEXAS

PRO SALUTE AC INCOLUMITATE

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USAF ENVIRONMENTAL HEALTH LABORATORY (AFLC)

UNITED STATES AIR FORCE

KELLY AFB, TEXAS 78241

SURVEY OF WASTEWATER TREATMENT FACILITIES AND RECEIVING WATERS AND PROPOSED PERFORMANCE SPECIFICATIONS MCGUIRE AFB AND FT DIX NEW JERSEY

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VOLUME II OF TWO VOLUMES

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Commander

NOTICE

PREFACE

This technical report has been written in two volumes due to its length. Volume I contains the basic discussion, conclusions, and recommendations. Volume II contains additional material, discussions, and detailed survey data that have been summarized in the discussion contained in Volume I. Volume II should only be required by those agencies/activities that require a more complete technical discussion and all collected raw data.

A preliminary version of this technical report, EHL(K) 72-23, "Preliminary Report of Wastewater Treatment and Disposal, McGuire AFB and Ft Dix NJ," November 1972, was previously distributed. The preliminary version was limited in discussion and presentation of the technical data which was not available at the time. This technical report supersedes the preliminary report and no further reference to the preliminary report is required.

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Related Correspondence

This appendix contains correspondence related to field studies conducted by USAF EHL/K in September 1972.

APPENDIX A

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State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATER RESOURCES

JOHN FITCH PLAZA, P.O. BOX 1390, TRENTON, N.J. 08625

November 22, 1971

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Base Commander
McGuire Air Force Base, New Jersey 08741

Dear Sir:

Re: McGuire Air Force Base
Township of New Hanover

Reference is made to Sec. 21(a) of the Federal Water Pollution Control Act which states that "Each Federal agency...having jurisdiction over any real property or facility,...shall, consistent with the paramount interest of the United States as determined by the President, insure compliance with applicable water quality standards and the purposes of this Act..."

In addition, the President's Executive Order 11507 of February 4, 1970 establishes that "The Federal Government in the design, operation and maintenance of its facilities shall provide leadership in the nationwide effort to protect and enhance the quality of our air and water resources." Also, this Executive Order requires that necessary actions to abate pollution by Federal agencies be completed or underway by December 31, 1972.

Since New Jersey's water quality standards have been approved by the U. S. Environmental Protection Agency, these standards are, in fact, also Federal standards as provided for under the Federal Water Pollution Control Act.

We have found that the sewage treatment facility serving the installation under your command is discharging an effluent in violation of these standards and also in violation of R.S. 58:12-2. There is attached, for your information, those New Jersey statutes applicable in this instance.

As a consequence of the aforesaid, there is enclosed for service upon you an Order, in duplicate, made by this Department pursuant to the provisions of the recited statutes.

Kindly acknowledge receipt of this Order by affixing your signature and date of acceptance on the back of the original and return it to this Department in the enclosed envelope. The duplicate may be retained by you.

Very truly yours,

Charles M. Pike
Director

6E5:G5
Encls.
c.c. - Honorable Herbert J. Stern
Honorable John N. Mitchell
Mr. Gerald Hansler
Delaware River Basin Commission
Attorney General Kugler
Deputy Attorney General Steve Gordon
Commissioner Sullivan
Philadelphia District Corps of Engineers

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATER RESOURCES

JOHN FITCH PLAZA, P.O. BOX 1390, TRENTON, N.J. 08625

ORDER

WHEREAS, The New Jersey Department of Environmental Protection promulgated the "Classification of the Surface Waters of the Delaware River Basin, Being Waters of the State of New Jersey," effective July 28, 1967; and

WHEREAS, The New Jersey Department of Environmental Protection promulgated "Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Delaware River Basin, being Waters of the State of New Jersey," effective November 17, 1967; and

WHEREAS, The New Jersey Department of Environmental Protection promulgated "Rules and Regulations Establishing Surface Water Quality Criteria," effective June 30, 1971; and

WHEREAS, on July 26, 1971 the Water Quality Standards of the State of New Jersey were approved, in their entirety, by the U. S. Environmental Protection Agency pursuant to Section 19 (c)(3) of the Federal Water Pollution Control Act; and

WHEREAS, The New Jersey Department of Environmental Protection has found through investigations made by its representatives that the sewage treatment plant owned and operated by the United States of America located on the premises of McGuire Air Force Base, in the Township of New Hanover, County of Burlington and State of New Jersey, does not conform to the aforesaid regulations of the New Jersey Department of Environmental Protection and is inadequate in capacity or unit design to properly care for, treat and dispose of sewage received therein before an effluent from the said sewage treatment plant is discharged into South Run, a tributary of Crosswicks Creek, being waters of this State thereby causing or threatening injury to the inhabitants of this State either in their health, comfort or property in violation of R.S. 58:12-2; and

WHEREAS, The New Jersey Department of Environmental Protection in consideration of the aforesaid finds that in order for the sewage to be properly, adequately and sufficiently treated and/or disposed of said sewage treatment plant must be altered, added to or improved in a manner approved by the New Jersey Department of Environmental Protection; therefore

NOTICE IS HEREBY GIVEN by the New Jersey Department of Environmental Protection pursuant to R.S. 58:12-2 to the United States of America requiring that the sewage treatment plant located on the premises of McGuire Air Force Base, in the Township of New Hanover, County of Burlington and State of New Jersey, must and shall, prior to February 29, 1972, cease the discharge of improperly, inadequately and insufficiently treated sewage into South Run, a tributary of Crosswicks Creek, being waters of this State in a manner approved by the New Jersey Department of Environmental Protection and

NOTICE IS FURTHER GIVEN by the New Jersey Department of Environmental Protection th such alterations, additions or improvements to the said sewage treatment plant shall be in conformity with the master sewerage plan for the County of Burlington as approved by the New Jersey Department of Environmental Protection.

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Charles M. Pike

Charles M. Pike
Director

Dated: November 22, 1971

DEPARTMENT OF THE AIR FORCE
USAF DISPENSARY, McGUIRE
McGUIRE AIR FORCE BASE, NEW JERSEY 08641

REPLY TO ATTN OF: SGPM/1Lt Jandrucko/2693

9 DEC 1971

SUBJECT: Water Pollution Abatement Survey

TO: MAC (MAASGP)
Attn: Maj Jones

1. Request that qualified personnel from the Regional Environmental Health Laboratory (Kelly AFB) be placed on TDY to the USAF Dispensary McGuire, McGuire AFB, N. J., to provide assistance in water pollution abatement program.

2. Purpose of this request is to ascertain the quality of treatment now provided by the McGuire AFB Sewage Treatment Facility, to determine the sources and the type of industrial waste not presently or adequately being treated, and to follow up on recommendation made in Water Pollution Survey, McGuire AFB, N. J., January 1968, REHL (K) 68-1, as to their effectiveness.

3. This requirement is necessitated by a cease and desist order (see Atch 1) served on McGuire AFB by the State of New Jersey, Department of Environmental Protection, Division of Water Resources It is our hope that information gained from this assistance survey will lend insight into the nature of our alleged violation of the New Jersey's water quality standards.

Glenn Graves
GLENN R. GRAVES, Capt, USAF MC FS
Director Base Medical Services

1 Atch
Cy ltr, 22 Nov 71

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE LOGISTICS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

REPLY TO ATTN OF: SGP

23 December 1971

SUBJECT: Water Pollution Survey, McGuire AFB NJ

TO: USAF Environmental Health Laboratory, Kelly

The attached request from McGuire AFB NJ to evaluate the efficacy of treatment provided by the sewage treatement facility for domestic and industrial liquid waste is forwarded for your action.

FOR THE COMMANDER

Donald D Higgins

DONALD D. HIGGINS, Lt Col, USAF, BSC
Chief, Bioenvironmental Engineering Division
Office of the Surgeon

1 Atch
USAF Disp, McGuire/SGPM
Ltr, 9 Dec 71/w 1 atch
w/1st Ind MAC/SGPE 20 Dec

Cy to: MAC/SGPE
USAF Disp, McGuire/
SGPM

CC APR 7 1972

Trip Report - McGuire AFB NJ 08641

Commander, USAF Env Health Lab/CC, Kelly AFB TX 78241
AFLC/SGPE, Wright-Patterson AFB OH 45433
IN TURN

1. Place: McGuire AFB NJ 08641, (MAFB) EPA Region II Conference, NYC.

2. Inclusive Dates of Travel: 27 Feb - 2 Mar 1972, McGuire AFB NJ 08641.

2 Mar - 3 Mar 1972, New York City.

3. Persons Making Trip: Captain J. Tremblay, 1Lt N. Lamb.

4. Primary Mode of Transportation: Commercial Air.

5. Purpose of Trip: To conduct a preliminary survey of McGuire AFB NJ to determine the need for and scope of future water pollution abatement efforts. To attend a conference of representatives from federal facilities located in Region II, Environmental Protection Agency (EPA) and discuss environmental issues with the Region II, EPA's newly established Federal Facilities Branch.

6. Persons Contacted: (See Attachment.)

7. Observations and Findings:

A. Background

(1) Earlier Study. In 1967 an industrial waste survey of MAFB was conducted by the EHL-K. Sources of untreated industrial waste discharges were identified and corrective actions were recommended. Many major recommendations were accomplished, and most known untreated industrial waste discharges were diverted into the base's domestic sewage plant.

(2) Receiving Stream Standards

a. The receiving stream for the Ft Dix and MAFB secondary sewage effluents is South Run which drains into Crosswicks Creek and thence into the Delaware River. South Run has been classified by New Jersey Dept. of Environmental Protection (NJDEP) as non-trout FW-2 waters according to a recent report. (Reference Alexander Potter Assoc. "Study of Sewage Treatment Facilities (Tertiary Treatment), Fort Dix and McGuire AFB," U. S. Army Corps of Engineers, New York, January 1972.)

b. In June 1970 a NJ State representative indicated that the McGuire and Ft Dix treatment plants should provide 90 percent BOD_5 removal with an effluent value never exceeding 25 mg/1.

c. On 26 July 1971 NJDEP's latest water quality standards of 30 June 1971 were approved by EPA in accordance with the Federal Water Pollution Control Act. The only substantive changes in criteria for non-trout FW-2 waters pertained to minimum dissolved oxygen content requirements, temperature limits, bacteriological quality and radioactivity limits. The minimum daily average of dissolved oxygen is now 5.0 mg/1 and not less than 4.0 mg/1 at any time, vice the minimum average of 4.0 mg/1.

(3) NJ State Cease and Desist Order

a. On 22 November 1971 the NJDEP issued an order to McGuire AFB to "... prior to February 29, 1972, cease the discharge of improperly, inadequately and insufficiently treated sewage..." from the base's sewage treatment facility. This order alleged that the MAFB sewage treatment plant is inadequate to properly treat and dispose of sewage in accordance with the State's water quality standards. Similar orders were issued to Ft Dix as well as seven other federal installations located in the state of New Jersey.

b. With the exception of the McGuire/Dix complex, it appears that the State will be satisfied with agreements from the other seven installations to join civil-military regional waste treatment systems. The State's attitude is that such a scheme is not feasible for McGuire/Dix since their bases are the bulk of the sewered population in the area.

c. Both Ft Dix and MAFB are operating secondary sewage treatment plants producing a high quality effluent near design efficiency. Both Dix/MAFB plants combined currently discharge approximately 900 pounds per day (lb/day) of 5-day Biochemical Oxygen Demand (BOD_5) to South Run. However, the State authorities have stated that this discharge overwhelms the stream's assimilative capacity by a factor of at least 10 times. The State evidently estimates that South Run can assimilate 50 to 100 lb/day BOD_5. The NJDEP has suggested that a combined advanced waste treatment facility for the McGuire/Dix complex may solve the quality/quantity problem of treated wastes into South Run.

d. A consulting engineers study of advanced waste treatment for the McGuire/Dix complex was released in January 1972. The object of this study was to evaluate alternative methods of providing tertiary treatment which would remove, as a minimum 95 percent of the BOD_5, phosphates and trace heavy metals. This study recommended a tertiary treatment plant located at Ft Dix to treat the combined secondary effluents from both MAFB and Ft Dix at an estimated capital investment of $8.3-million.

1. A review of State water quality standards revealed that no specific requirement for phosphate removal currently exists. A significant part of the advanced treatment facilities recommended in the study was for phosphate removal. The requirement for phosphate removal appears to have first been voiced by EPA (Boston) officials (Reference Federal Water Pollution Control Administration, Northeast Region, Boston, Mass. letter, to U.S. Army Corps of Engineers, NY District Engineer, dated 30 July 1970, RE: "Fort-Dix - McGuire Tertiary Treatment Study.")

2. According to the study, Alexander-Potter, the loading of the combined discharge from the Dix/MAFB advanced treatment facility would be approximately 380 lb/day BOD_5. No doubt, the State authorities will still consider this discharge to South Run excessive and in violation of State standards.

B. Preliminary Survey Findings:

(1) McGuire AFB Sewage Treatment Plant:

a. This plant has a rated capacity of 1.25 MGD. A review of plant operating logs for a one year period ending Aug 1971 revealed that the mean daily flow (averaged 1.5 MGD) exceeded the plant's rated capacity more than 60 percent of the time. The plant's flow metering device has been inoperative for several months. Entries in plant operating logs since August 1970 have reflected continuing problems with this flow measuring device.

b. The plant's monthly average BOD_5 removal efficiency has, according to plant logs, ranged from 87 to 90 percent and for suspended solids - 86 to 90 percent removal. An analysis of plant logs for a recent 12-month period revealed that the plant's effluent has been meeting the State's effluent quality standard of 25 mg/1 BOD_5 approximately 80 percent of the time. Worthy of note is that the effluent BOD_5 concentration was less than 30 mg/1 95 percent of the time, and less than 37 mg/1 98 percent of the time. The mean daily effluent BOD_5 for this 12-month period was 22 mg/1, while the mean daily effluent suspended solids (SS) concentration was 22 mg/1. The daily SS concentration was less than 32 mg/1 98 percent of the time.

c. Discussions with plant operators revealed that the anaerobic sludge digesters have not been producing methane for several months, since the breakdown of a gas recirculation system. Green, undigested sludge has been drawn regularly from the digesters, producing an obnoxious odor problem. Additionally, sludge drying bed underdrains clog and prolongs the sludge drying process.

d. Solids carry over from both primary and secondary clarifiers was evident during two visits to the plant. Small grease balls were overflowing the clarifier weirs and collecting in the chlorine contact chamber. Evidence of septic sludge deposits in the chlorine contact chamber was also noted. This problem most likely results from hydraulic overloading of the primary and secondary clarifiers. Plant operators commented that the clarifier overflow weirs are frequently inundated during peak flow periods.

e. MAFB currently has programmed an expansion of the existing sewage plant to accommodate the additional flow generated by 250 more military family housing units proposed for FY 1973, and for upgrading of the sewage plant to treat present flows (projected design capacity - 1.9 MGD).

(2) Fort Dix Sewage Treatment Plant

a. A Brief tour of this facility was made. This facility is a high-rate trickling filter plant and has a rated capacity of 3.0 MGD. An older standard-rate, fixed nozzle biofiltration plant provides treatment for about 20 percent of the total daily flow. Plant records showed that the average daily flow through both plants was 4.2 MGD.

b. Operating logs were available only on the newer, high-rate trickling filter plant. A review of monthly logs revealed that this plant was producing a high quality secondary effluent, the monthly average BOD_5 removal ranged from 82 to 91 percent. The older plant, however, is suspected of providing lower efficiencies, primarily because of its intermittent loading.

c. A concept design was completed in January 1971 to abandon the old fixed nozzle biofilter and expand the remaining facility to accommodate an average hydraulic loading of 5.0 MGD. These modifications to the Dix sewage plant are scheduled to begin during the summer of 1972.

(3) Untreated Waste Discharges (MAFB)

a. South Run was observed through MAFB. There were numerous indications of untreated waste discharges into the stream. Oil slicks were ever present, and solvent and grease odors were noted in several storm drain outfalls to the stream. Solvent and paint odors were very noticeable in the storm sewer flow draining the 2300, 2400, 3000, and 3100 areas.

b. The oil separators at the two aircraft washracks (Bldgs 2227 and 1824) were found to be in a poor repair. Recent problems with a scavanger service contract have resulted in poor conditions at these two sites.

c. Indications of frequent fuel spills around the fuel tanker maintenance area (Bldg 3206) were apparent. Surface runoff from this area would no doubt cause unsightly oil slicks in nearby streams.

d. Evidence was found of numerous vehicle equipment washracks located throughout the base. Washings from these areas contain oils, greases and detergents. These contaminants find their way into the base storm sewer, and ultimately into one of the two main surface drainage creeks on MAFB.

e. A comprehensive source survey of all base industrial wastewater discharges has been initiated by the Base Bioenvironmental Engineer. This survey should serve to identify the sources of untreated discharges as well as to document the volumes and types of industrial waste discharges to the sanitary sewer and those wastes disposed of through R & M.

(4) Receiving Water Observations

a. On 29 February 1972 the stream course of South Run was followed from above the Ft Dix treatment plant to the confluence with Crosswicks Creek. South Run is a small stream; normal flow above the Ft Dix plant outfall is probably less than 0.5 MGD. The entire course of South Run is shallow and fast flowing with sandy sediments. There is ample opportunity for reaeration of the stream. The visual impact of the Ft Dix - McGuire complex was that oils and greases overwhelmed South Run and caused discoloration and odors at the confluence with Crosswicks Creek. Small fish (killifish family, Cyprinodontidae) were observed upstream of the Ft Dix plant. No fish were observed anywhere on South Run downstream of Ft Dix. Sludge worms were found in the sediments at several points downstream of Ft Dix before the McGuire STP outfall. The previous EHL(K) study did not assess South Run's biological conditions. The quality of the receiving waters must be determined by biological parameters prior to discussing assimilative capacities.

b. The oils, detergents, and other materials in the water apparently are toxic and are suppressing algal growths and aquatic biota. A thorough evaluation of the stream oxygen curves and other chemical parameters as well as sampling of algae (plankton and periphyton), aquatic invertebrates, endemic fish and in situ bioassays using test fish are needed to define South Run's biological quality.

c. To determine the assimilative capacity of South Run and

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Crosswicks Creek, a clear definition of the quality of unpolluted area streams is necessary. Preliminary observations revealted that analyses of Jumping Brook and other small streams near Brindle Lake should provide these background data.

(5) Advanced Waste Treatment Program

a. A conference among MAFB, Ft Dix and Region II, EPA engineers was held on 23 March 1972. The McGuire - Ft Dix engineers are programming for FY 72 construction of the advanced waste treatment plant at McGuire. The plant's effluent is to be discharged into Crosswicks Creek below Oakford Lake in New Egypt, NJ. This programming is to include the provisions for phosphate removal. However, the EPA is to establish with the State authorities whether phosphate removal is necessarily a requirement for discharge to the South Run or to Crosswicks below Oakford Lake. If phosphate removal is not a valid requirement, then the phosphate removal unit processes could be deleted from the proposed tertiary system.

b. Discussions with the Region II, EPA Federal Facilities Branch resulted in the EPA agreeing to determine exactly what the NJ State requirements are for the MAFB - Ft Dix complex. The State is reportedly finishing work on a water basin plan covering this region. The EPA Region II plans to review this plan in the coming weeks. EPA Region II Federal Facilities Branch representatives have agreed to advise Ft Dix - MAFB authorities of any significant developments from discussions with State authorities.

(6) Pesticide Programs: McGuire AFB is a principal port for overseas flights. Rapid movement of military personnel and cargo results in the possibility of introducing agricultural pests. The problems are serious enough to warrant stiff quarantine laws and chemical control programs to eliminate known pests, and to prevent possible infestations of them. Many pesticides have been used routinely and repeatedly over long periods. Many of these compounds are persistent and cumulative in the environment. An environmental pesticide monitoring program is advocated and will be outlined elsewhere for base personnel.

8. Recommendations:

A. The Special Projects Division of the USAF Environmental Health Laboratory (EHL) should accomplish a field study at MAFB, tentatively planned for 11 - 23 June 1972. The basic objectives of this study should include:

(1) Establishing baseline data documenting the present physical, chemical and biological characteristics of the receiving waters.

(2) Evaluating present loading and treatment efficiencies for

both McGuire AFB and Ft Dix sewage treatment plants.

(3) Determinating assimilative capacity of waters receiving the treated effluents.

(4) Proposing performance specifications for both MAFB and Ft Dix sewage treatment plants to comply with New Jersey State water quality standards.

(5) Evaluating the impact of diverting untreated industrial waste discharges from the receiving streams to the existing and proposed treatment facilities following necessary pre-treatment.

B. The EHLK should coordinate this survey with New Jersey State authorities through Region II, EPA, as necessary to insure Ft Dix - MAFB compliance with present State pollution control requirements. Active participation by the State in this survey is strongly recommended so that the survey results could be used by the State to develop and justify water quality standards and concomitant plant performance specifications for both Ft Dix and MAFB discharges.

C. The MAFB authorities should coordinate all aspects of the June field survey with Ft Dix authorities. All sources of untreated waste-water discharges from Ft Dix should be identified prior to the June survey.

D. The Base Bioenvironmental Engineer should accomplish the:

(1) Industrial waste source inventory for MAFB as outlined during the preliminary survey. Particular attention should be given to immediately eliminating or relocating any non-essential washrack activities that do not have adequate wastewater pre-treatment and sufficient controls for discharge of wastes to the sanitary sewer.

(2) Sampling of stream sediments and base wells for pesticide residues as outlined during the preliminary survey.

E. MAFB authorities should repair and calibrate the flow meter at the base sewage treatment plant prior to the field survey in June.

F. An operation plan will soon be prepared by EHL outlining the scope of the June field survey, defining the study's purpose and objectives, and outlining the coordination and support requirements.

James W. Tremblay

JAMES W. TREMBLAY, Captain, USAF, BSC
Project Engineer

1 Atch
List of Persons Contacted

Cy to: USAF Env Health Lab/CC
McClellan AFB CA 95652

Base Med Officer
McGuire AFB NJ 08641

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Personnel Contacted
EHL Preliminary Visit-MAFB NJ
Special Project 72-1, Feb-Mar 1972

A. McGuire AFB, Fort Dix Personnel:

Col J. E. Perkinson, MAFB Civil Engineer
Lt Col A. Townsend, MAFB Surgeon
Capt D. Abraham, MAFB, Chief Military Public Health
1Lt R. Jandrucko, MAFB, Bioenvironmental Engineer
Lt Col A. Blaylock, Ft Dix Post Engineer
Mr. E. Porr, MAFB, Civil Engineering (DEE)
Mr. E. Dion, MAFB, Civil Engineering (DEEE)
Mr. J. Zebrowski, MAFB, Civil Engineering (DEEE)
Mr. E. Kirschner, MAFB, Civil Engineering (DEPD)
Mr. E. Herndon, Ft Dix, Chief Engineer
Mr. T. Scott, Ft Dix, Sewage Plant Foreman
TSgt A. Jones, MAFB, Sewage Plant Foreman
Mr. R. Gervasoni, MAFB, Entomology Foreman

B. EPA, Region II Conference, NYC

Mr. John Chase, EPA, Office of Federal Activities, Washington, DC
Mr. Harvey Falk, OSD, Washington, DC
Mr. Harry Ike, EPA, Region II, Federal Facilities Br, Edison, NJ
Mr. Ed Ernstrom, EPA, Region II, Edison, NJ
Mr. F. Oliva, NY Dist. Army Corps of Engr, Project Engineer
Mr. R. Mawhrnney, NY Dist. Army Corps of Engr

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DEPARTMENT OF THE AIR FORCE
USAF ENVIRONMENTAL HEALTH LABORATORY (AFLC)
KELLY AIR FORCE BASE, TEXAS 78241

5 June 1972

REPLY TO ATTN OF: CC

SUBJECT: Trip Report - McGuire AFB NJ - Special Project 72-1

TO: Commander, USAF Env Health Lab/CC, Kelly AFB TX 78241
AFLC/SCPE, Wright-Patterson AFB OH 45433

1. Place: McGuire AFB NJ.

2. Inclusive Dates of Travel: 23-26 May 1972.

3. Persons Making Trip: LtCol Albert M. Elliott & Capt James W. Tremblay.

4. Primary Mode of Transportation: Commercial Air.

5. Purpose of Trip: To provide technical assistance to McGuire AFB and Fort Dix authorities in discussions with the New Jersey Department of Environmental Protection (NJDEP) and Region II, Environmental Protection Agency (EPA).

6. Persons Contacted: (See Attachment).

7. Observations and Findings:

a. Background: (See EHL/K Trip Report-McGuire AFB NJ, dtd 7 Apr 72)- Following the preliminary survey to MAFB in March 1972, the EHL/K recommended to Hq USAF that the legal embargo on technical discussions with NJDEP be lifted. On 14 April 1972, permission was granted by U. S. Attorney, Newark NJ through CSAF to conduct technical dialogue among all interested parties at MAFB in May 1972. (Reference CSAF Msg, PREV 15, subj: "McGuire Cease/Desist Order," dtg 051727Z May 72). Preliminary discussions among DOD agencies were held at MAFB on 24 May 1972, and a technical conference including NJDEP and EPA representatives was conducted on 26 May 1972. Detailed minutes of both days' discussions are to be prepared by MAFB authorities and distributed to all attendees.

b. Army/Air Force Discussions - 24 May: Technical background materials concerning the NJDEP administrative orders were reviewed, and DOD chief legal counsel's guidance for technical discussions with non-DOD agencies was critiqued. Alternative courses of action were developed; specific questions for the NJDEP representatives were formulated; and a single Army/Air Force spokesman was selected for the following day's conference.

c. Army/Air Force, EPA, NJDEP Discussions - 25 May: Introductory comments were made by EPA, NJDEP and DOD representatives. The technical, non-legal character of the discussions was stressed from the outset. All attendees agreed that the conference objectives were to arrive at a set of future viable alternative courses of action and to define as clearly as possible what additional supportive studies will be required to properly consider these viable alternatives. Following detailed discussions of a number of overall water quality management schemes, it was agreed that:

1. The DIX/MAFB engineers will investigate the feasibility of entering into one of the three known regional wastewater treatment plans (North Burlington County, Ocean County and Oakford Lake plans).

2. Concurrently with the above investigation the Army/Air Force is to study a total water quality management concept for the DIX/MAFB complex from an economic, technical and environmental viewpoint.

d. Post-Conference Discussions - Dix/MAFB/EPA-25 May: The Ft. Dix representatives indicated that they were going to request guidance/assistance from 1st Army Headquarters to support any required field investigations. The EPA representative indicated that in-field laboratory assistance could be arranged with the EPA's Edison Laboratory. At the request of the Ft. Dix and MAFB representatives the EHL/K will coordinate all field investigations required to support the various water quality management schemes identified as viable alternatives.

8. Recommendations:

a. The Special Projects Division of the EHL/K should coordinate all necessary field studies among DOD, EPA, NJDEP agencies to support the following alternative water quality management schemes:

1. Separate detention basins for later discharge of stabilized secondary effluent to surface water courses at higher natural stream flows.

2. Ground water renovation by spray irrigation, overland runoff or rapid infiltration.

3. Water quality management of South Run (present receiving waters) by providing an engineered system of flow regulation and selective reclamation/reuse of stabilized wastewater.

4. Low-flow augmentation of receiving waters.

5. Discharge of treated wastewater effluents to other surface water courses.

b. The objectives of any field studies should include the development of performance specifications as required by current directives (Executive Order 11507, DOD Directive 5100.50 and USA/USAF implementing directives). These specifications should, as a minimum, provide for conformance with all applicable water quality standards and should be developed in consultation with NJDEP and EPA authorities. (Reference para 5.b.(2)(f), AFR 19-1, "Protection and Enhancement of Environmental Quality," 18 Feb 72).

c. Available climatological data indicate that late summer/early fall would be the best time for lower flow conditions in surface water courses. Pre-survey planning and coordinating among all concerned agencies will be required, and optimum weather conditions for field studies suggest that late August to early October be tentatively established as a target date for accomplishing any required field investigations.

James W. Tremblay

JAMES W. TREMBLAY, Capt, USAF, BSC
Project Engineer

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List of Persons Contacted

Cy to:
USAF Env Health Lab/CC
McClellan AFB CA 95652
Base Medical Officer
McGuire AFB NJ 08641
Base Civil Engineer
McGuire AFB NJ 08641
Chief, Facilities Engineer
Fort Dix NJ 08640

PERSONNEL CONTACTED

EHL/K Visit to MAFB NJ
Special Project 72-1, May 1972

Col Wigley, 438 MAW, Vice Commander
Col Perkinson, MAFB, Civil Engineer
LtCol Townsend, MAFB Surgeon
LtCol Blaylock, Ft Dix Post Engineer
Maj Klingenberger, MAFB Civil Engineering
1st Lt Jandrucko, MAFB Bioenvironmental Engineer
Mr Segal, Hq US Air Force, Wash DC (PREV)
Mr Nixon, Hq Military Airlift Command, Scott AFB IL (DEMP)
Mr Ike, Region II, Env Prot Agency, Chief Fed. Fac. Br.
Mr Mansfield, Region II, Env. Prot. Agency, Fed. Fac. Br.
Mr Giallella, N.J. Dept of Env Protection (DEP)
Mr Kaushik, N.J. DEP
Mr Binder, N.J. DEP
Mr Herndon, Ft Dix Post Engineering
Mr Petrino, Ft Dix Post Engineering
Mr Porr, MAFB Civil Engineering
Mr Zebrowski, MAFB Civil Engineering
Mr Manning, Delaware River Basin Commission
Mr Bloom, North Atlantic District Army Corps of Engineers
Mr Grippi, Alexander-Potter Consulting Engineers

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DEPARTMENT OF THE AIR FORCE
USAF ENVIRONMENTAL HEALTH LABORATORY (AFLC)
KELLY AIR FORCE BASE, TEXAS 78241

REPLY TO ATTN OF: CC

20 July 1972

SUBJECT: Trip Report - McGuire AFB NJ - Special Pro, 72-1

TO: Commander, USAF Env Health Lab/CC, Kelly AFB TX 78241
AFLC/SGPE, WPAFB OH 45433

1. Place: McGuire AFB, NJ
U. S. Army Env Hygiene Agency, Edgewood MD.
New Jersey Dept of Env Protection, Trenton, NJ.
U. S. Env Protection Agency Laboratory, Edision NJ.

2. Inclusive Dates of Travel: 9-14 July 1972.

3. Persons Making Trip: Maj. C. Williams, Capt. J. Tremblay, 1Lt N. Lamb.

4. Primary Mode of Transportation: Commercial Air.

5. Purpose of Trip: To coordinate technical aspects of water pollution abatement activities of McGuire AFB and Fort Dix New Jersey, and to outline the purpose, scope and necessary support requirements for detailed field investigations requested by MAFB and Fort Dix authorities.

6. Persons Contacted:

McGuire AFB Personnel:

Col. Perkinson, Civil Engineer
LtCol. Townsend, Surgeon
Maj. Klingenberger, Civil Engineering
1Lt. Jandrucko, Bioenvironmental Engineer.
Mr. Porr, Civil Engineering
Mr. Zebrowski, Civil Engineering

Fort Dix Personnel:

LtCol. Blalock, Director of Facilities Engr
Mr. Petrino, Chief Engr Directorate of Facilities Engr
Mr. Herndon, Chief, Utilities

Army Environmental Hygiene Agency Personnel

Col. H. Taft, Commander
LtCol. D. Muntz, Chief Water Qual Engr Div
LtCol. M. Steinberg, Director, Lab Services
LtCol. W. Ward, Chief Env Chemistry Div
Maj. L. Spangler, Water Qual Engr Div
Maj. C. Sorber, R & D Activity
Capt M. Lawson, Entomology Sci. & Pesticides Div
Mr. P. Fianu, Env Chemistry Div

1st Army Medical Laboratory

Capt E. Hollos

U. S. Environmental Protection Agency (EPA)

Mr. W. Mansfield, Region II Fed. Fac. Branch
Mr. F. Brezenski, Technical Support Branch, Edison Laboratory
Mr. R. Dewling, Surveillance & Analysis Division Laboratory

New Jersey Dept of Environmental Protection

Mr. E. Segesser, Chief Water Resources
Mr. C. Kaushik, Principal Engineer, Water Resources
Mr. N. Binder, Sr. Env. Engineer, Water Resources
Mr. F. Takacs, Principal Biologist, Water Resources

Delaware River Basin Commission

Mr. R. Manning, Resident Engineer

Burlington County Health Department

Mr. W. Trommelen, Public Health Coordinator

7. Observations and Findings:

a. Background: (See EHL/K Trip Reports McGuire AFB, NJ, dated 7 Apr 72 and 5 June 72 covering an EHL/K preliminary visit to MAFB/Dix in late February and a technical assistance visit to MAFB during conferences held among all concerned parties in late May) The May conference resulted in agreements that:

(1) The Dix/MAFB engineers would investigate the feasibility of entering into one of the three known regional wastewater treatment plans.

(2) The EHL/K would coordinate all necessary field studies in support of acceptable water quality management schemes.

(3) The active participants in these field studies would meet again to coordinate the necessary details.

b. Itinerary: Following is an itinerary of the EHL/K team:

(1) 10-11 July - Discussions with, MAFB/Dix, 1st Army Med Lab, and Region II EPA personnel concerning alternative courses of action and scope of field studies.

(2) 12 July - Visit to U. S. Army Environmental Hygiene Agency to discuss analytical support of field studies.

(3) 13 July - Discussions with NJ Dept of Env Protection on regionalization schemes, scope of field studies and interim water quality criteria.

(4) 14 July - Visit to U. S. Environmental Protection Agency Edison Laboratory to discuss analytical support of field studies.

c. MAFB/Dix/EPA/EHL Discussions - 10/11 July:

(1) Regionalization: The MAFB, Ft Dix and EPA representatives agreed that regionalization would be the best alternative. The MAFB and Dix engineers had been in contact earlier with the consultant engineers for the North Burlington County and Ocean County plans. Both consultant firms have expressed interest in the regional plants accepting the Dix/MAFB raw waste for treatment. Because of relative distances to these two systems, the North Burlington County plan is considered more economical. In addition, the NJ DEP had earlier expressed some objections to transporting the wastes from MAFB/Dix complex out of the Crosswicks Creek/Delaware River Basin to the Ocean County regional system. (Reference minutes of meeting with NJDEP on 25 May 72). The Ft Dix Facilities Engineer expressed serious concern over the status of an FY 73 project for hydraulic upgrading of the existing Dix sewage plant in the event that one of the possible regionalization schemes materializes. Authorization for the funds appropriated for this project (in excess of $2.5 million) expires in October 72.

(2) Field Survey Plans: Ft Dix and MAFB requested that the EHL/K and 1st Army Medical Laboratory continue plans for a field study in September. The overall scope of the study was discussed, including a comprehensive stream survey, treatment plant evaluations and pilot studies as necessary depending on the reaction of the NJDEP during later discussions. General support requirements by Dix/MAFB were outlined and an agreement was reached for EHL/K to publish an operation plan including the field survey support required from Dix and MAFB.

d. Army/Air Force/EPA/NJDEP Discussions - 13 July:

(1) Regionalization: The NJDEP representatives expressed the desire for a regional wastewater treatment concept for the Dix/MAFB complex, and revealed that the North Burlington County Board of Freeholders had created a regional sewerage authority the previous evening, 12 July 72. The sewerage authority representative agreed to invite the Dix and MAFB to the authority's initial meetings. The Dix and MAFB representatives agreed to submit to the State through appropriate legal channels a summary of the official Army/Air Force position regarding regionalization, including a request that the State express its official position concerning interim water quality criteria. Unofficially, the NJDEP's view is that if the bases entry into a regional wastewater treatment scheme is anticipated, and no significant increases in wastewater flow are expected, the state would not impose interim requirements resulting in capital expenditures for facilities to be abondoned upon connection to the regional treatment plant. In effect, the "status quo" could be acceptable to the state under these conditions. The NJDEP representative pointed out that federal funding of the regional system through the federal grant- and- aid program would be an important

issue in the timely realization of any regional wastewater treatment scheme.

(2) Field Survey Plans. Following a brief EHL/K presentation of the field survey plans, the State representatives expressed interest in limited participation in, and observation of the field activities. Stressed during these discussions was the need for data to prepare an environmental assessment of the proposed courses of action, particularly with respect to the diversion of the waste waters from the Crosswicks Creek water shed in the case of regionalization. The overall objectives of the field survey were determined to be the definition of existing water quality in the receiving stream, the impact of current discharges, the relationship of existing and desired stream water quality, the development of performance specifications for each of the two sewage treatment plants to meet the prevailing water quality criteria of the receiving stream, including recommendations for interim specifications, and proposed schemes to achieve the desired effluent quality.

e. AEHA/EHL/EPA Discussions - 12 & 14 July: The AEHA and EPA laboratories have agreed to provide analytical support of field studies.

8. Recommendations:

a. The Dix and MAFB authorities should continue their investigations into the feasibility of entering into the North Burlington County regional wastewater treatment plan. Despite some State reservations, the Dix and MAFB authorities should further investigate the feasibility of the Ocean County plan as an alternative in the event that future discussions with the North Burlington County Sewerage Authority reach an impasse.

b. The Special Projects Division of the EHL/K in cooperation with the EPA, AEHA, and 1st Army Med Lab will conduct a comprehensive field study at the Dix/MAFB complex between 12 and 25 September 1972. An operations plan outlining the scope, purpose, objectives and support requirements of the field study will be published at the earliest possible date.

James W. Tremblay

JAMES W. TREMBLAY, Capt
Project Engineer

Cy to: USAF Env Health Lab/CC
Base Surgeon
Base Civil Engineer
Chief Facilities Engineer
1st Army Medical Laboratory
HQ USAF/PREV
HQ MAC/Civil Engr

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DEPARTMENT OF THE AIR FORCE
USAF ENVIRONMENTAL HEALTH LABORATORY (AFLC)
KELLY AIR FORCE BASE, TEXAS 78241

REPLY TO ATTN OF: CC

18 October 1972

SUBJECT: Trip Report - Special Project 72-1 - McGuire AFB NJ

TO: Commander, USAF Env Health Lab/CC, Kelly AFB TX 78241
AFLC/SGPE, Wright-Patterson AFB OH 45433
IN TURN

1. Place Visited: McGuire AFB/Fort Dix NJ

2. Inclusive Dates of Travel: 10-26 Sep 1972

3. Persons Making Trip:

Maj C. Williams	Sgt G. Beere
Capt R. Clegern	Sgt R. Suppes
Capt J. Thomas	Sgt W. Caskey
Capt J. Tremblay	Sgt D. Jones
1/Lt N. Lamb	Sgt J. Jones
TSgt S. Britt	Sgt D. Hodgkinson
SSgt A. Buziak	

4. Primary Modes of Transportation:

To McGuire AFB:

9 Sep - 2 personnel and survey equipment - LOGAIR
10 Sep - 10 personnel - Commercial Air
10 Sep - 1 person - POV

To Kelly AFB:

24 Sep - 2 personnel and survey equipment - LOGAIR
24 Sep - 6 personnel - Mil Air/Commercial Air
24 Sep - 1 person - POV
25/26 Sep - 4 personnel - Commercial Air

5. Purpose of Trip: To conduct a comprehensive water pollution field investigation at the request of McGuire AFB/Ft Dix authorities. The purpose and objectives of this field survey are outlined in the Technical Report, "Water Pollution Survey Operational Plan - McGuire AFB, Fort Dix, New Jersey", USAF Environmental Health Laboratory, Kelly AFB TX, August 1972.

6. Persons Contacted: (See Atch 1).

7. Observations and Findings:

a. Sampling and Analyses: The field survey was accomplished as planned. Composite samples of the Ft Dix and MAFB sewage plants were obtained for a 12-day period. Sampling of the receiving waters was conducted for an 11-day period. Most chemical analyses of these samples were accomplished in the field, while some samples are currently under analysis at the Environmental Protection Agency Laboratory (Edison NJ), the U.S. Army Environmental Hygiene Agency (Edgewood Arsenal MD) and the Environmental Health Laboratory (Kelly AFB TX).

(1) Sewage Treatment Plant Evaluations: Both treatment plants are providing good to excellent secondary treatment of wastewaters. Some inefficiencies in suspended solids removal and inadequate effluent disinfection were noted.

(2) Enhanced Treatment Evaluations: The feasibility of chemical additions and activated carbon adsorption for enhanced treatment at both sewage plants was evaluated. Preliminary analysis of available data indicates that enhanced treatment is technically feasible.

(3) Receiving Waters Evaluation: Preliminary evaluation of available stream data has revealed some degradation of water quality as a result of treated wastewater discharges from the two treatment plants. Gross pollution, however, was not in evidence.

b. Alternative Treatment Schemes: Land disposal, advanced waste treatment, and regionalization are three alternative wastewater management schemes. All three schemes are still considered viable alternatives. Regionalization is considered the most desirable scheme. The State of New Jersey authorities have voiced objections to the inter-basin transport of wastewaters to the Ocean County Sewerage Authority, and the Northern Burlington County Sewerage Authority is currently experiencing organizational problems.

8. Conclusions and Recommendations:

The authorities of both Ft Dix and MAFB were out-briefed by the field survey team on 25 September. (See Attachment.) Following additional data analyses, a preliminary technical report of the results of this field study will be published by the Environmental Health Laboratory.

James W. Tremblay

JAMES W. TREMBLAY, Capt, USAF, BSC
Bioenvironmental Engineer

1 Atch: Personnel Contacted

Cy to: Base Surgeon, McGuire AFB NJ 0864
Base Civil Engr, McGuire AFB NJ 0
Chief Facilities Engr, Ft Dix NJ0
1st U.S. Army Med Lab (EHES),
Ft Geo G. Meade MD 20755
USAF/PREV USAF/SGP
MAC/DEMP MAC/SGPE
USAF Env Health Lab/CC, McClellan

PERSONNEL CONTACTED - MCGUIRE AFB/FT DIX
WATER POLLUTION SURVEY - 10-26 SEP 1972

McGuire AFB Personnel

*Col Wentsch, Commander, 438 MAW
*Col Dalton, Vice-Commander, 438 MAW
*Col Echabarne, Base Commander
*Col Montgomery, Deputy Base Commander
*Col Perkinson, Base Civil Engineer
*Lt Col Gibson, 438 LG
*Lt Col Townsend, Base Surgeon
*Capt Emigh, Clinic Administrator
Capt Abraham, Chief, Military Public Health
*Capt Jandrucko, Base Bioenvironmental Engineer
*Capt Schnorr, 438 LGM
*Mr. Porr, Associate Base Civil Engineer
Mr. Camilli, Base Civil Engineering
Mr. Dion, Chief of Engineers
*Mr. Zebrowski, Base Civil Engineering
CMSgt Slominski, Superintendent, Sanitation Division
SSgt West, Sewage Plant Operator

HQ Military Airlift Command Personnel

Maj Markland, Command Bioenvironmental Engineer

Fort Dix Personnel

Lt Col Blalock, Director, Facilities Engineering
Lt Col Bartley, Preventive Medicine Officer
*Maj Rebello, Facilities Engineering
*Capt Braverman, Environmental Sanitarian, Ft Dix Meddac, Prev. Med. Act.
*Mr. Petrino, Chief, Engr Directorate of Facilities Engr
*Mr. Herndon, Chief, Utilities
Mr. Scott, Sewage Treatment Plant Supervisor

U.S. Army Environmental Hygiene Agency Personnel

Capt Graven, Water Quality Engr Division
Mr. Fianu, Engr Chemistry Division

1st Army Medical Laboratory Personnel

*Capt Hollos, Sanitary Engineer
Sp4 Sobczak, Biology Technician
Sp4 Kosoglow, Chemistry Technician
Sp4 Gaspari, Chemistry Technician

Atch /

*Personnel atttended out-briefing on 25 Sep 1972.

Federal EPA (Region II) Personnel

Mr. Ike, Chief, Federal Facilities Division
Mr. Mansfield, Federal Facilities Division
Mr. Stanton Federal Facilities Division

State of New Jersey Dept of Environmental Protection Personnel

Mr. Binder, Water Resources, Principal Engr
Mr. Takacs, Water Resources, Principal Biologist
Mr. Olson, Water Resources, Asst Biologist
Mr. Lubow, Water Resources, Asst Biologist
Mr. Kotch, Water Resources, Env Field Worker

State of New Jersey Div of Fish Game and Shellfisheries Personnel

Mr. Bolton, Bureau of Fishery Mgt, Asst Biologist
Mr. Cramer, Bureau of Fishery Mgt, Fisheries Worker

Battelle Columbus Laboratories Personnel

Mr. Carlton, Waste Control and Process Technology Division
Mr. Baytos, Waste Control and Process Technology Division

Soil Conservation Service Personnel

Mr. Mahn, Burlington Co., District Conservationist
Mr. Tharpe, Ocean Co., District Conservationist
Mr. Jablonski, Ocean Co., Soil Scientist

Lakehurst Naval Air Station Personnel

Mr. Newby, Station Forester, Public Works Department

Ocean County Sewer Authority Personnel

Mr. Gritzuh, Engineering Administrator
Mr. Calderella, Consulting Engineer, Fellows, Reed & Weber, Inc.

Region II Office
26 Federal Plaza
New York, New York 10007

September 7, 1972

Mr. Ernest R. Segesser
State of New Jersey
Department of Environmental Protection
Division of Water Resources
Trenton, New Jersey 08625

Dear Mr. Segesser:

Reference is made to your letter of August 10, 1972 and the meeting in your office on July 13, 1972, regarding Fort Dix and McGuire Air Force Base. At the meeting it was agreed that Fort Dix and McGuire AFB would indicate in writing their position concerning possible participation in the proposed Northern Burlington County Sewage Authority system.

Attached is a letter from Fort Dix indicating their position regarding this. We have not yet received McGuire's position; however, we have been advised it will be forthcoming shortly.

It is requested that you confirm in writing the items mentioned in paragraph seven (7) of the Fort Dix letter; namely

1. Your intention to construct or have constructed a regional sewage system in the vicinity of Fort Dix, and

2. Your agreement that funds not be spent at Fort Dix at this time for improvements later to be abandoned and that the Fort Dix wastewater treatment facility should continue to be operated in the current manner with the existing plant equipment pending connection to the regional sewage system.

An expeditious answer would be greatly appreciated. If you have any questions, please contact us at 212-264-9637 at any time.

Sincerely yours,

Harry A. Ike, P.E.
Chief
Federal Facilities Section

Enclosure

cc: McGuire, AFB
cc: Fort Dix, AFB

send copy to C. Dufor

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATER RESOURCES

TRENTON, NEW JERSEY 08625

December 4, 1972

Mr. Gerald M. Hansler
Regional Administrator
Environmental Protection Agency
Room 847
26 Federal Plaza
New York, NY 10007

Dear Mr. Hansler:

This is in response to your letter of October 31, 1972 concerning the need for the development of a basin plan covering the headwaters area of Crosswicks Creek in relation to the problems associated with the Fort Dix - McGuire Air Force Base waste water discharges in that Basin.

An investigation of this situation by our staff would indicate that connection to the sewerage system being planned by the Ocean County Sewerage Authority would have a number of environmental problems associated with it, and we feel at this point that this alternative should be eliminated.

I attended a meeting in Northern Burlington County sponsored by the county government, which included representation from Fort Dix and McGuire Air Force Base, last Wednesday night, November 29. There is a long history of difficulties concerning the establishment of a regional agency to construct a comprehensive regional sewerage system to serve Northern Burlington County. An attempt to form a regional authority was frustrated through a referendum in the City of Bordentown, and a county authority which was formed, with jurisdiction limited to this area, held two meetings and then dissolved itself. At the conclusion of the meeting last Wednesday evening, I recommended that the County undertake an environmental assessment study, examining all of the concepts and alternatives for providing an environmentally sound water quality management program for Northern Burlington County. At this point, it appears that this recommendation has been accepted, and the work would be carried out with close coordination with the basin planning group in our Bureau of Water Pollution Control. Since a number of alternatives have already been investigated, including cost estimates reflecting capital costs and cost of operation and maintenance of regional facilities, we envision the completion of this study in approximately six months after its initiation.

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In the near future the staff of our Bureau of Water Pollution Control will be in touch with your office to coordinate the environmental studies which will be undertaken, and to guarantee that their scope and content will be complete and comprehensive and result in an acceptable water quality management plan, taking into consideration the requirements of Fort Dix and McGuire Air Force Base.

Very truly yours,

Charles M. Pike
Director

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

December 20, 1972

Colonel Julian E. Perkinson
Base Civil Engineer
Headquarters 438 Air Base Group (MAC)
McGuire Air Force Base, New Jersey 08641

Dear Colonel Perkinson:

We have received a reply to our letter of October 31 to the New Jersey Department of Environmental Protection (NJDEP) concerning the proposal to connect the Fort Dix and McGuire Air Force Base wastewater systems to the planned Ocean County Sewerage Authority system.

The NJDEP takes the position in this letter that the proposed connection would have a number of environmental problems associated with it and that this alternative should be eliminated from consideration at this point. You have already received a copy of the November 22 letter from the Delaware River Basin Commission (DRBC) to this office voicing their concern over the environmental issues involved in an inter-basin transfer of the Fort Dix-McGuire Air Force Base wastewater to the Ocean County system. This office concurs with the NJDEP and the DRBC in their concern over the environmental issues involved in this matter and recommends that this alternative be eliminated from further consideration and that your installation actively pursue other alternative wastewater management schemes.

Sincerely yours,

Rocco D Ricci

Rocco D. Ricci, P. E.
Acting Director
Division of Air and Water Programs

Enclosure
NJDEP letter of Dec. 4, 1972

cc: NJDEP
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APPENDIX B

Field Survey and Analytical Procedures and Methods

Contents | Page

Tables

Figures

I. GENERAL

A. A field survey was conducted at the Ft Dix/MAFB complex by the EHLK between 10 and 26 September 1972. Extensive sampling of both wastewater treatment plants to provide data on the volume and characteristics of wastes and sewage treatment plant efficiencies was accomplished.

B. Participants in the field survey are listed below:

1. EHLK Personnel

Major C. Williams	Sgt C. Beere
Capt R. Clegern	Sgt R. Suppes
Capt J. Thomas	Sgt W. Caskey
Capt J. Tremblay	Sgt D. Jones
Capt N. Lamb	Sgt J. Jones
TSgt S. Britt	Sgt D. Hodgkinson
SSgt A. Buziak	

2. U. S. Army Env Hygiene Agency Personnel

Capt H. Graven	Mr P. Fianu

3. 1st U. S. Army Medical Laboratory Personnel

Capt E. Hollos	Sp4 B. Kosoglow
Sp4 A. Sobczak	Sp4 C. Gespari

II. SAMPLING STATION LOCATIONS

A total of 13 sewage plant sampling stations and eight receiving stream sampling stations were established. Following are location logs for the field survey sampling stations.

A. SEWAGE PLANT'S SAMPLES

Twenty-four hour and twelve-hour composite samples from the various sampling locations at both the Ft Dix and MAFB sewage plants were manually composted hourly in proportion to flow as measured by existing flow metering devices at each plant. The composite samples were refrigerated during the collection period. Table B-1 is a location log for sampling stations at both the Ft Dix and MAFB sewage treatment plants. Figures B-1 and B-2 are respectively schematic diagrams of the Ft Dix and MAFB sewage plants showing locations of sampling stations.

TABLE B-1. SEWAGE PLANT SAMPLING STATION LOCATION LOG, FT. DIX/MAFB, NJ, SEPTEMBER 1972.

FT. DIX SEWAGE PLANT

D-1	Raw Sewage
D-2	Primary Clarifier Influent
D-3	Primary Clarifier Effluent
D-4	TF Influent
D-5	TF Effluent
D-6	Final Clarifier Effluent
D-7	Final Effluent
D-A	Sludge Influent to Digester
D-B	Digested Sludge Effluent to Drying Beds
D-C	Digester Supernatant

McGUIRE AFB SEWAGE PLANT

M-1	Raw Sewage
M-2	Primary Clarifier Influent
M-3	Primary Clarifier Effluent
M-4	TF Effluent
M-5	Final Clarifier Effluent
M-6	Final Effluent
M-A	Sludge Influent to Digester
M-B	Digested Sludge to Drying Beds
M-C	Digester Supernatant

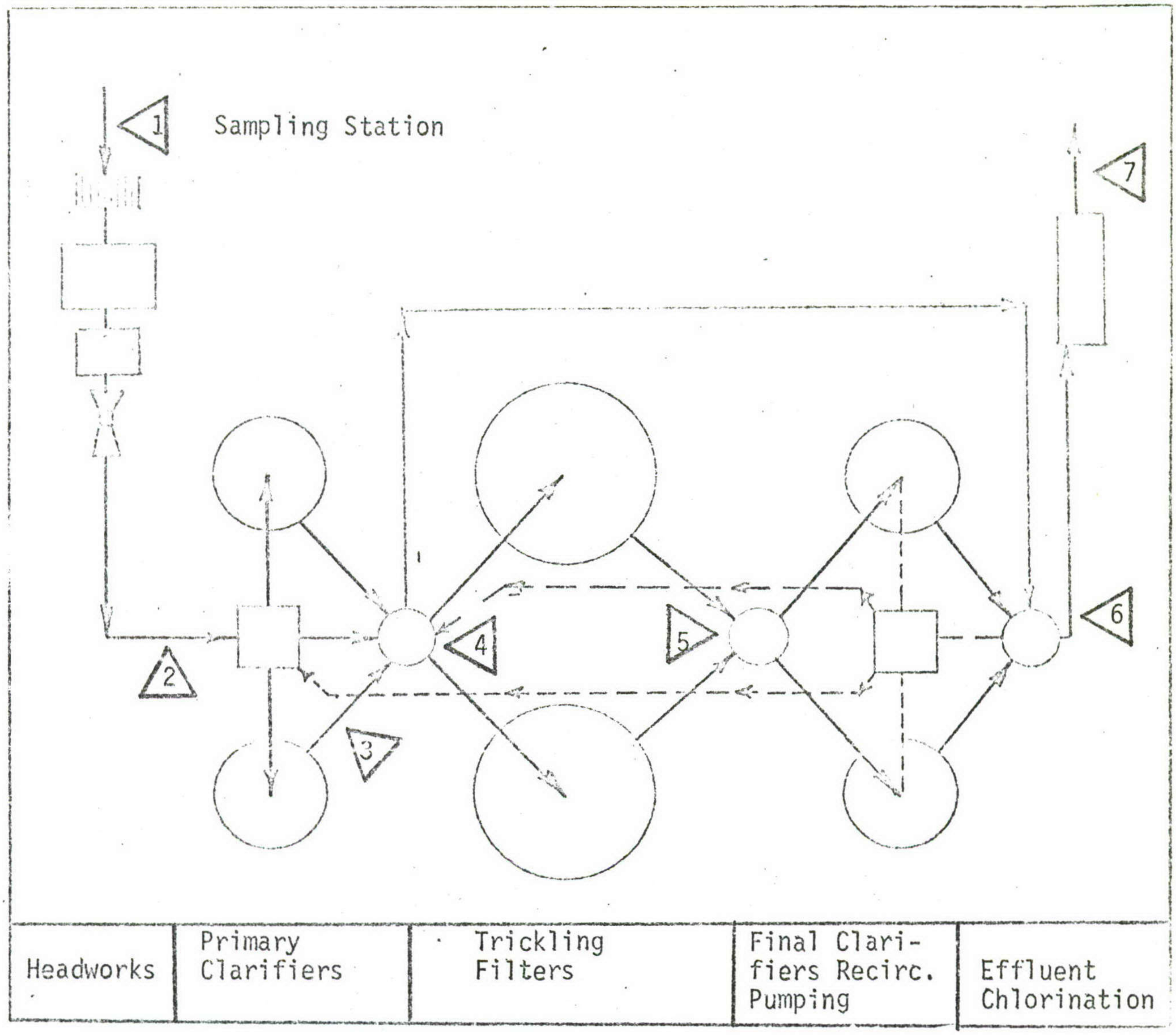

Figure B-1. Schematic Flow Diagram - Ft Dix Sewage Plant - Sampling Station Locations - Sep 1972

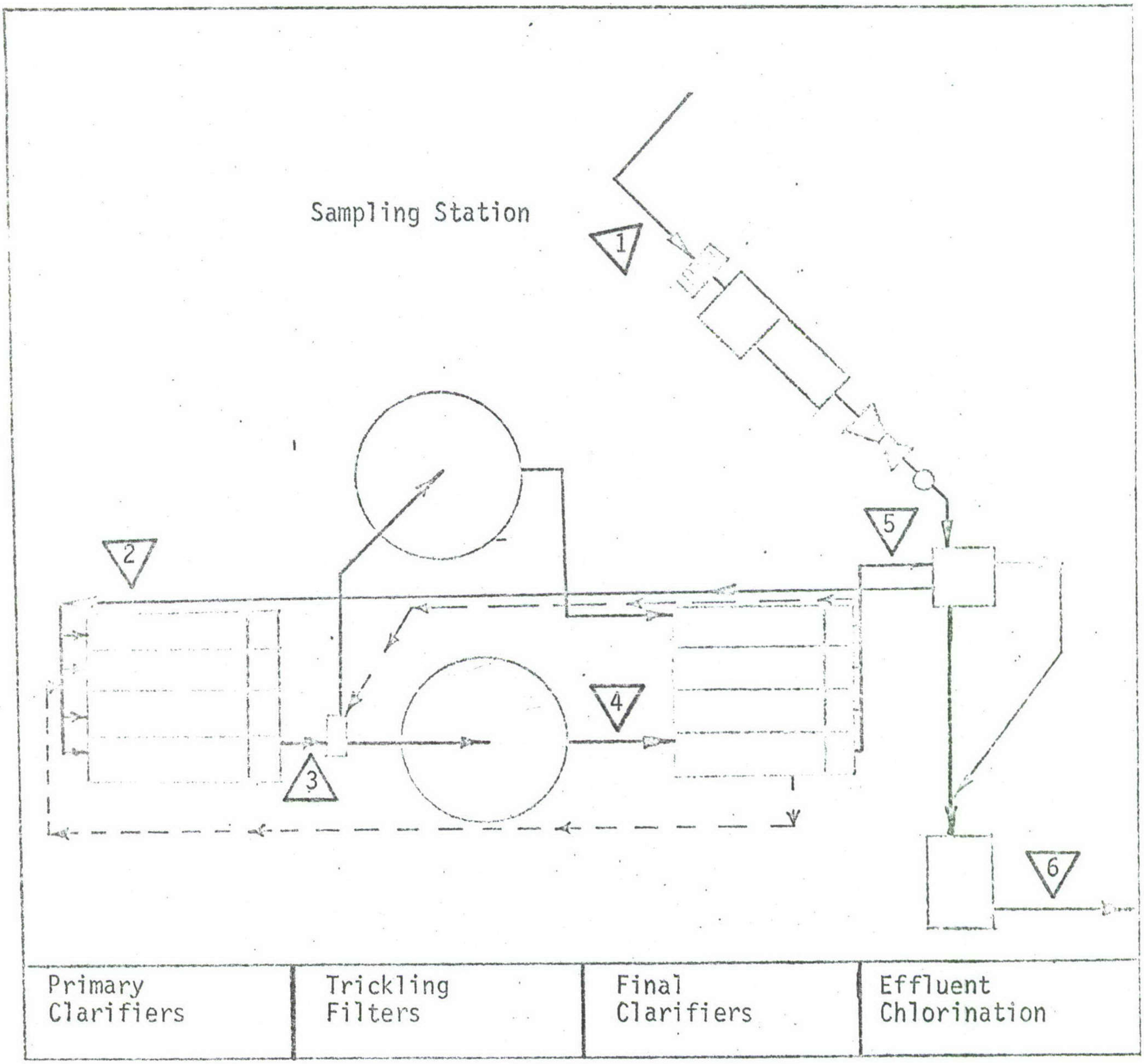

Figure B-2. Schematic Flow Diagram - MAFB Sewage Plant - Sampling Station Locations - Sep 1972

B. STREAM SAMPLES

Most all water samples from the receiving waters were composited by battery-operated, time-proportional samplers over a 24-hour period for each day. As a result of equipment failure/maintenance, some stream water samples were grabbed and have been so identified in data presentations. Table B-2 is a location log for sampling stations on the receiving waters. Figure B-3 is an area sketch showing the stream sampling station locations.

TABLE B-2. SAMPLING STATION LOG McGUIRE AFB/FT DIX NJ WATER POLLUTION SURVEY, SEPTEMBER 1972

STREAM LOCATIONS

Station	Location
S-1	Jumping Br Above Confluence with Crosswicks
S-2	South Run Above Ft Dix STP
S-2A	Tributary to South Run above Ft Dix STP
S-3	South Run Below Ft Dix STP on McGuire
S-3A	Tributary to South Run above MAFB STP
S-4	South Run Below McGuire STP
S-5	Crosswicks Cr at Brindle Lake Road
S-6	Crosswicks Cr at Bunting Bridge Rd
S-7	North Run Above Confluence with Crosswicks
S-8	Crosswicks Cr Below New Egypt

Figure B-3. Area Surface Drainage - Ft Dix, MAFB Stream Sampling Station Locations - Sep 1972

III. STREAM FLOW MEASUREMENTS

All stream flow measurements (width, depth, and velocity) were made using current meters and accessories. Continuous recording of stream flows was not possible, so a number of flow measurements were made each day during the field survey to estimate the average total daily flows at each stream station.

IV. ANALYTICAL PROCEDURES

Procedures used in sample analyses were in accordance with "Standard Methods for Examination of Water and Wastewaters," 13th Edition, 1971, American Public Health Association, New York, New York. Analyses of samples were accomplished by two different agencies: (1) USAF Environmental Health Laboratory, Kelly (EHLK) Environmental Chemistry Support Branch; (2) U. S. Army Environmental Hygiene Agency, (AEHA), Edgewood Arsenal, Maryland. Table B-3 is a list of parameters determined by the EHLK, the analytical procedures/methods used and lower detectable limits. Table B-4 is a list of parameters determined by the AEHA, the analytical procedures/methods used and lower detectable limits. Table B-5 is a list of biological parameters and the method of analysis.

TABLE B-3. ANALYTICAL PROCEDURES USED BY EHL FIELD LABORATORY

Parameter	Method	Notes	Detectable Limits
1. pH[1]	Standard Methods, 144A Glass Electrode, p. 276		
2. Total Oxygen Demand[2]	Ionics, Model 225, Total Oxygen Demand Analyzer		0-200 ppm-good linearity
3. Chemical Oxygen Demand[1]	Standard Methods, 220 Oxygen Demand (Chemical), p. 495		5 mg/1
4. Biochemical Oxygen Demand 5-day[1]	Standard Methods, p. 484-494		2 mg/1
5. Biochemical Oxygen Demand (soluble) 5-day[1]	Standard Methods for Biochemical Oxygen Demand but using a filtered sample, (Whatman 41 filter paper)		2 mg/1
6. Total Solids[1]	Standard Methods, 148A, Total Residue, p. 288; 224A Residue on Evaporation, p. 535	Practical[6] range above 10 mg/1	1 mg/1
7. Total Dissolved Solids[1]	Standard Methods, 148B, Filtrable Residue, p. 290; 224E Dissolved Matter, p. 539.	Practical range[6] above 10 mg/1	1 mg/1
8. Suspended[1] Solids	Total Suspended Matter, p. 537	Practical range[6] above 20 mg/1	1 mg/1
9. Total Volatile Solids[1]	Standard Methods, 224B, Total Volatile and Fixed Residue, p. 536		1 mg/1
10. Methylene Blue[1] Active Substances	Standard Methods, p. 339, Methylene Blue Method For Methylene Blue-Active Substance	Use one separatory funnel. Filter the chloroform-extract through cotton	1 mg/1 as LAS

TABLE B-3 (cont'd)

Parameter	Method	Notes	Detectable Limits
11. Phenols[1]	Standard Methods, p. 502-506, Chloroform Extraction Method		.001
12. Alkalinity[1] Total as mg/1 $CaCO_3$	Standard Methods, p. 52-56 - Potentiometric Method		1 mg/1
13. Cyanide[1,3]	Standard Methods, p. 400 - Preservation of samples with NaOH, "Technicon Auto Analyzer Methodology"	Preserve in field with NaOH to raise pH to 11 or more. Analyzed at KEHL.	.01 mg/1
14. Turbidity[1]	Standard Methods, p. 350, Nephelometric Method		0.1 JTU units
15. Color[1]	Standard Methods, p. 160		1 unit
16. Chlorine Free Available[1]	Standard Methods, p. 123 (OTA) Method		0 mg/1
17. Chlorine Residual[1]	Standard Methods, p. 123, 386 (OTA) Method Method		0 mg/1
18. Total Hardness[1]	Standard Methods, p. 179, EDTA Titrimetric Method		1 mg/1
19. Total Coliforms	Standard Methods, p. 678. Membrane Filter	Agar-based medium	1 colony/ 100 mls
20. Fecal Coliforms[1]	Standard Methods, p. 684. Membrane Filter	Agar-based medium	1 colony/ 100 mls
21. Fecal Streptococci[1]	Standard Methods, p. 690. Membrane Filter	Agar-based medium	1 colony/ 100 mls

TABLE B-3 (cont'd)

Parameter	Method	Notes	Detectable Limits
22. Hexavalent[1] Chromium	Standard Methods, p. 156	Filter cloudy Samples through Whatman #42 filter paper	.01 mg/l
23. Cadmium	Atomic Absorption Spectrophotometric Method, Standard Methods, p. 129, 211, 418		
24. Copper	Perkin Elmer "Analytical Methods For Atomic Absorption Spectrophotometry"		.02
25. Chromium			.05
26. Iron			0.1
27. Nickel	Varian Techtron Atomic Absorption Spectrophotometer Model 1000		.04
28. Silver			.01
29. Manganese			.02
30. Aluminum			.10
31. Barium			1.0
32. Zinc			.01
33. Calcium			.1
32. Mercury			.005
33. Magnesium			.1
33. Lead			.05

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

[2]Ionics, Incorporated Instrumentation, "Instruction Manual Model 225 Total Oxygen Demand Analyzer," 65 Grove Street, Watertown, Mass, April 1970.

[3]Technicon Instruments Corporation, "Technicon Autoanalyzer Methodology," Tarrytown, New York.

[4]Perkin-Elmer Corporation, "Analytical Methods For Atomic Spectrophotometry," Norwalk, Connecticut

[5]Varian Techtron PTY. Limited, "Instruction Manual For Atomic Absorption Spectrophotometer Model 1000," Melbourne, Australia.

[6]EPA Water Quality Office, Analytical Quality Control Laboratory, "Methods For Chemical Analysis of Water and Wastes," Cincinnati, Ohio, 1971.

TABLE B-4. ANALYTICAL PROCEDURES USED BY AEHA LABORATORY

Parameter	Method	Notes	Detectable Limits
1. Total Organic Carbon	Standard Methods 138A Combustion-Infrared Method (Tentative) p. 257		1.0 mg/1
2. Oil and Grease	Standard Methods 209A Soxhlet Extraction Method, p. 409		
3. Total Phosphorous	Standard Methods, 223C Prelim Digestion Step for T-PO_4 and 223F Ascorbic Acid Method (Tentative), p. 524 and 532.	(1)	
4. Ortho Phosphorous (as P)	Standard Methods, 223F Ascorbic Acid Method (Tentative), p. 532.	(1)	
5. Total Kjeldahl Nitrogen (as N)	Technicon Auto Analyzer, Ind. Method 30-69A.	(1)	0.1 mg/1
6. Ammonia Nitrogen (as N)	Orion's Analytical Technique with Ammonia Electrode 95-10 & Model 801 Digital MV Meter		0.05 mg/1

Notes: (1) The S-1 series of samples were clarified with activated carbon prior to analyses for PO_4, NO_2 and NO_3.

TABLE B-5. Analytical Procedures used in biological stream sampling.

Parameter	Method
1. Plankton[1]	Standard Methods, p. 726-737. Wisconsin Net concentration Sedgwick-Raft Cell counting
2. Periphyton[1,2]	Standard Methods, p.743-746 (modified) Modified Biomass-Chlorophyll Ratio (Weber, 1971)
3. Macroinvertebrates[1] a) Ponar dredge b) diverse sampling	Standard Methods, p. 761-769 identifications: Capt Neil J. Lamb
4. Effluent bioassays[1]	Standard Methods, p. 562-575 continuous flow.
5. In-situ stream bioassays	Hardware cloth cages (530 cu. in.) anchored below surface.
6. Endemic Fish[1]	Standard Methods, p. 771-775 Electroshocking, D.C. pulse, 230V, 2.2 amp.
7. Pesticide Residues (USAEHA)	-Soxhlet Extraction(Hexane:Acetone) -Florisil Column -Electron-capture gas-liquid chromatography -thin layer chromatography

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

[2] Weber, C. I., "Recent Developments in the measurement of the Response of Plankton and Periphyton to Changes in Their Environment," 162nd National Meeting, American Chemical Society, 1971.

APPENDIX C

Field Survey Water Sample Analytical Data Tabulations

Contents | Page

This appendix contains water sample data tabulations for composite samples and grab samples obtained during the September field survey.

I. COMPOSITE SAMPLE DATA

Tables C-1 through C-34 are raw data tabulations and statistical summaries for composite samples from all sampling stations. These tabulations were compiled by the US AEHA, Water Quality Engineering Division using a UNIVAC 1108 computer.

A. FT DIX DATA SUMMARIES

Tables	Sample Description	Pages
C-1 - C-7	24-hour composite samples	C-3 - C-13
C-8 - C-14	12-hour composite samples	C-14 - C-24

B. MAFB DATA SUMMARIES

Tables	Sample Description	Pages
C-15 - C-20	24-hour composite samples	C-25 - C-34
C-21 - C-26	12-hour composite samples	C-35 - C-44

C. RECEIVING WATERS DATA SUMMARIES

Tables	Sample Description	Pages
C-27 - C-34	24-hour composite samples	C-45 - C-68

II. GRAB SAMPLE DATA

Table C-35 contains raw data tabulations for grab samples obtained during the September field study. Some stream sample data summaries for grab samples have been included in Tables C-27 - C-34 and are so identified (see footnote in tabulated data).

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-1 *

SAMPLE POINT D1-FT. DIX RAW INFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
PH	7.000	7.400	6.900	7.000	7.100	7.000	7.100	*********	*********
ALKALINITY	160.000	144.000	121.000	127.000	128.000	110.000	116.000	*********	*********
TOTAL SOLIDS	516.000	504.000	426.000	464.000	460.000	400.000	476.000	*********	*********
SUSPENDED SOLIDS	175.000	245.000	170.000	185.000	180.000	125.000	200.000	*********	*********
DISSOLVED SOLIDS	341.000	259.000	258.000	279.000	280.000	275.000	276.000	*********	*********
TOTAL VOLATILE SOLIDS	*********	*********	176.000	284.000	260.000	240.000	280.000	*********	*********
TOTAL ORGANIC CARBON	88.000	89.000	123.000	63.000	96.000	59.000	81.000	*********	*********
TOTAL OXYGEN DEMAND	610.000	425.000	500.000	620.000	592.000	450.000	370.000	*********	*********
TOTAL COD	422.000	379.000	379.000	364.000	420.000	357.000	382.000	*********	*********
BOD	218.000	210.000	233.000	120.000	224.000	230.000	*********	*********	*********
KJELDAHL NITROGEN	22.000	27.000	35.000	23.000	26.000	23.500	22.500	*********	*********
AMMONIA NITROGEN	13.000	14.000	14.200	14.200	13.900	12.000	12.400	*********	*********
NITRITES	< .100	< .100	< .100	< .100	< .100	< .100	< .100	*********	*********
NITRATES	< .100	< .100	< .100	.100	.100	< .100	< .100	*********	*********
TOTAL PHOSPHATE	*********	9.800	10.700	11.600	10.800	14.200	13.500	*********	*********
ORTHO PHOSPHATE	*********	7.700	7.700	8.300	8.500	7.800	7.700	*********	*********
OIL & GREASE	69.000	94.000	92.000	39.000	98.000	76.000	164.000	*********	*********
PHENOLS	.070	.040	.050	.050	.040	.035	.030	*********	*********
MBAS	4.600	7.600	7.600	7.600	6.400	8.000	9.200	*********	*********
TOTAL HARDNESS	*********	145.600	132.000	132.000	180.000	136.000	128.000	*********	*********
MERCURY	< .005	< .005	*********	*********	*********	*********	*********	*********	*********
CHROMIUM	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********
HEXAVALENT CHROMIUM	< .001	< .001	< .001	< .001	< .001	< .001	< .001	*********	*********
LEAD	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********
ZINC	.100	.070	.020	.130	*********	.050	.050	*********	*********
IRON	1.200	1.260	1.200	1.620	1.250	1.500	1.080	*********	*********
COPPER	< .020	< .020	.030	.070	.040	.030	.020	*********	*********
SILVER	.070	.050	.050	.020	.020	< .010	< .010	*********	*********
NICKEL	< .040	< .040	< .040	< .040	< .040	< .040	< .040	*********	*********
ARSENIC	< .010	< .010	*********	*********	*********	*********	*********	*********	*********
CYANIDE	< .010	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
MANGANESE	.100	.250	.060	.450	.110	.180	.100	*********	*********
BARIUM	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	*********	*********
ALUMINUM	1.340	1.160	1.220	1.000	.860	.780	.800	*********	*********
CADMIUM	< .010	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. * INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS.
ALL SAMPLE DAY ENTRIES INCLOSED IN [ ] ARE GRAB-SAMPLES TREATED AS COMPOSITES FOR EVALUATION.
MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-1 Cont'd* *

SAMPLE POINT D1-FT. DIX RAW INFLUENT

PARAMETER	DAY 10	DAY 11	DAY 12
PH	*********	*********	*********
ALKALINITY	*********	*********	*********
TOTAL SOLIDS	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********
TOTAL VOLATILE SOLIDS	*********	*********	*********
TOTAL ORGANIC CARBON	*********	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
KJELDAHL NITROGEN	*********	*********	*********
AMMONIA NITROGEN	*********	*********	*********
NITRITES	*********	*********	*********
NITRATES	*********	*********	*********
TOTAL PHOSPHATE	*********	*********	*********
ORTHO PHOSPHATE	*********	*********	*********
OIL & GREASE	*********	*********	*********
PHENOLS	*********	*********	*********
MBAS	*********	*********	*********
TOTAL HARDNESS	*********	*********	*********
MERCURY	*********	*********	*********
CHROMIUM	*********	*********	*********
HEXAVALENT CHROMIUM	*********	*********	*********
LEAD	*********	*********	*********
ZINC	*********	*********	*********
IRON	*********	*********	*********
COPPER	*********	*********	*********
SILVER	*********	*********	*********
NICKEL	*********	*********	*********
ARSENIC	*********	*********	*********
CYANIDE	*********	*********	*********
MANGANESE	*********	*********	*********
BARIUM	*********	*********	*********
ALUMINUM	*********	*********	*********
CADMIUM	*********	*********	*********

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. ¤ INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS. ALL SAMPLE DAY ENTRIES INCLOSED IN [ ] ARE GRAB-SAMPLES TREATED AS COMPOSITES FOR EVALUATION. MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* *Table C-1 Cont'd* *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	6.900	7.400	7.071	.500	2.424	4.646	.110
ALKALINITY	110.000	160.000	129.429	50.000	15.011	23.620	12.898
TOTAL SOLIDS	400.000	516.000	463.714	116.000	13.740	11.275	30.041
SUSPENDED SOLIDS	125.000	245.000	182.857	120.000	31.641	33.984	23.265
DISSOLVED SOLIDS	258.000	341.000	281.143	83.000	8.232	21.291	17.102
TOTAL VOLATILE SOLIDS	176.000	284.000	248.000	108.000	29.032	14.516	32.000
TOTAL ORGANIC CARBON	59.000	123.000	85.571	64.000	31.052	43.740	15.347
TOTAL OXYGEN DEMAND	370.000	620.000	509.571	250.000	27.390	21.671	83.796
TOTAL COD	357.000	422.000	386.143	65.000	7.547	9.286	19.918
BOD	120.000	233.000	205.833	113.000	41.700	13.198	28.611
KJELDAHL NITROGEN	22.000	35.000	25.571	13.000	13.966	36.872	3.224
AMMONIA NITROGEN	12.000	14.200	13.386	2.200	10.352	6.083	.788
NITRITES	< .100	< .100	< .100	.000	-.000	.000	.000
NITRATES	< .100	< .100	< .100	.000	-.000	.000	.000
TOTAL PHOSPHATE	9.800	14.200	11.767	4.400	16.714	20.680	1.389
ORTHO PHOSPHATE	7.700	8.500	7.950	.800	3.145	6.918	.300
OIL & GREASE	39.000	164.000	90.286	125.000	56.804	81.646	24.816
PHENOLS	.030	.070	.045	.040	33.333	55.556	.010
MBAS	4.600	9.200	7.286	4.600	36.863	26.275	1.020
TOTAL HARDNESS	128.000	180.000	142.267	52.000	10.028	26.523	13.689
MERCURY	< .005	< .005	< .005	.000	.000	.000	.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	< .001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	.020	.130	.070	.110	71.429	85.714	.030
IRON	1.080	1.820	1.330	.740	18.797	36.842	.189
COPPER	< .020	.070	< .033	.050	39.130	113.043	.013
SILVER	< .010	.070	< .033	.060	69.565	113.043	.020
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
ARSENIC	< .010	< .010	< .010	.000	.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.060	.450	.179	.390	66.400	152.000	.098
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	.780	1.340	1.023	.560	23.743	31.006	.186
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. ¤ INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS. ALL SAMPLE DAY ENTRIES INCLOSED IN [] ARE GRAB-SAMPLES TREATED AS COMPOSITES FOR EVALUATION. MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-2 *

SAMPLE POINT D2-FT. DIX PRIMARY CLARIFIER INFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	496.000	320.000	*********	396.000	472.000	*********	296.000	*********	*********
SUSPENDED SOLIDS	215.000	80.000	75.000	100.000	195.000	*********	145.000	*********	*********
DISSOLVED SOLIDS	281.000	240.000	*********	296.000	277.000	*********	*********	*********	*********
TOTAL OXYGEN DEMAND	440.000	340.000	370.000	440.000	340.000	*********	260.000	*********	*********
TOTAL COD	278.000	209.000	374.000	267.000	249.000	*********	*********	*********	*********
BOD	144.000	141.000	122.000	111.000	137.000	*********	*********	*********	*********
CHROMIUM	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	*********	*********	*********

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	296.000	496.000	396.000	200.000	25.253	25.253	70.400
SUSPENDED SOLIDS	75.000	215.000	135.000	140.000	44.444	59.259	50.000
DISSOLVED SOLIDS	240.000	296.000	273.500	56.000	12.249	8.227	16.750
TOTAL OXYGEN DEMAND	260.000	440.000	365.000	180.000	28.767	20.548	51.667
TOTAL COD	209.000	374.000	275.400	165.000	24.110	35.802	40.480
BOD	111.000	144.000	131.000	33.000	15.267	9.924	11.600
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. ¤ INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS.
ALL SAMPLE DAY ENTRIES INCLOSED IN [ ] ARE GRAB-SAMPLES TREATED AS COMPOSITES FOR EVALUATION.
MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-3 *

SAMPLE POINT D3-FT. DIX PRIMARY CLARIFIER EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	388.000	364.000	176.000	276.000	388.000	*********	232.000	*********	*********
SUSPENDED SOLIDS	115.000	68.000	75.000	110.000	150.000	*********	*********	*********	*********
DISSOLVED SOLIDS	273.000	296.000	101.000	166.000	238.000	*********	*********	*********	*********
TOTAL OXYGEN DEMAND	305.000	224.000	290.000	240.000	350.000	*********	205.000	*********	*********
TOTAL COD	194.000	119.000	176.000	159.000	216.000	*********	*********	*********	*********
BOD	80.000	78.500	76.700	*********	82.500	*********	*********	*********	*********
CHROMIUM	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	*********	*********	*********

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	176.000	388.000	304.000	212.000	42.105	27.632	76.000
SUSPENDED SOLIDS	68.000	150.000	103.600	82.000	34.363	44.788	25.680
DISSOLVED SOLIDS	101.000	296.000	214.800	195.000	52.980	37.803	65.040
TOTAL OXYGEN DEMAND	205.000	350.000	269.000	145.000	23.792	30.112	46.000
TOTAL COD	119.000	216.000	172.800	97.000	31.134	25.000	27.040
BOD	76.700	82.500	79.425	5.800	3.431	3.872	1.825
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. ¤ INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS. ALL SAMPLE DAY ENTRIES INCLOSED IN [ ] ARE GRAB-SAMPLES TREATED AS COMPOSITES FOR EVALUATION. MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-4 *

SAMPLE POINT D4-FT. DIX TRICKLING FILTER INFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	388.000	176.000	346.000	216.000	348.000	*********	268.000	*********	*********
SUSPENDED SOLIDS	75.000	68.000	75.000	75.000	*********	*********	*********	*********	*********
DISSOLVED SOLIDS	313.000	108.000	271.000	141.000	*********	*********	*********	*********	*********
TOTAL OXYGEN DEMAND	335.000	237.000	260.000	261.000	332.000	*********	240.000	*********	*********
TOTAL COD	194.000	164.000	170.000	148.000	160.000	*********	*********	*********	*********
BOD	79.000	66.200	85.000	61.300	76.500	*********	*********	*********	*********
CHROMIUM	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	*********	*********	*********

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	176.000	388.000	290.333	212.000	39.380	33.639	70.333
SUSPENDED SOLIDS	68.000	75.000	73.250	7.000	7.167	2.389	2.625
DISSOLVED SOLIDS	108.000	313.000	208.250	205.000	48.139	50.300	83.750
TOTAL OXYGEN DEMAND	237.000	335.000	277.500	98.000	14.595	20.721	37.333
TOTAL COD	148.000	194.000	167.200	46.000	11.483	16.029	11.840
BOD	61.300	85.000	73.600	23.700	16.712	15.489	7.880
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. ¤ INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS.
ALL SAMPLE DAY ENTRIES INCLOSED IN [ ] ARE GRAB-SAMPLES TREATED AS COMPOSITES FOR EVALUATION.
MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-5 *

SAMPLE POINT D5-FT. DIX TRICKLING FILTER EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	340.000	272.000	280.000	*********	260.000	*********	196.000	*********	*********
SUSPENDED SOLIDS	64.000	38.000	24.000	65.000	*********	*********	70.000	*********	*********
DISSOLVED SOLIDS	276.000	234.000	256.000	*********	*********	*********	*********	*********	*********
TOTAL OXYGEN DEMAND	195.000	129.000	165.000	168.000	180.000	*********	123.000	*********	*********
TOTAL COD	194.000	107.000	104.000	91.000	103.000	*********	*********	*********	*********
BOD	< 40.000	< 24.000	23.200	< 24.000	31.000	*********	*********	*********	*********
CHROMIUM	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	*********	*********	*********

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	196.000	340.000	269.600	144.000	27.300	26.113	33.280
SUSPENDED SOLIDS	24.000	70.000	52.200	46.000	54.023	34.100	16.960
DISSOLVED SOLIDS	234.000	276.000	255.333	42.000	8.355	8.094	14.222
TOTAL OXYGEN DEMAND	123.000	195.000	160.000	72.000	23.125	21.875	22.667
TOTAL COD	91.000	194.000	119.800	103.000	24.040	61.937	29.680
BOD	23.200	< 40.000	< 28.440	16.800	18.425	40.647	5.648
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. ¤ INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS.
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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-6 *

SAMPLE POINT D6-FT. DIX FINAL CLARIFIER EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	336.000	184.000	*********	216.000	260.000	*********	244.000	*********	*********
SUSPENDED SOLIDS	26.000	14.000	22.000	24.000	48.000	*********	44.000	*********	*********
DISSOLVED SOLIDS	310.000	170.000	*********	192.000	212.000	*********	*********	*********	*********
TOTAL OXYGEN DEMAND	165.000	132.000	128.000	174.000	158.000	*********	124.000	*********	*********
TOTAL COD	78.000	51.000	77.000	45.000	¤ 162.000	*********	*********	*********	*********
BOD	< 24.000	< 24.000	23.000	13.800	< 20.000	*********	*********	*********	*********
CHROMIUM	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	*********	*********	*********

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	184.000	336.000	248.000	152.000	25.806	35.484	40.000
SUSPENDED SOLIDS	14.000	48.000	29.667	34.000	52.809	61.798	10.889
DISSOLVED SOLIDS	170.000	310.000	221.000	140.000	23.077	40.271	44.500
TOTAL OXYGEN DEMAND	124.000	174.000	146.833	50.000	15.551	18.502	18.833
TOTAL COD	45.000	78.000	62.750	33.000	28.287	24.303	14.750
BOD	13.800	< 24.000	< 20.960	10.200	34.160	14.504	3.248
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-7 *

SAMPLE POINT D7-FT. DIX CHLORINATED EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
PH	7.200	7.400	7.200	7.200	7.300	7.400	7.500	*********	*********
ALKALINITY	124.000	121.000	114.000	122.000	108.000	109.000	93.000	*********	*********
COLOR	70.000	60.000	40.000	40.000	50.000	50.000	60.000	*********	*********
TURBIDITY	13.000	11.000	11.000	11.000	12.000	15.000	10.000	*********	*********
TOTAL SOLIDS	324.000	*********	344.000	292.000	308.000	304.000	336.000	*********	*********
SUSPENDED SOLIDS	42.000	33.000	37.000	36.000	36.000	*********	46.000	*********	*********
DISSOLVED SOLIDS	282.000	*********	312.000	266.000	272.000	*********	290.000	*********	*********
TOTAL VOLATILE SOLIDS	*********	*********	48.000	116.000	280.000	128.000	152.000	*********	*********
TOTAL ORGANIC CARBON	28.000	25.000	27.000	25.000	27.000	23.000	22.000	*********	*********
TOTAL OXYGEN DEMAND	140.000	148.000	136.000	184.000	160.000	162.000	116.000	*********	*********
TOTAL COD	128.000	62.000	66.000	45.000	97.000	88.000	76.000	*********	*********
BOD	< 24.000	< 24.000	17.500	< 12.000	< 24.000	< 24.000	*********	*********	*********
BOD SOLUBLE	12.000	13.000	12.000	11.000	12.500	14.500	*********	*********	*********
KJELDAHL NITROGEN	12.500	20.500	23.000	*********	21.000	23.000	18.000	*********	*********
AMMONIA NITROGEN	11.000	12.500	12.500	12.500	12.500	14.000	13.000	*********	*********
NITRITES	< .100	.100	.200	.200	.200	.200	< .100	*********	*********
NITRATES	2.100	1.100	1.400	1.500	1.400	1.600	2.200	*********	*********
TOTAL PHOSPHATE	*********	10.100	9.600	6.900	10.800	11.400	10.500	*********	*********
ORTHO PHOSPHATE	*********	6.500	6.000	6.300	6.400	6.400	5.600	*********	*********
CHLORIDES	27.000	26.000	27.000	28.000	27.000	25.000	*********	*********	*********
OIL & GREASE	201.000	19.000	38.000	271.000	110.000	58.000	113.000	*********	*********
PHENOLS	.015	.015	< .001	.030	.015	< .001	.005	*********	*********
MBAS	2.880	2.400	2.200	1.600	2.000	1.800	3.800	*********	*********
TOTAL HARDNESS	263.200	145.600	144.000	140.000	172.000	136.000	128.000	*********	*********
CHLORINE RESIDUAL	+ .000	*********	*********	.600	.100	.300	.300	*********	*********
MERCURY	< .005	< .005	*********	*********	*********	*********	*********	*********	*********
CHROMIUM	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********
HEXAVALENT CHROMIUM	< .001	< .001	< .001	< .001	< .001	< .001	< .001	*********	*********
LEAD	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********
ZINC	.040	.030	.010	.060	.090	.040	.030	*********	*********
IRON	1.020	.830	1.150	.800	.800	.780	.770	*********	*********
COPPER	< .020	< .020	< .020	.040	.020	.030	< .020	*********	*********
SILVER	< .010	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
NICKEL	*********	< .040	< .040	< .040	< .040	< .040	< .040	*********	*********
ARSENIC	.020	< .010	*********	*********	*********	*********	*********	*********	*********
CYANIDE	< .010	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
MANGANESE	.140	.060	.010	.100	.100	.100	.090	*********	*********
BARIUM	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	1.200	*********	*********
ALUMINUM	.560	.780	.880	.300	.400	.560	6.300	*********	*********
CADMIUM	< .010	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-7 Cont'd *

SAMPLE POINT D7-FT. DIX CHLORINATED EFFLUENT

PARAMETER	DAY 10	DAY 11	DAY 12
PH	*********	*********	*********
ALKALINITY	*********	*********	*********
COLOR	*********	*********	*********
TURBIDITY	*********	*********	*********
TOTAL SOLIDS	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********
TOTAL VOLATILE SOLIDS	*********	*********	*********
TOTAL ORGANIC CARBON	*********	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
BOD SOLUBLE	*********	*********	*********
KJELDAHL NITROGEN	*********	*********	*********
AMMONIA NITROGEN	*********	*********	*********
NITRITES	*********	*********	*********
NITRATES	*********	*********	*********
TOTAL PHOSPHATE	*********	*********	*********
ORTHO PHOSPHATE	*********	*********	*********
CHLORIDES	*********	*********	*********
OIL & GREASE	*********	*********	*********
PHENOLS	*********	*********	*********
MBAS	*********	*********	*********
TOTAL HARDNESS	*********	*********	*********
CHLORINE RESIDUAL	*********	*********	*********
MERCURY	*********	*********	*********
CHROMIUM	*********	*********	*********
HEXAVALENT CHROMIUM	*********	*********	*********
LEAD	*********	*********	*********
ZINC	*********	*********	*********
IRON	*********	*********	*********
COPPER	*********	*********	*********
SILVER	*********	*********	*********
NICKEL	*********	*********	*********
ARSENIC	*********	*********	*********
CYANIDE	*********	*********	*********
MANGANESE	*********	*********	*********
BARIUM	*********	*********	*********
ALUMINUM	*********	*********	*********

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* *Table C-7 Cont'd* *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	7.200	7.500	7.314	.300	1.562	2.539	.102
ALKALINITY	93.000	124.000	113.000	31.000	17.699	9.735	8.286
COLOR	40.000	70.000	52.857	30.000	24.324	32.432	8.980
TURBIDITY	10.000	15.000	11.857	5.000	15.663	26.506	1.265
TOTAL SOLIDS	292.000	344.000	318.000	52.000	8.176	8.176	16.667
SUSPENDED SOLIDS	33.000	46.000	38.333	13.000	13.913	20.000	3.778
DISSOLVED SOLIDS	266.000	312.000	284.400	46.000	6.470	9.705	13.280
TOTAL VOLATILE SOLIDS	48.000	280.000	144.800	232.000	66.851	93.370	56.960
TOTAL ORGANIC CARBON	22.000	28.000	25.286	6.000	12.994	10.734	1.755
TOTAL OXYGEN DEMAND	116.000	184.000	149.429	68.000	22.371	23.136	16.490
TOTAL COD	45.000	128.000	80.286	83.000	43.950	59.431	20.612
BOD	< 12.000	< 24.000	< 20.917	12.000	42.629	14.741	4.111
BOD SOLUBLE	11.000	14.500	12.500	3.500	12.000	16.000	.833
KJELDAHL NITROGEN	12.500	23.000	19.667	10.500	36.441	16.949	2.944
AMMONIA NITROGEN	11.000	14.000	12.571	3.000	12.500	11.364	.531
NITRITES	< .100	.200	< .157	.100	36.364	27.273	.049
NITRATES	1.100	2.200	1.614	1.100	31.858	36.283	.306
TOTAL PHOSPHATE	6.900	11.400	9.883	4.500	30.185	15.346	1.089
ORTHO PHOSPHATE	5.600	6.500	6.200	.900	9.677	4.839	.267
CHLORIDES	25.000	28.000	26.667	3.000	6.250	5.000	.778
OIL & GREASE	19.000	271.000	115.714	252.000	83.580	134.198	68.735
PHENOLS	< .001	.030	< .012	.029	91.463	156.098	.008
MBAS	1.600	3.800	2.383	2.200	32.854	59.472	.552
TOTAL HARDNESS	128.000	263.200	161.257	135.200	20.624	63.218	32.196
CHLORINE RESIDUAL	.000	.600	+ .260	.600	100.000	130.769	.168
MERCURY	< .005	< .005	< .005	.000	.000	.000	.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	< .001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	.010	.090	.043	.080	76.667	110.000	.018
IRON	.770	1.150	.879	.380	12.358	30.894	.118
COPPER	< .020	.040	< .024	.020	17.647	64.706	.006
SILVER	< .010	< .010	< .010	.000	-.000	.000	.000
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
ARSENIC	< .010	.020	< .015	.010	33.333	33.333	.005
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.010	.140	.086	.130	88.333	63.333	.029
BARIUM	< 1.000	1.200	< 1.029	.200	2.778	16.667	.049
ALUMINUM	.300	6.300	1.397	6.000	78.528	350.920	1.401
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-8 *

SAMPLE POINT D1-FT. DIX RAW INFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
PH	*********	*********	*********	*********	*********	*********	*********	6.800	6.900
ALKALINITY	*********	*********	*********	*********	*********	*********	*********	131.000	121.000
TOTAL SOLIDS	*********	*********	*********	*********	*********	*********	*********	592.000	528.000
SUSPENDED SOLIDS	*********	*********	*********	*********	*********	*********	*********	210.000	155.000
DISSOLVED SOLIDS	*********	*********	*********	*********	*********	*********	*********	382.000	373.000
TOTAL VOLATILE SOLIDS	*********	*********	*********	*********	*********	*********	*********	336.000	288.000
TOTAL ORGANIC CARBON	*********	*********	*********	*********	*********	*********	*********	86.000	106.000
TOTAL COD	*********	*********	*********	*********	*********	*********	*********	561.000	393.000
BOD	*********	*********	*********	*********	*********	*********	*********	142.000	263.000
KJELDAHL NITROGEN	*********	*********	*********	*********	*********	*********	*********	25.000	25.000
AMMONIA NITROGEN	*********	*********	*********	*********	*********	*********	*********	13.000	12.500
NITRITES	*********	*********	*********	*********	*********	*********	*********	< .100	< .100
NITRATES	*********	*********	*********	*********	*********	*********	*********	< .100	< .100
TOTAL PHOSPHATE	*********	*********	*********	*********	*********	*********	*********	6.700	8.200
ORTHO PHOSPHATE	*********	*********	*********	*********	*********	*********	*********	8.300	8.200
OIL & GREASE	*********	*********	*********	*********	*********	*********	*********	114.000	*********
PHENOLS	*********	*********	*********	*********	*********	*********	*********	.090	.090
MBAS	*********	*********	*********	*********	*********	*********	*********	12.000	6.400
CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .050	< .050
HEXAVALENT CHROMIUM	*********	*********	*********	*********	*********	*********	*********	*********	< .001
LEAD	*********	*********	*********	*********	*********	*********	*********	< .050	< .050
ZINC	*********	*********	*********	*********	*********	*********	*********	.180	.240
IRON	*********	*********	*********	*********	*********	*********	*********	5.530	1.220
COPPER	*********	*********	*********	*********	*********	*********	*********	< .020	< .020
SILVER	*********	*********	*********	*********	*********	*********	*********	< .010	< .010
NICKEL	*********	*********	*********	*********	*********	*********	*********	< .040	< .040
CYANIDE	*********	*********	*********	*********	*********	*********	*********	< .010	< .010
MANGANESE	*********	*********	*********	*********	*********	*********	*********	.430	.100
BARIUM	*********	*********	*********	*********	*********	*********	*********	1.400	1.000
ALUMINUM	*********	*********	*********	*********	*********	*********	*********	1.600	1.780
CADMIUM	*********	*********	*********	*********	*********	*********	*********	< .010	< .010

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* *Table C-8 Cont'd* *

SAMPLE POINT D1-FT. DIX RAW INFLUENT

PARAMETER	DAY 10	DAY 11	DAY 12
PH	6.700	*********	*********
ALKALINITY	122.000	130.000	*********
TOTAL SOLIDS	544.000	*********	*********
SUSPENDED SOLIDS	220.000	160.000	*********
DISSOLVED SOLIDS	324.000	*********	*********
TOTAL VOLATILE SOLIDS	316.000	*********	*********
TOTAL ORGANIC CARBON	123.000	*********	*********
TOTAL COD	448.000	502.000	465.000
BOD	231.000	257.000	247.000
KJELDAHL NITROGEN	29.500	*********	*********
AMMONIA NITROGEN	13.000	*********	*********
NITRITES	< .100	*********	*********
NITRATES	< .100	*********	*********
TOTAL PHOSPHATE	11.600	*********	*********
ORTHO PHOSPHATE	8.600	*********	*********
OIL & GREASE	118.000	*********	*********
PHENOLS	.090	< .080	.140
MBAS	7.200	7.400	7.000
CHROMIUM	< .050	< .050	< .050
HEXAVALENT CHROMIUM	< .001	< .001	*********
LEAD	< .050	< .050	< .050
ZINC	.110	.150	.110
IRON	2.370	1.220	1.670
COPPER	< .020	< .020	< .020
SILVER	.020	.030	< .010
NICKEL	< .040	< .040	< .040
CYANIDE	< .010	< .010	< .010
MANGANESE	.210	.120	.170
BARIUM	< 1.000	< 1.000	2.000
ALUMINUM	1.180	1.460	1.080
CADMIUM	< .010	< .010	< .010

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. ¤ INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS.
ALL SAMPLE DAY ENTRIES INCLOSED IN [ ] ARE GRAB-SAMPLES TREATED AS COMPOSITES FOR EVALUATION.
MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* *Table C-8 Cont'd *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	6.700	6.900	6.800	.200	1.471	1.471	.067
ALKALINITY	121.000	131.000	126.000	10.000	3.968	3.968	4.500
TOTAL SOLIDS	528.000	592.000	554.667	64.000	4.808	6.731	24.889
SUSPENDED SOLIDS	155.000	220.000	186.250	65.000	16.779	18.121	28.750
DISSOLVED SOLIDS	324.000	382.000	359.667	58.000	9.917	6.209	23.778
TOTAL VOLATILE SOLIDS	288.000	336.000	313.333	48.000	8.085	7.234	16.889
TOTAL ORGANIC CARBON	86.000	123.000	105.000	37.000	18.095	17.143	12.667
TOTAL COD	393.000	561.000	473.800	168.000	17.054	18.404	46.160
BOD	142.000	263.000	228.000	121.000	37.719	15.351	34.400
KJELDAHL NITROGEN	25.000	29.500	26.500	4.500	5.660	11.321	2.000
AMMONIA NITROGEN	12.500	13.000	12.833	.500	2.597	1.299	.222
NITRITES	< .100	< .100	< .100	.000	-.000	.000	.000
NITRATES	< .100	< .100	< .100	.000	-.000	.000	.000
TOTAL PHOSPHATE	6.700	11.600	8.833	4.900	24.151	31.321	1.844
ORTHO PHOSPHATE	8.200	8.600	8.367	.400	1.992	2.789	.156
OIL & GREASE	114.000	118.000	116.000	4.000	1.724	1.724	2.000
PHENOLS	< .080	.140	< .098	.060	18.367	42.857	.017
MBAS	6.400	12.000	8.000	5.600	20.000	50.000	1.600
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	< .001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	.110	.240	.158	.130	30.380	51.899	.042
IRON	1.220	5.530	2.402	4.310	49.209	130.225	1.251
COPPER	< .020	< .020	< .020	.000	-.000	.000	.000
SILVER	< .010	.030	< .016	.020	37.500	87.500	.007
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.100	.430	.206	.330	51.456	108.738	.091
BARIUM	< 1.000	2.000	< 1.280	1.000	21.875	56.250	.336
ALUMINUM	1.080	1.780	1.420	.700	23.944	25.352	.232
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. ¤ INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS. ALL SAMPLE DAY ENTRIES INCLOSED IN [ ] ARE GRAB-SAMPLES TREATED AS COMPOSITES FOR EVALUATION. MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-9 *

SAMPLE POINT D2-FT. DIX PRIMARY CLARIFIER INFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
SUSPENDED SOLIDS	*********	*********	*********	*********	*********	*********	*********	85.000	165.000
TOTAL COD	*********	*********	*********	*********	*********	*********	*********	225.000	322.000
BOD	*********	*********	*********	*********	*********	*********	*********	227.000	215.000
CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .050	< .050

PARAMETER	DAY 10	DAY 11	DAY 12
SUSPENDED SOLIDS	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	< .050	< .050	< .050

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
SUSPENDED SOLIDS	85.000	165.000	125.000	80.000	32.000	32.000	40.000
TOTAL COD	225.000	322.000	273.500	97.000	17.733	17.733	48.500
BOD	215.000	227.000	221.000	12.000	2.715	2.715	6.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. ¤ INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS. ALL SAMPLE DAY ENTRIES INCLOSED IN [ ] ARE GRAB-SAMPLES TREATED AS COMPOSITES FOR EVALUATION. MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-10 *

SAMPLE POINT D3-FT. DIX PRIMARY CLARIFIER EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL COD	*********	*********	*********	*********	*********	*********	*********	154.000	186.000
BOD	*********	*********	*********	*********	*********	*********	*********	57.000	183.000
CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .050	< .050

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	< .050	< .050	< .050

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL COD	154.000	186.000	170.000	32.000	9.412	9.412	16.000
BOD	57.000	183.000	120.000	126.000	52.500	52.500	63.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
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Table C-11

SAMPLE POINT D4-FT. DIX TRICKLING FILTER INFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL COD	*********	*********	*********	*********	*********	*********	*********	181.000	290.000
BOD	*********	*********	*********	*********	*********	*********	*********	116.000	99.000
CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .050	< .050

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	< .050	< .050	< .050

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL COD	181.000	290.000	235.500	109.000	23.142	23.142	54.500
BOD	99.000	116.000	107.500	17.000	7.907	7.907	8.500
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
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* Table C-12 *

SAMPLE POINT D5-FT. DIX TRICKLING FILTER EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
SUSPENDED SOLIDS	*********	*********	*********	*********	*********	*********	*********	65.000	50.000
TOTAL COD	*********	*********	*********	*********	*********	*********	*********	71.000	153.000
BOD	*********	*********	*********	*********	*********	*********	*********	38.000	33.100
CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .050	< .050

PARAMETER	DAY 10	DAY 11	DAY 12
SUSPENDED SOLIDS	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	< .050	< .050	< .050

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
SUSPENDED SOLIDS	50.000	65.000	57.500	15.000	13.043	13.043	7.500
TOTAL COD	71.000	153.000	112.000	82.000	36.607	36.607	41.000
BOD	33.100	38.000	35.550	4.900	6.892	6.892	2.450
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

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ALL SAMPLE DAY ENTRIES INCLOSED IN [] ARE GRAB-SAMPLES TREATED AS COMPOSITES FOR EVALUATION.
MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
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* Table C-13 *

SAMPLE POINT D6-FT. DIX FINAL CLARIFIER EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	*********	*********	*********	*********	*********	*********	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********	*********	*********	*********	*********	22.000	20.000
DISSOLVED SOLIDS	*********	*********	*********	*********	*********	*********	*********	*********	*********
TOTAL COD	*********	*********	*********	*********	*********	*********	*********	44.000	104.000
BOD	*********	*********	*********	*********	*********	*********	*********	31.000	< 20.000
CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .050	< .050

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	228.000	*********	*********
SUSPENDED SOLIDS	92.000	48.000	*********
DISSOLVED SOLIDS	136.000	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	30.000
CHROMIUM	< .050	< .050	< .050

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	228.000	228.000	228.000	.000	.000	.000	.000
SUSPENDED SOLIDS	20.000	92.000	45.500	72.000	56.044	102.198	24.500
DISSOLVED SOLIDS	136.000	136.000	136.000	.000	.000	.000	.000
TOTAL COD	44.000	104.000	74.000	60.000	40.541	40.541	30.000
BOD	< 20.000	31.000	< 27.000	11.000	25.926	14.815	4.667
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

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MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
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* Table C-14 *

SAMPLE POINT D7-FT. DIX CHLORINATED EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
PH	*********	*********	*********	*********	*********	*********	*********	7.400	7.000
ALKALINITY	*********	*********	*********	*********	*********	*********	*********	98.000	102.000
COLOR	*********	*********	*********	*********	*********	*********	*********	60.000	60.000
TURBIDITY	*********	*********	*********	*********	*********	*********	*********	12.000	13.000
TOTAL SOLIDS	*********	*********	*********	*********	*********	*********	*********	252.000	312.000
SUSPENDED SOLIDS	*********	*********	*********	*********	*********	*********	*********	38.000	28.000
DISSOLVED SOLIDS	*********	*********	*********	*********	*********	*********	*********	214.000	284.000
TOTAL VOLATILE SOLIDS	*********	*********	*********	*********	*********	*********	*********	216.000	88.000
TOTAL ORGANIC CARBON	*********	*********	*********	*********	*********	*********	*********	26.000	30.000
TOTAL COD	*********	*********	*********	*********	*********	*********	*********	77.000	93.000
BOD	*********	*********	*********	*********	*********	*********	*********	28.800	< 20.000
KJELDAHL NITROGEN	*********	*********	*********	*********	*********	*********	*********	21.500	21.000
AMMONIA NITROGEN	*********	*********	*********	*********	*********	*********	*********	13.000	13.900
NITRITES	*********	*********	*********	*********	*********	*********	*********	< .100	< .100
NITRATES	*********	*********	*********	*********	*********	*********	*********	1.100	1.300
TOTAL PHOSPHATE	*********	*********	*********	*********	*********	*********	*********	6.400	6.300
ORTHO PHOSPHATE	*********	*********	*********	*********	*********	*********	*********	6.300	6.600
OIL & GREASE	*********	*********	*********	*********	*********	*********	*********	52.000	*********
PHENOLS	*********	*********	*********	*********	*********	*********	*********	.005	.015
MBAS	*********	*********	*********	*********	*********	*********	*********	2.400	1.400
CHLORINE RESIDUAL	*********	*********	*********	*********	*********	*********	*********	+ .000	+ .000
CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .050	< .050
HEXAVALENT CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .010	< .001
LEAD	*********	*********	*********	*********	*********	*********	*********	< .050	< .050
ZINC	*********	*********	*********	*********	*********	*********	*********	.050	.080
IRON	*********	*********	*********	*********	*********	*********	*********	.630	.710
COPPER	*********	*********	*********	*********	*********	*********	*********	< .020	< .020
SILVER	*********	*********	*********	*********	*********	*********	*********	< .010	< .010
NICKEL	*********	*********	*********	*********	*********	*********	*********	< .040	< .040
CYANIDE	*********	*********	*********	*********	*********	*********	*********	< .010	< .010
MANGANESE	*********	*********	*********	*********	*********	*********	*********	.090	.120
BARIUM	*********	*********	*********	*********	*********	*********	*********	< 1.000	< 1.000
ALUMINUM	*********	*********	*********	*********	*********	*********	*********	.520	.500
CADMIUM	*********	*********	*********	*********	*********	*********	*********	< .010	< .010

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FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* *Table C-14 Cont'd* *

SAMPLE POINT D7-FT. DIX CHLORINATED EFFLUENT

PARAMETER	DAY 10	DAY 11	DAY 12
PH	7.100	*********	*********
ALKALINITY	116.000	141.000	*********
COLOR	80.000	*********	*********
TURBIDITY	15.000	*********	*********
TOTAL SOLIDS	324.000	*********	*********
SUSPENDED SOLIDS	40.000	24.000	*********
DISSOLVED SOLIDS	284.000	*********	*********
TOTAL VOLATILE SOLIDS	172.000	*********	*********
TOTAL ORGANIC CARBON	26.000	*********	*********
TOTAL COD	109.000	107.000	86.000
BOD	< 20.000	< 20.000	< 12.000
KJELDAHL NITROGEN	23.000	*********	*********
AMMONIA NITROGEN	10.600	*********	*********
NITRITES	< .100	*********	*********
NITRATES	.800	*********	*********
TOTAL PHOSPHATE	9.700	*********	*********
ORTHO PHOSPHATE	6.300	*********	*********
OIL & GREASE	87.000	*********	*********
PHENOLS	.025	.015	.035
MBAS	2.400	1.800	1.700
CHLORINE RESIDUAL	.100	*********	*********
CHROMIUM	< .050	< .050	< .050
HEXAVALENT CHROMIUM	< .001	< .001	*********
LEAD	< .050	< .050	< .050
ZINC	.060	.080	.060
IRON	.790	.790	.790
COPPER	< .020	< .020	< .020
SILVER	.020	< .010	< .010
NICKEL	< .040	< .040	< .040
CYANIDE	< .010	< .010	< .010
MANGANESE	.100	.120	.100
BARIUM	< 1.000	< 1.000	< 1.000
ALUMINUM	.660	.600	.480
CADMIUM	< .010	< .010	< .010

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* *Table C-14 Cont'd* *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	7.000	7.400	7.167	.400	2.326	3.256	.156
ALKALINITY	98.000	141.000	114.250	43.000	14.223	23.414	14.250
COLOR	60.000	80.000	66.667	20.000	10.000	20.000	8.889
TURBIDITY	12.000	15.000	13.333	3.000	10.000	12.500	1.111
TOTAL SOLIDS	252.000	324.000	296.000	72.000	14.865	9.459	29.333
SUSPENDED SOLIDS	24.000	40.000	32.500	16.000	26.154	23.077	6.500
DISSOLVED SOLIDS	214.000	284.000	260.667	70.000	17.903	8.951	31.111
TOTAL VOLATILE SOLIDS	88.000	216.000	158.667	128.000	44.538	36.134	47.111
TOTAL ORGANIC CARBON	26.000	30.000	27.333	4.000	4.878	9.756	1.778
TOTAL COD	77.000	109.000	94.400	32.000	18.432	15.466	10.880
BOD	< 12.000	28.800	< 20.160	16.800	40.476	42.857	3.456
KJELDAHL NITROGEN	21.000	23.000	21.833	2.000	3.817	5.344	.778
AMMONIA NITROGEN	10.600	13.900	12.500	3.300	15.200	11.200	1.267
NITRITES	< .100	< .100	< .100	.000	-.000	.000	.000
NITRATES	.800	1.300	1.067	.500	25.000	21.875	.178
TOTAL PHOSPHATE	6.300	9.700	7.467	3.400	15.625	29.911	1.489
ORTHO PHOSPHATE	6.300	6.600	6.400	.300	1.562	3.125	.133
OIL & GREASE	52.000	87.000	69.500	35.000	25.180	25.180	17.500
PHENOLS	.005	.035	.019	.030	73.684	84.211	.009
MBAS	1.400	2.400	1.940	1.000	27.835	23.711	.368
CHLORINE RESIDUAL	.000	.100	+ .033	.100	100.000	200.000	.044
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .010	< .003	.009	69.231	207.692	.003
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	.050	.080	.066	.030	24.242	21.212	.011
IRON	.630	.790	.742	.160	15.094	6.469	.058
COPPER	< .020	< .020	< .020	.000	-.000	.000	.000
SILVER	< .010	.020	< .012	.010	16.667	66.667	.003
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.090	.120	.106	.030	15.094	13.208	.011
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	.480	.660	.552	.180	13.043	19.565	.062
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-15 *

SAMPLE POINT M1-MAFB RAW INFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
PH	7.200	7.500	7.000	7.000	7.000	7.000	7.100	*********	*********
ALKALINITY	152.000	107.000	100.000	102.000	93.000	92.000	92.000	*********	*********
TOTAL SOLIDS	508.000	260.000	400.000	332.000	288.000	292.000	460.000	*********	*********
SUSPENDED SOLIDS	144.000	188.000	200.000	*********	160.000	*********	145.000	*********	*********
DISSOLVED SOLIDS	364.000	72.000	200.000	*********	128.000	*********	315.000	*********	*********
TOTAL VOLATILE SOLIDS	*********	¤ 616.000	¤ 232.000	212.000	116.000	¤ 542.000	164.000	*********	*********
TOTAL ORGANIC CARBON	56.000	43.000	74.000	51.000	43.000	41.000	46.000	*********	*********
TOTAL OXYGEN DEMAND	410.000	270.000	280.000	260.000	240.000	210.000	300.000	*********	*********
TOTAL COD	244.000	186.000	181.000	204.000	182.000	291.000	213.000	*********	*********
BOD	108.000	123.000	135.000	81.000	102.000	195.000	*********	*********	*********
KJELDAHL NITROGEN	27.500	15.000	18.500	16.000	14.200	15.000	14.000	*********	*********
AMMONIA NITROGEN	11.000	8.700	8.700	8.700	7.200	7.800	7.700	*********	*********
NITRATES	.100	< .100	< .100	.200	< .100	.300	< .100	*********	*********
TOTAL PHOSPHATE	*********	8.800	10.500	10.300	11.100	13.900	9.600	*********	*********
ORTHO PHOSPHATE	*********	6.700	6.500	6.800	6.200	6.600	6.400	*********	*********
OIL & GREASE	¤ 510.000	67.000	65.000	223.000	91.000	109.000	249.000	*********	*********
PHENOLS	.020	.030	.020	.030	.020	.005	.010	*********	*********
MBAS	7.600	9.600	9.800	10.600	7.800	11.200	9.600	*********	*********
TOTAL HARDNESS	290.800	163.800	160.000	148.000	188.000	158.000	144.000	*********	*********
MERCURY	< .005	< .005	*********	*********	*********	*********	*********	*********	*********
CHROMIUM	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********
HEXAVALENT CHROMIUM	< .001	< .001	< .001	< .001	< .001	< .001	< .001	*********	*********
LEAD	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********
ZINC	.020	.020	.010	.050	.070	.040	.020	*********	*********
IRON	1.750	1.630	2.200	1.120	1.600	2.850	1.880	*********	*********
COPPER	.050	.050	.050	.080	.050	.070	.090	*********	*********
SILVER	< .010	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
NICKEL	*********	< .040	< .040	< .040	< .040	< .040	< .040	*********	*********
ARSENIC	< .010	< .010	*********	*********	*********	*********	*********	*********	*********
CYANIDE	< .010	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
MANGANESE	.050	.080	.050	.050	.050	.060	.040	*********	*********
BARIUM	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	*********	*********
ALUMINUM	.440	.280	.360	.280	.300	.200	.420	*********	*********
CADMIUM	< .010	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-15 Cont'd *

SAMPLE POINT M1-MAFB RAW INFLUENT

PARAMETER	DAY 10	DAY 11	DAY 12
PH	*********	*********	*********
ALKALINITY	*********	*********	*********
TOTAL SOLIDS	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********
TOTAL VOLATILE SOLIDS	*********	*********	*********
TOTAL ORGANIC CARBON	*********	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
KJELDAHL NITROGEN	*********	*********	*********
AMMONIA NITROGEN	*********	*********	*********
NITRATES	*********	*********	*********
TOTAL PHOSPHATE	*********	*********	*********
ORTHO PHOSPHATE	*********	*********	*********
OIL & GREASE	*********	*********	*********
PHENOLS	*********	*********	*********
MBAS	*********	*********	*********
TOTAL HARDNESS	*********	*********	*********
MERCURY	*********	*********	*********
CHROMIUM	*********	*********	*********
HEXAVALENT CHROMIUM	*********	*********	*********
LEAD	*********	*********	*********
ZINC	*********	*********	*********
IRON	*********	*********	*********
COPPER	*********	*********	*********
SILVER	*********	*********	*********
NICKEL	*********	*********	*********
ARSENIC	*********	*********	*********
CYANIDE	*********	*********	*********
MANGANESE	*********	*********	*********
BARIUM	*********	*********	*********
ALUMINUM	*********	*********	*********
CADMIUM	*********	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-15 Cont'd *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	7.000	7.500	7.114	.500	1.606	5.422	.135
ALKALINITY	92.000	152.000	105.429	60.000	12.737	44.173	13.755
TOTAL SOLIDS	260.000	508.000	362.857	248.000	28.346	40.000	79.837
SUSPENDED SOLIDS	144.000	200.000	167.400	56.000	13.978	19.474	21.280
DISSOLVED SOLIDS	72.000	364.000	215.800	292.000	66.636	68.675	98.960
TOTAL VOLATILE SOLIDS	116.000	212.000	164.000	96.000	29.268	29.268	32.000
TOTAL ORGANIC CARBON	41.000	74.000	50.571	33.000	18.927	46.328	8.367
TOTAL OXYGEN DEMAND	210.000	410.000	281.429	200.000	25.381	45.685	42.041
TOTAL COD	181.000	291.000	214.429	110.000	15.590	35.710	30.327
BOD	81.000	195.000	124.000	114.000	34.677	57.258	27.333
KJELDAHL NITROGEN	14.000	27.500	17.171	13.500	18.469	60.150	3.331
AMMONIA NITROGEN	7.200	11.000	8.543	3.800	15.719	28.763	.837
NITRATES	< .100	.300	< .143	.200	30.000	110.000	.061
TOTAL PHOSPHATE	8.800	13.900	10.700	5.100	17.757	29.907	1.200
ORTHO PHOSPHATE	6.200	6.800	6.533	.600	5.102	4.082	.167
OIL & GREASE	65.000	249.000	134.000	184.000	51.493	85.821	68.000
PHENOLS	.005	.030	.019	.025	74.074	55.556	.007
MBAS	7.600	11.200	9.457	3.600	19.637	18.429	1.004
TOTAL HARDNESS	144.000	290.800	178.943	146.800	19.527	62.510	34.547
MERCURY	< .005	< .005	< .005	.000	.000	.000	.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	< .001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	.010	.070	.033	.060	69.565	113.043	.018
IRON	1.120	2.850	1.861	1.730	39.831	53.108	.384
COPPER	.050	.090	.063	.040	20.455	43.182	.015
SILVER	< .010	< .010	< .010	.000	-.000	.000	.000
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
ARSENIC	< .010	< .010	< .010	.000	.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.040	.080	.054	.040	26.316	47.368	.009
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	.200	.440	.326	.240	38.596	35.088	.069
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-16 *

SAMPLE POINT M2-MAFB PRIMARY CLARIFIER INFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	256.000	280.000	300.000	268.000	268.000	*********	*********	*********	*********
SUSPENDED SOLIDS	68.000	133.000	90.000	*********	180.000	*********	50.000	*********	*********
DISSOLVED SOLIDS	168.000	147.000	210.000	*********	88.000	*********	*********	*********	*********
TOTAL OXYGEN DEMAND	280.000	196.000	280.000	280.000	240.000	*********	240.000	*********	*********
TOTAL COD	222.000	181.000	341.000	318.000	265.000	*********	*********	*********	*********
BOD	60.000	78.200	127.000	85.000	109.000	*********	*********	*********	*********
MERCURY	< .005	*********	*********	*********	*********	*********	*********	*********	*********
CHROMIUM	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********
LEAD	< .050	*********	*********	*********	*********	*********	*********	*********	*********

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
MERCURY	*********	*********	*********
CHROMIUM	*********	*********	*********
LEAD	*********	*********	*********

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	256.000	300.000	274.400	44.000	6.706	9.329	12.480
SUSPENDED SOLIDS	50.000	180.000	108.200	130.000	53.789	66.359	38.640
DISSOLVED SOLIDS	88.000	210.000	153.250	122.000	42.577	37.031	35.750
TOTAL OXYGEN DEMAND	196.000	280.000	252.667	84.000	22.427	10.818	27.333
TOTAL COD	181.000	341.000	265.400	160.000	31.801	28.485	51.280
BOD	60.000	127.000	91.840	67.000	34.669	38.284	20.928
MERCURY	< .005	< .005	< .005	.000	.000	.000	.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-17 *

SAMPLE POINT M3-MAFB PRIMARY CLARIFIER EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	292.000	188.000	*********	260.000	224.000	*********	*********	*********	*********
SUSPENDED SOLIDS	68.000	120.000	115.000	65.000	95.000	*********	*********	*********	*********
DISSOLVED SOLIDS	224.000	68.000	*********	195.000	129.000	*********	*********	*********	*********
TOTAL OXYGEN DEMAND	250.000	174.000	180.000	224.000	256.000	*********	232.000	*********	*********
TOTAL COD	150.000	62.000	165.000	*********	144.000	*********	*********	*********	*********
BOD	65.000	84.600	93.700	81.500	64.000	*********	*********	*********	*********
CHROMIUM	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********
NICKEL	< .040	*********	*********	*********	*********	*********	*********	*********	*********
ALUMINUM	*********	*********	.400	*********	*********	*********	*********	*********	*********

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	*********	*********	*********
NICKEL	*********	*********	*********
ALUMINUM	*********	*********	*********

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	188.000	292.000	241.000	104.000	21.992	21.162	35.000
SUSPENDED SOLIDS	65.000	120.000	92.600	55.000	29.806	29.590	20.880
DISSOLVED SOLIDS	68.000	224.000	154.000	156.000	55.844	45.455	55.500
TOTAL OXYGEN DEMAND	174.000	256.000	219.333	82.000	20.669	16.717	28.222
TOTAL COD	62.000	165.000	130.250	103.000	52.399	26.679	34.125
BOD	64.000	93.700	77.760	29.700	17.695	20.499	10.608
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
NICKEL	< .040	< .040	< .040	.000	.000	.000	.000
ALUMINUM	.400	.400	.400	.000	.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-18 *

SAMPLE POINT M4--MAFB TRICKLING FILTER EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	264.000	280.000	*********	220.000	212.000	*********	*********	*********	*********
SUSPENDED SOLIDS	24.000	68.000	60.000	45.000	50.000	*********	*********	*********	*********
DISSOLVED SOLIDS	240.000	212.000	*********	175.000	162.000	*********	*********	*********	*********
TOTAL OXYGEN DEMAND	164.000	144.000	144.000	116.000	165.000	*********	128.000	*********	*********
TOTAL COD	155.000	68.000	88.000	*********	105.000	*********	*********	*********	*********
BOD	38.000	38.300	31.700	32.000	34.500	*********	*********	*********	*********
CHROMIUM	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********
ALUMINUM	*********	*********	.160	*********	*********	*********	*********	*********	*********

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	*********	*********	*********
ALUMINUM	*********	*********	*********

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	212.000	280.000	244.000	68.000	13.115	14.754	28.000
SUSPENDED SOLIDS	24.000	68.000	49.400	44.000	51.417	37.652	11.920
DISSOLVED SOLIDS	162.000	240.000	197.250	78.000	17.871	21.673	28.750
TOTAL OXYGEN DEMAND	116.000	165.000	143.500	49.000	19.164	14.983	14.333
TOTAL COD	68.000	155.000	104.000	87.000	34.615	49.038	26.000
BOD	31.700	38.300	34.900	6.600	9.169	9.742	2.600
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
ALUMINUM	.160	.160	.160	.000	.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
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* Table C-19 *

SAMPLE POINT M5-MAFB FINAL CLARIFIER EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	276.000	184.000	260.000	212.000	228.000	*********	*********	*********	*********
SUSPENDED SOLIDS	24.000	78.000	72.000	40.000	56.000	*********	60.000	*********	*********
DISSOLVED SOLIDS	252.000	106.000	188.000	172.000	172.000	*********	*********	*********	*********
TOTAL OXYGEN DEMAND	148.000	136.000	128.000	116.000	136.000	*********	108.000	*********	*********
TOTAL COD	111.000	¤ 407.000	¤ 676.000	79.000	88.000	*********	*********	*********	*********
BOD	30.000	34.200	35.800	26.600	< 24.000	*********	*********	*********	*********
CHROMIUM	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********
ALUMINUM	*********	*********	4.000	*********	*********	*********	*********	*********	*********

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	*********	*********	*********
ALUMINUM	*********	*********	*********

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	184.000	276.000	232.000	92.000	20.690	18.966	28.800
SUSPENDED SOLIDS	24.000	78.000	55.000	54.000	56.364	41.818	15.333
DISSOLVED SOLIDS	106.000	252.000	178.000	146.000	40.449	41.573	33.600
TOTAL OXYGEN DEMAND	108.000	148.000	128.667	40.000	16.062	15.026	11.333
TOTAL COD	79.000	111.000	92.667	32.000	14.748	19.784	12.222
BOD	< 24.000	35.800	< 30.120	11.800	20.319	18.858	3.904
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
ALUMINUM	4.000	4.000	4.000	.000	.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
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* Table C-20 *

SAMPLE POINT M6-MAFB CHLORINATED EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
PH	7.100	7.500	7.100	7.200	6.900	7.000	7.200	*********	*********
ALKALINITY	100.000	83.000	90.000	87.000	94.000	84.000	78.000	*********	*********
COLOR	50.000	40.000	20.000	40.000	30.000	50.000	70.000	*********	*********
TURBIDITY	18.000	15.000	16.000	16.000	11.000	10.000	15.000	*********	*********
TOTAL SOLIDS	276.000	212.000	284.000	248.000	308.000	204.000	280.000	*********	*********
SUSPENDED SOLIDS	53.000	42.000	38.000	32.000	36.000	22.000	52.000	*********	*********
DISSOLVED SOLIDS	223.000	170.000	246.000	216.000	172.000	182.000	238.000	*********	*********
TOTAL VOLATILE SOLIDS	*********	*********	60.000	248.000	144.000	*********	76.000	*********	*********
TOTAL ORGANIC CARBON	28.000	26.000	26.000	29.000	27.000	26.000	26.000	*********	*********
TOTAL OXYGEN DEMAND	140.000	148.000	152.000	150.000	156.000	148.000	120.000	162.000	*********
TOTAL COD	100.000	45.000	104.000	80.000	133.000	110.000	87.000	*********	*********
BOD	< 20.000	< 24.000	26.400	< 24.000	< 24.000	< 24.000	*********	*********	*********
BOD SOLUBLE	11.000	23.000	13.000	10.500	15.100	23.000	24.400	*********	*********
KJELDAHL NITROGEN	19.400	15.000	15.500	10.000	14.500	14.500	12.000	*********	*********
AMMONIA NITROGEN	6.600	8.700	8.600	7.200	7.600	7.800	6.800	*********	*********
NITRATES	.900	.600	.600	.400	.400	.600	.600	*********	*********
TOTAL PHOSPHATE	*********	9.600	9.600	10.900	10.000	10.900	10.500	*********	*********
ORTHO PHOSPHATE	*********	6.000	5.600	6.000	6.000	5.900	5.800	*********	*********
CHLORIDES	25.000	23.000	23.000	24.000	23.000	21.000	*********	*********	*********
OIL & GREASE	231.000	167.000	120.000	89.000	112.000	172.000	175.000	*********	*********
PHENOLS	.010	.010	.005	.025	.013	.005	.005	*********	*********
MBAS	6.000	6.000	6.000	4.800	4.200	4.800	5.600	*********	*********
TOTAL HARDNESS	338.400	152.900	152.000	152.000	192.000	154.000	136.000	*********	*********
CHLORINE RESIDUAL	.200	*********	.500	*********	1.500	1.500	1.500	*********	*********
MERCURY	< .005	< .005	*********	*********	*********	*********	*********	*********	*********
CHROMIUM	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********
HEXAVALENT CHROMIUM	< .001	< .001	< .001	< .001	< .001	< .001	< .001	*********	*********
LEAD	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********	*********
ZINC	.010	.020	.010	.030	*********	.030	.020	*********	*********
IRON	1.530	1.300	1.500	.920	1.160	1.450	1.650	*********	*********
COPPER	.040	.050	.030	.080	.050	.060	.080	*********	*********
SILVER	< .010	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
NICKEL	*********	< .040	< .040	< .040	< .040	< .040	< .040	*********	*********
ARSENIC	< .010	< .010	*********	*********	*********	*********	*********	*********	*********
CYANIDE	< .010	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
MANGANESE	.130	.040	.030	.040	.050	.040	.060	*********	*********
BARIUM	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	*********	*********
ALUMINUM	.120	.200	*********	.250	.120	.120	.520	*********	*********
CADMIUM	< .010	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-20 Cont'd *

SAMPLE POINT M6-MAFB CHLORINATED EFFLUENT

PARAMETER	DAY 10	DAY 11	DAY 12
PH	*********	*********	*********
ALKALINITY	*********	*********	*********
COLOR	*********	*********	*********
TURBIDITY	*********	*********	*********
TOTAL SOLIDS	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********
TOTAL VOLATILE SOLIDS	*********	*********	*********
TOTAL ORGANIC CARBON	*********	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
BOD SOLUBLE	*********	*********	*********
KJELDAHL NITROGEN	*********	*********	*********
AMMONIA NITROGEN	*********	*********	*********
NITRATES	*********	*********	*********
TOTAL PHOSPHATE	*********	*********	*********
ORTHO PHOSPHATE	*********	*********	*********
CHLORIDES	*********	*********	*********
OIL & GREASE	*********	*********	*********
PHENOLS	*********	*********	*********
MBAS	*********	*********	*********
TOTAL HARDNESS	*********	*********	*********
CHLORINE RESIDUAL	*********	*********	*********
MERCURY	*********	*********	*********
CHROMIUM	*********	*********	*********
HEXAVALENT CHROMIUM	*********	*********	*********
LEAD	*********	*********	*********
ZINC	*********	*********	*********
IRON	*********	*********	*********
COPPER	*********	*********	*********
SILVER	*********	*********	*********
NICKEL	*********	*********	*********
ARSENIC	*********	*********	*********
CYANIDE	*********	*********	*********
MANGANESE	*********	*********	*********
BARIUM	*********	*********	*********
ALUMINUM	*********	*********	*********
CADMIUM	*********	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-20 Cont'd *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	6.900	7.500	7.143	.600	3.400	5.000	.135
ALKALINITY	78.000	100.000	88.000	22.000	11.364	13.636	5.714
COLOR	20.000	70.000	42.857	50.000	53.333	63.333	11.837
TURBIDITY	10.000	18.000	14.429	8.000	30.693	24.752	2.245
TOTAL SOLIDS	204.000	308.000	258.857	104.000	21.192	18.985	32.163
SUSPENDED SOLIDS	22.000	53.000	39.286	31.000	44.000	34.909	8.327
DISSOLVED SOLIDS	170.000	246.000	206.714	76.000	17.761	19.005	27.469
TOTAL VOLATILE SOLIDS	60.000	248.000	132.000	188.000	54.545	87.879	64.000
TOTAL ORGANIC CARBON	26.000	29.000	26.857	3.000	3.191	7.979	.980
TOTAL OXYGEN DEMAND	120.000	162.000	147.000	42.000	18.367	10.204	8.500
TOTAL COD	45.000	133.000	94.143	88.000	52.200	41.275	20.122
BOD	< 20.000	26.400	< 23.733	6.400	15.730	11.236	1.244
BOD SOLUBLE	10.500	24.400	17.143	13.900	38.750	42.333	5.420
KJELDAHL NITROGEN	10.000	19.400	14.414	9.400	30.624	34.589	1.951
AMMONIA NITROGEN	6.600	8.700	7.614	2.100	13.321	14.259	.645
NITRATES	.400	.900	.586	.500	31.707	53.659	.106
TOTAL PHOSPHATE	9.600	10.900	10.250	1.300	6.341	6.341	.517
ORTHO PHOSPHATE	5.600	6.000	5.883	.400	4.816	1.983	.122
CHLORIDES	21.000	25.000	23.167	4.000	9.353	7.914	.889
OIL & GREASE	89.000	231.000	152.286	142.000	41.557	51.689	38.816
PHENOLS	.005	.025	.010	.020	52.055	139.726	.005
MBAS	4.200	6.000	5.343	1.800	21.390	12.299	.637
TOTAL HARDNESS	136.000	338.400	182.471	202.400	25.468	85.454	47.273
CHLORINE RESIDUAL	.200	1.500	1.040	1.300	80.769	44.231	.552
MERCURY	< .005	< .005	< .005	.000	.000	.000	.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	< .001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	.010	.030	.020	.020	50.000	50.000	.007
IRON	.920	1.650	1.359	.730	32.282	21.451	.199
COPPER	.030	.080	.056	.050	46.154	43.590	.015
SILVER	< .010	< .010	< .010	.000	-.000	.000	.000
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
ARSENIC	< .010	< .010	< .010	.000	.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.030	.130	.056	.100	46.154	133.333	.022
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	.120	.520	.222	.400	45.865	134.586	.109
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

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Table C-21

SAMPLE POINT M1-MAFB RAW INFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
PH	*********	*********	*********	*********	*********	*********	*********	6.800	*********
ALKALINITY	*********	*********	*********	*********	*********	*********	*********	118.000	101.000
TOTAL SOLIDS	*********	*********	*********	*********	*********	*********	*********	448.000	560.000
SUSPENDED SOLIDS	*********	*********	*********	*********	*********	*********	*********	165.000	135.000
DISSOLVED SOLIDS	*********	*********	*********	*********	*********	*********	*********	283.000	425.000
TOTAL VOLATILE SOLIDS	*********	*********	*********	*********	*********	*********	*********	184.000	240.000
TOTAL ORGANIC CARBON	*********	*********	*********	*********	*********	*********	*********	77.000	86.000
TOTAL COD	*********	*********	*********	*********	*********	*********	*********	368.000	240.000
BOD	*********	*********	*********	*********	*********	*********	*********	106.000	101.000
KJELDAHL NITROGEN	*********	*********	*********	*********	*********	*********	*********	17.500	16.000
AMMONIA NITROGEN	*********	*********	*********	*********	*********	*********	*********	9.600	7.400
NITRITES	*********	*********	*********	*********	*********	*********	*********	< .100	< .100
NITRATES	*********	*********	*********	*********	*********	*********	*********	< .100	< .100
TOTAL PHOSPHATE	*********	*********	*********	*********	*********	*********	*********	6.900	6.900
ORTHO PHOSPHATE	*********	*********	*********	*********	*********	*********	*********	6.900	6.600
OIL & GREASE	*********	*********	*********	*********	*********	*********	*********	113.000	*********
PHENOLS	*********	*********	*********	*********	*********	*********	*********	.085	.035
MBAS	*********	*********	*********	*********	*********	*********	*********	19.000	9.200
CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .050	< .050
HEXAVALENT CHROMIUM	*********	*********	*********	*********	*********	*********	*********	*********	< .001
LEAD	*********	*********	*********	*********	*********	*********	*********	< .050	< .050
ZINC	*********	*********	*********	*********	*********	*********	*********	.090	.080
IRON	*********	*********	*********	*********	*********	*********	*********	2.930	4.750
COPPER	*********	*********	*********	*********	*********	*********	*********	.030	.030
SILVER	*********	*********	*********	*********	*********	*********	*********	< .010	.060
NICKEL	*********	*********	*********	*********	*********	*********	*********	< .040	< .040
CYANIDE	*********	*********	*********	*********	*********	*********	*********	< .010	< .010
MANGANESE	*********	*********	*********	*********	*********	*********	*********	.060	.100
BARIUM	*********	*********	*********	*********	*********	*********	*********	< 1.000	< 1.000
ALUMINUM	*********	*********	*********	*********	*********	*********	*********	.420	.590
CADMIUM	*********	*********	*********	*********	*********	*********	*********	< .010	< .010

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-21 Cont'd *

SAMPLE POINT M1-MAFB RAW INFLUENT

PARAMETER	DAY 10	DAY 11	DAY 12
PH	6.700	*********	*********
ALKALINITY	102.000	108.000	*********
TOTAL SOLIDS	298.000	*********	*********
SUSPENDED SOLIDS	105.000	105.000	*********
DISSOLVED SOLIDS	193.000	*********	*********
TOTAL VOLATILE SOLIDS	192.000	*********	*********
TOTAL ORGANIC CARBON	62.000	*********	*********
TOTAL COD	229.000	279.000	251.000
BOD	59.500	113.000	116.000
KJELDAHL NITROGEN	17.500	*********	*********
AMMONIA NITROGEN	8.000	*********	*********
NITRITES	< .100	*********	*********
NITRATES	< .100	*********	*********
TOTAL PHOSPHATE	10.300	*********	*********
ORTHO PHOSPHATE	6.900	*********	*********
OIL & GREASE	186.000	*********	*********
PHENOLS	.025	.020	.045
MBAS	15.000	9.000	11.000
CHROMIUM	< .050	< .050	< .050
HEXAVALENT CHROMIUM	< .001	< .001	*********
LEAD	< .050	< .050	< .050
ZINC	.060	.090	.080
IRON	2.140	9.620	2.230
COPPER	.030	.030	< .020
SILVER	< .010	< .010	< .010
NICKEL	< .040	< .040	< .040
CYANIDE	< .010	< .010	< .010
MANGANESE	.070	.170	.060
BARIUM	< 1.000	< 1.000	< 1.000
ALUMINUM	.500	.500	.400
CADMIUM	< .010	< .010	< .010

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-21 Cont'd *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	6.700	6.800	6.750	.100	.741	.741	.050
ALKALINITY	101.000	118.000	107.250	17.000	5.828	10.023	5.750
TOTAL SOLIDS	298.000	560.000	435.333	262.000	31.547	28.637	91.556
SUSPENDED SOLIDS	105.000	165.000	127.500	60.000	17.647	29.412	22.500
DISSOLVED SOLIDS	193.000	425.000	300.333	232.000	35.738	41.509	83.111
TOTAL VOLATILE SOLIDS	184.000	240.000	205.333	56.000	10.390	16.883	23.111
TOTAL ORGANIC CARBON	62.000	86.000	75.000	24.000	17.333	14.667	8.667
TOTAL COD	229.000	368.000	273.400	139.000	16.240	34.601	40.080
BOD	59.500	116.000	99.500	56.500	40.201	16.583	16.000
KJELDAHL NITROGEN	16.000	17.500	17.000	1.500	5.882	2.941	.667
AMMONIA NITROGEN	7.400	9.600	8.333	2.200	11.200	15.200	.844
NITRITES	< .100	< .100	< .100	.000	-.000	.000	.000
NITRATES	< .100	< .100	< .100	.000	-.000	.000	.000
TOTAL PHOSPHATE	6.900	10.300	8.033	3.400	14.108	28.216	1.511
ORTHO PHOSPHATE	6.600	6.900	6.800	.300	2.941	1.471	.133
OIL & GREASE	113.000	186.000	149.500	73.000	24.415	24.415	36.500
PHENOLS	.020	.085	.042	.065	52.381	102.381	.018
MBAS	9.000	19.000	12.640	10.000	28.797	50.316	3.488
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	< .001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	.060	.090	.080	.030	25.000	12.500	.008
IRON	2.140	9.620	4.334	7.480	50.623	121.966	2.281
COPPER	< .020	.030	< .028	.010	28.571	7.143	.003
SILVER	< .010	.060	< .020	.050	50.000	200.000	.016
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.060	.170	.092	.110	34.783	84.783	.034
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	.400	.590	.482	.190	17.012	22.407	.058
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
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* Table C-22 *

SAMPLE POINT M2-MAFB PRIMARY CLARIFIER INFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	*********	*********	*********	*********	*********	*********	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********	*********	*********	*********	*********	70.000	200.000
DISSOLVED SOLIDS	*********	*********	*********	*********	*********	*********	*********	*********	*********
TOTAL COD	*********	*********	*********	*********	*********	*********	*********	418.000	235.000
CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .050	< .050

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	304.000	*********	*********
SUSPENDED SOLIDS	190.000	95.000	*********
DISSOLVED SOLIDS	114.000	*********	*********
TOTAL COD	*********	*********	*********
CHROMIUM	< .050	< .050	< .050

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	304.000	304.000	304.000	.000	.000	.000	.000
SUSPENDED SOLIDS	70.000	200.000	138.750	130.000	49.550	44.144	56.250
DISSOLVED SOLIDS	114.000	114.000	114.000	.000	.000	.000	.000
TOTAL COD	235.000	418.000	326.500	183.000	28.025	28.025	91.500
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
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* Table C-23 *

SAMPLE POINT M3-MAFB PRIMARY CLARIFIER EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	*********	*********	*********	*********	*********	*********	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********	*********	*********	*********	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********	*********	*********	*********	*********	*********	*********
TOTAL COD	*********	*********	*********	*********	*********	*********	*********	181.000	148.000
BOD	*********	*********	*********	*********	*********	*********	*********	31.500	79.000
CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .050	< .050

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	196.000	*********	*********
SUSPENDED SOLIDS	110.000	120.000	*********
DISSOLVED SOLIDS	86.000	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	< .050	< .050	< .050

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	196.000	196.000	196.000	.000	.000	.000	.000
SUSPENDED SOLIDS	110.000	120.000	115.000	10.000	4.348	4.348	5.000
DISSOLVED SOLIDS	86.000	86.000	86.000	.000	.000	.000	.000
TOTAL COD	148.000	181.000	164.500	33.000	10.030	10.030	16.500
BOD	31.500	79.000	55.250	47.500	42.986	42.986	23.750
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
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* Table C-24 *

SAMPLE POINT M4-MAFB TRICKLING FILTER EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	*********	*********	*********	*********	*********	*********	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********	*********	*********	*********	*********	*********	*********
DISSOLVED SOLIDS	*********	*********	*********	*********	*********	*********	*********	*********	*********
TOTAL COD	*********	*********	*********	*********	*********	*********	*********	115.000	104.000
BOD	*********	*********	*********	*********	*********	*********	*********	44.600	34.600
CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .050	< .050

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	244.000	*********	*********
SUSPENDED SOLIDS	110.000	25.000	*********
DISSOLVED SOLIDS	134.000	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	< .050	< .050	< .050

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	244.000	244.000	244.000	.000	.000	.000	.000
SUSPENDED SOLIDS	25.000	110.000	67.500	85.000	62.963	62.963	42.500
DISSOLVED SOLIDS	134.000	134.000	134.000	.000	.000	.000	.000
TOTAL COD	104.000	115.000	109.500	11.000	5.023	5.023	5.500
BOD	34.600	44.600	39.600	10.000	12.626	12.626	5.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS, ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. ¤ INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS.
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MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-25 *

SAMPLE POINT M5-MAFB FINAL CLARIFIER EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
TOTAL SOLIDS	*********	*********	*********	*********	*********	*********	*********	*********	*********
SUSPENDED SOLIDS	*********	*********	*********	*********	*********	*********	*********	52.000	28.000
DISSOLVED SOLIDS	*********	*********	*********	*********	*********	*********	*********	*********	*********
TOTAL COD	*********	*********	*********	*********	*********	*********	*********	88.000	82.000
BOD	*********	*********	*********	*********	*********	*********	*********	> 24.000	29.200
CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .050	< .050

PARAMETER	DAY 10	DAY 11	DAY 12
TOTAL SOLIDS	172.000	*********	*********
SUSPENDED SOLIDS	44.000	42.000	*********
DISSOLVED SOLIDS	128.000	*********	*********
TOTAL COD	*********	*********	*********
BOD	*********	*********	*********
CHROMIUM	< .050	< .050	< .050

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
TOTAL SOLIDS	172.000	172.000	172.000	.000	.000	.000	.000
SUSPENDED SOLIDS	28.000	52.000	41.500	24.000	32.530	25.301	6.750
DISSOLVED SOLIDS	128.000	128.000	128.000	.000	.000	.000	.000
TOTAL COD	82.000	88.000	85.000	6.000	3.529	3.529	3.000
BOD	> 24.000	29.200	> 26.600	5.200	9.774	9.774	2.600
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-26 *

SAMPLE POINT M6-MAFB CHLORINATED EFFLUENT

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
PH	*********	*********	*********	*********	*********	*********	*********	6.800	6.800
ALKALINITY	*********	*********	*********	*********	*********	*********	*********	90.000	81.000
COLOR	*********	*********	*********	*********	*********	*********	*********	60.000	60.000
TURBIDITY	*********	*********	*********	*********	*********	*********	*********	20.000	20.000
TOTAL SOLIDS	*********	*********	*********	*********	*********	*********	*********	308.000	396.000
SUSPENDED SOLIDS	*********	*********	*********	*********	*********	*********	*********	32.000	34.000
DISSOLVED SOLIDS	*********	*********	*********	*********	*********	*********	*********	276.000	352.000
TOTAL VOLATILE SOLIDS	*********	*********	*********	*********	*********	*********	*********	104.000	92.000
TOTAL ORGANIC CARBON	*********	*********	*********	*********	*********	*********	*********	33.000	33.000
TOTAL COD	*********	*********	*********	*********	*********	*********	*********	115.000	98.000
BOD	*********	*********	*********	*********	*********	*********	*********	31.200	< 24.000
KJELDAHL NITROGEN	*********	*********	*********	*********	*********	*********	*********	13.000	13.500
AMMONIA NITROGEN	*********	*********	*********	*********	*********	*********	*********	7.600	7.800
NITRITES	*********	*********	*********	*********	*********	*********	*********	< .100	< .100
NITRATES	*********	*********	*********	*********	*********	*********	*********	.300	.200
TOTAL PHOSPHATE	*********	*********	*********	*********	*********	*********	*********	10.500	10.300
ORTHO PHOSPHATE	*********	*********	*********	*********	*********	*********	*********	5.600	6.000
OIL & GREASE	*********	*********	*********	*********	*********	*********	*********	83.000	*********
PHENOLS	*********	*********	*********	*********	*********	*********	*********	.020	.025
MBAS	*********	*********	*********	*********	*********	*********	*********	10.500	5.800
CHLORINE RESIDUAL	*********	*********	*********	*********	*********	*********	*********	1.100	1.600
CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .050	< .050
HEXAVALENT CHROMIUM	*********	*********	*********	*********	*********	*********	*********	< .100	< .001
LEAD	*********	*********	*********	*********	*********	*********	*********	< .050	< .050
ZINC	*********	*********	*********	*********	*********	*********	*********	.050	.050
IRON	*********	*********	*********	*********	*********	*********	*********	2.050	1.860
COPPER	*********	*********	*********	*********	*********	*********	*********	< .020	< .020
SILVER	*********	*********	*********	*********	*********	*********	*********	< .010	< .010
NICKEL	*********	*********	*********	*********	*********	*********	*********	< .040	< .040
CYANIDE	*********	*********	*********	*********	*********	*********	*********	< .010	< .010
MANGANESE	*********	*********	*********	*********	*********	*********	*********	.070	.060
BARIUM	*********	*********	*********	*********	*********	*********	*********	< 1.000	< 1.000
ALUMINUM	*********	*********	*********	*********	*********	*********	*********	.180	.200
CADMIUM	*********	*********	*********	*********	*********	*********	*********	< .010	< .010

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MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-26 Cont'd *

SAMPLE POINT M6-MAFB CHLORINATED EFFLUENT

PARAMETER	DAY 10	DAY 11	DAY 12
PH	6.700	*********	*********
ALKALINITY	89.000	85.000	*********
COLOR	80.000	*********	*********
TURBIDITY	25.000	*********	*********
TOTAL SOLIDS	256.000	*********	*********
SUSPENDED SOLIDS	48.000	26.000	*********
DISSOLVED SOLIDS	208.000	*********	*********
TOTAL VOLATILE SOLIDS	288.000	*********	*********
TOTAL ORGANIC CARBON	37.000	*********	*********
TOTAL COD	109.000	116.000	102.000
BOD	35.000	20.000	< 12.000
KJELDAHL NITROGEN	15.000	*********	*********
AMMONIA NITROGEN	7.200	*********	*********
NITRITES	< .100	*********	*********
NITRATES	.300	*********	*********
TOTAL PHOSPHATE	9.600	*********	*********
ORTHO PHOSPHATE	6.300	*********	*********
OIL & GREASE	103.000	*********	*********
PHENOLS	.015	.020	.015
MBAS	6.000	5.800	6.200
CHLORINE RESIDUAL	1.100	1.100	*********
CHROMIUM	< .050	< .050	< .050
HEXAVALENT CHROMIUM	< .001	< .001	*********
LEAD	< .050	< .050	.050
ZINC	.040	.040	.040
IRON	1.670	2.140	1.910
COPPER	< .020	< .020	< .020
SILVER	< .010	< .010	< .010
NICKEL	< .040	< .040	< .040
CYANIDE	< .010	< .010	< .010
MANGANESE	.060	.060	.060
BARIUM	< 1.000	< 1.000	< 1.000
ALUMINUM	.200	.260	.220
CADMIUM	< .010	< .010	< .010

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-26 Cont'd *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	6.700	6.800	6.767	.100	.985	.493	.044
ALKALINITY	81.000	90.000	86.250	9.000	6.087	4.348	3.250
COLOR	60.000	80.000	66.667	20.000	10.000	20.000	8.889
TURBIDITY	20.000	25.000	21.667	5.000	7.692	15.385	2.222
TOTAL SOLIDS	256.000	396.000	320.000	140.000	20.000	23.750	50.667
SUSPENDED SOLIDS	26.000	48.000	35.000	22.000	25.714	37.143	6.500
DISSOLVED SOLIDS	208.000	352.000	278.667	144.000	25.359	26.316	48.889
TOTAL VOLATILE SOLIDS	92.000	288.000	161.333	196.000	42.975	78.512	84.444
TOTAL ORGANIC CARBON	33.000	37.000	34.333	4.000	3.883	7.767	1.778
TOTAL COD	98.000	116.000	108.000	18.000	9.259	7.407	6.400
BOD	< 12.000	35.000	< 24.440	23.000	50.900	43.208	6.928
KJELDAHL NITROGEN	13.000	15.000	13.833	2.000	6.024	8.434	.778
AMMONIA NITROGEN	7.200	7.800	7.533	.600	4.425	3.540	.222
NITRITES	< .100	< .100	< .100	.000	-.000	.000	.000
NITRATES	.200	.300	.267	.100	25.000	12.500	.044
TOTAL PHOSPHATE	9.600	10.500	10.133	.900	5.263	3.618	.356
ORTHO PHOSPHATE	5.600	6.300	5.967	.700	6.145	5.587	.244
OIL & GREASE	83.000	103.000	93.000	20.000	10.753	10.753	10.000
PHENOLS	.015	.025	.019	.010	21.053	31.579	.003
MBAS	5.800	10.500	6.860	4.700	15.452	53.061	1.456
CHLORINE RESIDUAL	1.100	1.600	1.225	.500	10.204	30.612	.183
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .100	< .026	.099	96.117	288.350	.037
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	.040	.050	.044	.010	9.091	13.636	.005
IRON	1.670	2.140	1.926	.470	13.292	11.111	.135
COPPER	< .020	< .020	< .020	.000	-.000	.000	.000
SILVER	< .010	< .010	< .010	.000	-.000	.000	.000
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.060	.070	.062	.010	3.226	12.903	.003
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	.180	.260	.212	.080	15.094	22.642	.022
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-27 *

SAMPLE POINT S1-JUMPING BROOK

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9
PH	*********	5.500	4.300	4.600	4.300	4.000	4.100	4.000	*********
ALKALINITY	*********	+ .000	+ .000	+ .000	+ .000	+ .000	+ .000	+ .000	*********
COLOR	*********	800.000	800.000	800.000	800.000	480.000	640.000	800.000	*********
TURBIDITY	*********	9.000	8.000	9.000	9.000	9.000	8.000	8.000	*********
TOTAL SOLIDS	*********	*********	204.000	136.000	124.000	96.000	136.000	100.000	*********
SUSPENDED SOLIDS	*********	*********	28.000	60.000	120.000	72.000	120.000	56.000	*********
DISSOLVED SOLIDS	*********	*********	176.000	76.000	4.000	24.000	16.000	44.000	*********
TOTAL ORGANIC CARBON	*********	49.000	41.000	40.000	40.000	40.000	38.000	40.000	*********
TOTAL OXYGEN DEMAND	*********	136.000	138.000	128.000	132.000	130.000	116.000	124.000	*********
TOTAL COD	*********	96.000	93.000	62.000	108.000	81.000	93.000	88.000	*********
BOD	*********	< 20.000	< 20.000	< 20.000	< 20.000	< 20.000	*********	< 12.000	*********
BOD SOLUBLE	*********	*********	*********	10.500	21.500	27.200	*********	*********	*********
KJELDAHL NITROGEN	*********	1.000	1.000	< .500	< .500	< .500	< .500	< .500	*********
AMMONIA NITROGEN	*********	.100	< .100	< .100	< .100	< .100	< .100	< .100	*********
NITRITES	*********	< .100	< .100	< .100	< .100	< .100	< .100	< .100	*********
NITRATES	*********	.200	< .100	.100	< .100	< .100	< .100	< .100	*********
TOTAL PHOSPHATE	*********	*********	*********	3.100	3.100	2.500	2.600	2.600	*********
ORTHO PHOSPHATE	*********	*********	*********	2.200	2.400	2.100	2.100	2.100	*********
OIL & GREASE	*********	25.000	77.000	51.000	*********	*********	*********	*********	*********
PHENOLS	*********	.035	.015	.020	.020	< .001	.005	< .001	*********
MBAS	*********	.300	.200	.200	.200	.100	.100	.150	*********
MERCURY	*********	< .005	*********	*********	*********	*********	*********	*********	*********
CHROMIUM	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********
HEXAVALENT CHROMIUM	*********	< .001	< .001	< .001	< .001	< .001	< .001	*********	*********
LEAD	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	*********
ZINC	*********	< .010	.010	.030	*********	.020	.010	*********	*********
IRON	*********	8.900	10.200	10.400	10.400	10.900	9.720	*********	*********
COPPER	*********	< .020	< .020	< .020	< .020	< .020	< .020	*********	*********
SILVER	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
NICKEL	*********	< .040	< .040	< .040	< .040	< .040	< .040	*********	*********
ARSENIC	*********	< .010	*********	*********	*********	*********	*********	*********	*********
CYANIDE	*********	< .010	< .010	< .010	< .010	*********	< .010	< .010	*********
MANGANESE	*********	.100	.020	.050	.030	.030	.050	*********	*********
BARIUM	*********	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	*********
ALUMINUM	*********	.980	*********	.440	.480	.460	.440	.440	*********
CADMIUM	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-27 Cont'd *

SAMPLE POINT S1-JUMPING BROOK

PARAMETER	[DAY 10]	[DAY 11]	[DAY 12]
PH	3.800	*********	*********
ALKALINITY	*********	*********	*********
COLOR	480.000	*********	*********
TURBIDITY	9.000	*********	*********
TOTAL SOLIDS	76.000	*********	*********
SUSPENDED SOLIDS	72.000	64.000	*********
DISSOLVED SOLIDS	4.000	*********	*********
TOTAL ORGANIC CARBON	61.000	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	82.000	107.000	*********
BOD	< 12.000	< 12.000	*********
BOD SOLUBLE	*********	*********	*********
KJELDAHL NITROGEN	< .500	*********	*********
AMMONIA NITROGEN	< .100	*********	*********
NITRITES	< .100	*********	*********
NITRATES	< .100	*********	*********
TOTAL PHOSPHATE	2.300	*********	*********
ORTHO PHOSPHATE	2.100	*********	*********
OIL & GREASE	49.000	*********	*********
PHENOLS	.010	< .001	*********
MBAS	.100	.130	*********
MERCURY	*********	*********	*********
CHROMIUM	< .050	< .050	< .050
HEXAVALENT CHROMIUM	*********	*********	*********
LEAD	< .050	< .050	*********
ZINC	*********	*********	*********
IRON	*********	*********	*********
COPPER	*********	*********	*********
SILVER	*********	*********	*********
NICKEL	*********	*********	*********
ARSENIC	*********	*********	*********
CYANIDE	< .010	< .010	< .010
MANGANESE	*********	*********	*********
BARIUM	< 1.000	< 1.000	< 1.000
ALUMINUM	.440	*********	*********
CADMIUM	*********	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-27 Cont'd *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	3.800	5.500	4.325	1.700	12.139	27.168	.362
ALKALINITY	.000	.000	+ .000	.000	.000	.000	.000
COLOR	480.000	800.000	700.000	320.000	31.429	14.286	125.000
TURBIDITY	8.000	9.000	8.625	1.000	7.246	4.348	.469
TOTAL SOLIDS	76.000	204.000	124.571	128.000	38.991	63.761	29.224
SUSPENDED SOLIDS	28.000	120.000	74.000	92.000	62.162	62.162	23.000
DISSOLVED SOLIDS	4.000	176.000	49.143	172.000	91.860	258.140	43.918
TOTAL ORGANIC CARBON	38.000	61.000	43.625	23.000	12.894	39.828	5.687
TOTAL OXYGEN DEMAND	116.000	138.000	129.143	22.000	10.177	6.858	5.551
TOTAL COD	62.000	108.000	90.000	46.000	31.111	20.000	10.444
BOD	< 12.000	< 20.000	< 17.000	8.000	29.412	17.647	3.750
BOD SOLUBLE	10.300	27.200	19.667	16.900	47.627	38.305	6.244
KJELDAHL NITROGEN	< .500	1.000	< .625	.500	20.000	56.000	.234
AMMONIA NITROGEN	< .100	.100	< .100	.000	-.000	.000	.000
NITRITES	< .100	< .100	< .100	.000	-.000	.000	.000
NITRATES	< .100	.200	< .112	.100	11.111	77.778	.022
TOTAL PHOSPHATE	2.300	3.100	2.700	.800	14.815	14.815	.267
ORTHO PHOSPHATE	2.100	2.400	2.167	.300	3.077	10.769	.089
OIL & GREASE	25.000	77.000	50.500	52.000	50.495	52.475	13.500
PHENOLS	< .001	.035	< .012	.034	91.667	191.667	.009
MBAS	.100	.300	.164	.200	39.189	82.432	.054
MERCURY	< .005	< .005	< .005	.000	.000	.000	.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	< .001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	< .010	.030	< .016	.020	37.500	87.500	.007
IRON	8.900	10.900	10.087	2.000	11.765	8.063	.518
COPPER	< .020	< .020	< .020	.000	-.000	.000	.000
SILVER	< .010	< .010	< .010	.000	-.000	.000	.000
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
ARSENIC	< .010	< .010	< .010	.000	.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.020	.100	.047	.080	57.143	114.286	.020
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	.440	.980	.526	.540	16.304	86.413	.130
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-28 *

SAMPLE POINT S2-SOUTH RUN ABOVE FT. DIX STP

PARAMETER	DAY 1	[DAY 2]	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	[DAY 9]
PH	*********	7.000	6.200	6.200	6.100	6.100	6.200	6.000	¤ 6.800
ALKALINITY	*********	40.000	39.000	*********	37.000	38.000	37.000	29.000	¤ 29.000
COLOR	*********	50.000	30.000	20.000	30.000	20.000	20.000	50.000	¤ 100.000
TURBIDITY	*********	6.000	6.000	6.000	7.000	8.000	7.000	13.000	¤ 28.000
TOTAL SOLIDS	*********	212.000	276.000	244.000	200.000	232.000	192.000	140.000	¤ 240.000
SUSPENDED SOLIDS	*********	15.000	12.000	36.000	44.000	4.000	28.000	12.000	¤ 48.000
DISSOLVED SOLIDS	*********	197.000	264.000	208.000	156.000	228.000	164.000	128.000	¤ 192.000
TOTAL ORGANIC CARBON	*********	4.000	7.000	6.000	6.000	6.000	5.000	10.000	¤ 34.000
TOTAL OXYGEN DEMAND	*********	+ .000	20.000	+ .000	+ .000	+ .000	+ .000	26.000	*********
TOTAL COD	*********	40.000	27.000	11.000	76.000	22.000	33.000	22.000	¤ 66.000
BOD	*********	< 2.000	6.600	4.200	3.500	2.300	*********	3.600	¤ 11.400
BOD SOLUBLE	*********	*********	*********	3.500	4.500	5.200	*********	*********	*********
KJELDAHL NITROGEN	*********	1.000	.500	< .500	< .500	< .500	< .500	< .500	¤ 2.500
AMMONIA NITROGEN	*********	.300	.200	.100	< .100	.100	.200	.200	¤ .100
NITRITES	*********	< .100	< .100	< .100	< .100	< .100	< .100	< .100	¤ .100
NITRATES	*********	1.000	.900	.900	.800	1.000	.600	.400	¤ .100
TOTAL PHOSPHATE	*********	1.800	1.800	1.700	1.600	1.800	1.800	1.300	¤ 2.400
ORTHO PHOSPHATE	*********	.200	.100	.100	.500	.700	1.300	1.000	¤ 1.300
OIL & GREASE	*********	48.000	108.000	276.000	*********	*********	*********	*********	*********
PHENOLS	*********	< .001	.015	.015	.010	< .001	< .001	< .001	¤ .010
MBAS	*********	.100	.400	.550	.300	.650	.950	2.300	¤ .200
MERCURY	*********	< .005	*********	*********	*********	*********	*********	*********	*********
CHROMIUM	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
HEXAVALENT CHROMIUM	*********	< .001	< .001	< .001	< .001	< .001	< .001	*********	*********
LEAD	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
ZINC	*********	< .010	.010	.030	*********	.020	< .010	*********	*********
IRON	*********	.900	.800	.880	.710	.800	.900	*********	*********
COPPER	*********	< .020	< .020	< .020	< .020	.020	< .020	< .020	¤ .020
SILVER	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
NICKEL	*********	.040	< .040	< .040	< .040	< .040	< .040	*********	*********
ARSENIC	*********	< .010	*********	*********	*********	*********	*********	*********	*********
CYANIDE	*********	< .010	< .010	< .010	< .010	< .010	< .010	< .010	¤ .010
MANGANESE	*********	.150	.140	.250	.150	.110	.090	*********	*********
BARIUM	*********	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	¤ 1.000
ALUMINUM	*********	.100	*********	< .100	.150	.140	.240	.500	¤ .360
CADMIUM	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-28 Cont'd *

SAMPLE POINT S2-SOUTH RUN ABOVE FT. DIX STP

PARAMETER	[DAY 10]	[DAY 11]	[DAY 12]
PH	6.000	*********	*********
ALKALINITY	33.000	38.000	*********
COLOR	100.000	*********	*********
TURBIDITY	30.000	*********	*********
TOTAL SOLIDS	132.000	*********	*********
SUSPENDED SOLIDS	72.000	8.000	*********
DISSOLVED SOLIDS	60.000	*********	*********
TOTAL ORGANIC CARBON	19.000	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	55.000	48.000	*********
BOD	6.000	7.300	*********
BOD SOLUBLE	*********	*********	*********
KJELDAHL NITROGEN	< .500	*********	*********
AMMONIA NITROGEN	.200	*********	*********
NITRITES	< .100	*********	*********
NITRATES	.200	*********	*********
TOTAL PHOSPHATE	1.800	*********	*********
ORTHO PHOSPHATE	.700	*********	*********
OIL & GREASE	121.000	*********	*********
PHENOLS	.010	< .001	*********
MBAS	.200	2.800	*********
MERCURY	*********	*********	*********
CHROMIUM	< .050	< .050	*********
HEXAVALENT CHROMIUM	*********	*********	*********
LEAD	< .050	< .050	*********
ZINC	*********	*********	*********
IRON	*********	*********	*********
COPPER	< .020	< .020	*********
SILVER	*********	*********	*********
NICKEL	*********	*********	*********
ARSENIC	*********	*********	*********
CYANIDE	< .010	< .010	*********
MANGANESE	*********	*********	*********
BARIUM	< 1.000	< 1.000	*********
ALUMINUM	.200	*********	*********
CADMIUM	*********	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-28 Cont'd *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	6.000	7.000	6.225	1.000	3.614	12.450	.194
ALKALINITY	29.000	40.000	36.375	11.000	20.275	9.966	2.687
COLOR	20.000	100.000	40.000	80.000	50.000	150.000	20.000
TURBIDITY	6.000	30.000	10.375	24.000	42.169	189.157	5.562
TOTAL SOLIDS	132.000	276.000	203.500	144.000	35.135	35.627	37.500
SUSPENDED SOLIDS	4.000	72.000	25.667	68.000	84.416	180.519	17.185
DISSOLVED SOLIDS	60.000	264.000	175.625	204.000	65.836	50.320	48.625
TOTAL ORGANIC CARBON	4.000	19.000	7.875	15.000	49.206	141.270	3.312
TOTAL OXYGEN DEMAND	.000	26.000	+ 6.571	26.000	100.000	295.652	9.388
TOTAL COD	11.000	76.000	37.111	65.000	70.359	104.790	15.679
BOD	< 2.000	7.300	< 4.437	5.300	54.930	64.507	1.647
BOD SOLUBLE	3.500	5.200	4.400	1.700	20.455	18.182	.600
KJELDAHL NITROGEN	< .500	1.000	< .563	.500	11.111	77.778	.109
AMMONIA NITROGEN	< .100	.300	< .175	.200	42.857	71.429	.056
NITRITES	< .100	< .100	< .100	.000	-.000	.000	.000
NITRATES	.200	1.000	.725	.800	72.414	37.931	.244
TOTAL PHOSPHATE	1.300	1.800	1.725	.500	24.638	4.348	.113
ORTHO PHOSPHATE	.100	1.300	.575	1.200	82.609	126.087	.350
OIL & GREASE	48.000	276.000	138.250	228.000	65.280	99.638	68.875
PHENOLS	< .001	.015	< .006	.014	83.636	145.455	.006
MBAS	.100	2.800	.917	2.700	89.091	205.455	.733
MERCURY	< .005	< .005	< .005	.000	.000	.000	.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	< .001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	< .010	.030	< .016	.020	37.500	87.500	.007
IRON	.710	.900	.832	.190	14.629	8.216	.062
COPPER	< .020	< .020	< .020	.000	-.000	.000	.000
SILVER	< .010	< .010	< .010	.000	-.000	.000	.000
NICKEL	< .040	.040	< .040	.000	-.000	.000	.000
ARSENIC	< .010	< .010	< .010	.000	.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.090	.250	.148	.160	39.326	68.539	.035
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	< .100	.500	< .204	.400	51.049	144.755	.095
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-29 *

SAMPLE POINT S3--SOUTH RUN BELOW FT. DIX STP

PARAMETER	DAY 1	[DAY 2]	[DAY 3]	DAY 4	DAY 5	DAY 6	DAY 7	[DAY 8]	[DAY 9]
PH	*********	7.200	7.100	6.500	6.800	6.900	6.900	6.700	¤ 6.800
ALKALINITY	*********	94.000	78.000	102.000	91.000	80.000	73.000	61.000	¤ 31.000
COLOR	*********	40.000	40.000	60.000	60.000	20.000	40.000	60.000	¤ 100.000
TURBIDITY	*********	13.000	12.000	16.000	14.000	8.000	8.000	15.000	¤ 34.000
TOTAL SOLIDS	*********	272.000	284.000	232.000	276.000	224.000	236.000	148.000	¤ 200.000
SUSPENDED SOLIDS	*********	40.000	36.000	28.000	64.000	8.000	36.000	16.000	¤ 24.000
DISSOLVED SOLIDS	*********	232.000	248.000	204.000	232.000	216.000	200.000	132.000	¤ 176.000
TOTAL ORGANIC CARBON	*********	17.000	17.000	20.000	18.000	16.000	15.000	16.000	¤ 21.000
TOTAL OXYGEN DEMAND	*********	81.000	94.000	124.000	120.000	108.000	64.000	72.000	*********
TOTAL COD	*********	50.000	49.000	51.000	59.000	60.000	44.000	49.000	¤ 44.000
BOD	*********	13.400	18.000	< 20.000	14.500	16.300	*********	< 10.000	¤ 10.000
BOD SOLUBLE	*********	*********	*********	14.300	11.700	13.300	*********	*********	*********
KJELDAHL NITROGEN	*********	13.000	13.500	17.000	13.000	12.500	10.500	8.000	¤ 5.500
AMMONIA NITROGEN	*********	6.800	6.800	10.000	7.800	7.600	5.800	5.000	¤ 9.600
NITRITES	*********	.300	.400	.200	.400	.300	.200	.300	¤ .200
NITRATES	*********	.900	.900	1.200	1.000	1.300	2.000	.700	¤ .400
TOTAL PHOSPHATE	*********	7.200	7.400	8.200	7.700	8.800	8.100	5.200	¤ 7.300
ORTHO PHOSPHATE	*********	5.500	4.800	5.300	5.300	5.400	5.100	5.000	¤ 5.300
OIL & GREASE	*********	55.000	90.000	*********	97.000	58.000	89.000	42.000	*********
PHENOLS	*********	< .001	< .001	.015	.005	.010	< .001	< .001	¤ .015
MBAS	*********	2.100	1.800	1.360	1.600	1.000	1.800	1.600	¤ .800
MERCURY	*********	< .005	*********	*********	*********	*********	*********	*********	*********
CHROMIUM	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
HEXAVALENT CHROMIUM	*********	< .001	< .001	< .001	< .001	< .001	< .001	*********	*********
LEAD	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
ZINC	*********	.010	.010	.050	*********	.040	.020	*********	*********
IRON	*********	1.490	1.200	1.200	1.410	1.150	1.050	*********	*********
COPPER	*********	< .020	< .020	< .020	< .020	.030	< .020	< .020	¤ .020
SILVER	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
NICKEL	< .040	< .040	< .040	< .040	< .040	< .040	< .040	*********	*********
ARSENIC	*********	< .010	*********	*********	*********	*********	*********	*********	*********
CYANIDE	*********	< .010	< .010	< .010	< .010	< .010	< .010	< .010	¤ .010
MANGANESE	*********	.170	.140	.250	.140	.130	.110	*********	*********
BARIUM	*********	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	¤ 1.000
ALUMINUM	*********	1.000	*********	.400	.520	.320	.220	.480	¤ 1.600
CADMIUM	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-29 Cont'd *

SAMPLE POINT S3-SOUTH RUN BELOW FT. DIX STP

PARAMETER	[DAY 10]	[DAY 11]	[DAY 12]
PH	6.700	*********	*********
ALKALINITY	77.000	99.000	*********
COLOR	60.000	*********	*********
TURBIDITY	14.000	*********	*********
TOTAL SOLIDS	184.000	*********	*********
SUSPENDED SOLIDS	36.000	24.000	*********
DISSOLVED SOLIDS	148.000	*********	*********
TOTAL ORGANIC CARBON	18.000	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	55.000	59.000	37.000
BOD	< 12.000	< 12.000	< 12.000
BOD SOLUBLE	*********	*********	*********
KJELDAHL NITROGEN	12.000	*********	*********
AMMONIA NITROGEN	5.400	*********	*********
NITRITES	.200	*********	*********
NITRATES	.700	*********	*********
TOTAL PHOSPHATE	8.200	*********	*********
ORTHO PHOSPHATE	5.500	*********	*********
OIL & GREASE	*********	*********	*********
PHENOLS	.020	.010	.015
MBAS	1.600	.900	1.660
MERCURY	*********	*********	*********
CHROMIUM	< .050	< .050	< .050
HEXAVALENT CHROMIUM	*********	*********	*********
LEAD	< .050	< .050	< .050
ZINC	*********	*********	*********
IRON	*********	*********	*********
COPPER	< .020	< .020	< .020
SILVER	*********	*********	*********
NICKEL	*********	*********	*********
ARSENIC	*********	*********	*********
CYANIDE	< .010	< .010	< .010
MANGANESE	*********	*********	*********
BARIUM	< 1.000	< 1.000	< 1.000
ALUMINUM	.400	.800	.420
CADMIUM	*********	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-29 Cont'd *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	6.500	7.200	6.850	.700	5.109	5.109	.175
ALKALINITY	61.000	102.000	83.889	41.000	27.285	21.589	11.210
COLOR	20.000	60.000	47.500	40.000	57.895	26.316	12.500
TURBIDITY	8.000	16.000	12.500	8.000	36.000	28.000	2.375
TOTAL SOLIDS	148.000	284.000	232.000	136.000	36.207	22.414	35.000
SUSPENDED SOLIDS	8.000	64.000	32.000	56.000	75.000	100.000	11.556
DISSOLVED SOLIDS	132.000	248.000	201.500	116.000	34.491	23.077	31.125
TOTAL ORGANIC CARBON	15.000	20.000	17.125	5.000	12.409	16.788	1.156
TOTAL OXYGEN DEMAND	64.000	124.000	94.714	60.000	32.428	30.920	10.388
TOTAL COD	37.000	60.000	51.300	23.000	27.875	16.959	5.560
BOD	< 10.000	< 20.000	< 14.244	10.000	29.797	40.406	2.627
BOD SOLUBLE	11.700	14.300	13.100	2.600	10.687	9.160	.933
KJELDAHL NITROGEN	8.000	17.000	12.437	9.000	35.678	36.683	1.703
AMMONIA NITROGEN	5.000	10.000	6.900	5.000	27.536	44.928	1.175
NITRITES	.200	.400	.287	.200	30.435	39.130	.066
NITRATES	.700	2.000	1.087	1.300	35.632	83.908	.309
TOTAL PHOSPHATE	5.200	8.800	7.600	3.600	31.579	15.789	.750
ORTHO PHOSPHATE	4.800	5.500	5.237	.700	8.353	5.012	.203
OIL & GREASE	42.000	97.000	71.833	55.000	41.531	35.035	20.167
PHENOLS	< .001	.020	< .008	.019	87.342	153.165	.006
MBAS	.900	2.100	1.542	1.200	41.634	36.187	.273
MERCURY	< .005	< .005	< .005	.000	.000	.000	.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	.001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	.010	.050	.026	.040	61.538	92.308	.015
IRON	1.050	1.490	1.250	.440	16.000	19.200	.133
COPPER	< .020	.030	< .021	.010	4.762	42.857	.002
SILVER	< .010	< .010	< .010	.000	-.000	.000	.000
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
ARSENIC	< .010	< .010	< .010	.000	.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.110	.250	.157	.140	29.787	59.574	.036
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	.220	1.000	.507	.780	56.579	97.368	.178
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-30 *

SAMPLE POINT S4-SOUTH RUN BELOW MAFB STP

PARAMETER	DAY 1	[DAY 2]	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	[DAY 8]	[DAY 9]
PH	*********	7.400	7.200	6.900	7.000	7.000	7.100	6.700	¤ 6.900
ALKALINITY	*********	81.000	88.000	84.000	88.000	82.000	72.000	47.000	¤ 26.000
COLOR	*********	40.000	40.000	50.000	40.000	30.000	30.000	60.000	¤ 100.000
TURBIDITY	*********	14.000	11.000	11.000	10.000	9.000	9.000	16.000	¤ 33.000
TOTAL SOLIDS	*********	*********	336.000	248.000	252.000	120.000	244.000	128.000	¤ 240.000
SUSPENDED SOLIDS	*********	22.000	38.000	12.000	38.000	2.000	32.000	28.000	¤ 60.000
DISSOLVED SOLIDS	*********	*********	298.000	236.000	214.000	118.000	212.000	100.000	¤ 180.000
TOTAL ORGANIC CARBON	*********	17.000	18.000	16.000	15.000	14.000	13.000	17.000	¤ 20.000
TOTAL OXYGEN DEMAND	*********	81.000	88.000	30.000	92.000	86.000	68.000	73.000	*********
TOTAL COD	*********	17.000	49.000	34.000	54.000	33.000	44.000	44.000	¤ 49.000
BOD	*********	12.200	17.800	< 10.000	< 12.000	< 12.000	*********	9.900	¤ 11.500
BOD SOLUBLE	*********	*********	*********	12.200	13.000	13.500	*********	*********	*********
KJELDAHL NITROGEN	*********	10.500	13.500	13.000	11.500	11.500	9.500	5.000	¤ 5.000
AMMONIA NITROGEN	*********	5.000	7.200	7.400	7.400	6.400	5.400	3.200	¤ 7.400
NITRITES	*********	.200	.400	.200	.400	.300	.100	.100	¤ .100
NITRATES	*********	.600	.900	.800	.600	.900	.700	.400	¤ .300
TOTAL PHOSPHATE	*********	6.000	5.800	7.700	8.200	7.400	4.000	5.000	¤ 6.800
ORTHO PHOSPHATE	*********	4.400	5.200	5.400	5.300	5.500	5.000	4.600	¤ 5.400
OIL & GREASE	*********	35.000	112.000	*********	127.000	174.000	218.000	91.000	*********
PHENOLS	*********	.085	.090	.020	< .001	.005	.005	< .001	¤ .010
MBAS	*********	2.160	2.400	1.460	1.500	2.100	1.700	2.100	¤ 1.400
MERCURY	*********	< .005	*********	*********	*********	*********	*********	*********	*********
CHROMIUM	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
HEXAVALENT CHROMIUM	*********	< .001	< .001	< .001	< .001	< .001	< .001	*********	*********
LEAD	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
ZINC	*********	< .010	< .010	.020	*********	.020	.010	*********	*********
IRON	*********	1.750	1.800	1.800	1.700	1.650	1.550	*********	*********
COPPER	*********	< .020	< .020	< .020	< .020	.040	< .020	< .020	¤ .020
SILVER	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
NICKEL	< .040	< .040	< .040	< .040	< .040	< .040	< .040	*********	*********
ARSENIC	*********	< .010	*********	*********	*********	*********	*********	*********	*********
CYANIDE	*********	< .010	< .010	< .010	< .010	< .010	< .010	< .010	¤ .010
MANGANESE	*********	.150	.140	.250	.160	.120	.090	*********	*********
BARIUM	*********	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	¤ 1.000
ALUMINUM	*********	.320	*********	.200	.200	.200	.280	.540	¤ 2.200
CADMIUM	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-30 Cont'd *

SAMPLE POINT S4-SOUTH RUN BELOW MAFB STP

PARAMETER	[DAY 10]	[DAY 11]	[DAY 12]
PH	6.600	*********	*********
ALKALINITY	69.000	85.000	*********
COLOR	60.000	*********	*********
TURBIDITY	15.000	*********	*********
TOTAL SOLIDS	188.000	*********	*********
SUSPENDED SOLIDS	40.000	44.000	*********
DISSOLVED SOLIDS	148.000	*********	*********
TOTAL ORGANIC CARBON	19.000	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	44.000	64.000	43.000
BOD	12.500	12.000	< 12.000
BOD SOLUBLE	*********	*********	*********
KJELDAHL NITROGEN	10.000	*********	*********
AMMONIA NITROGEN	7.400	*********	*********
NITRITES	.200	*********	*********
NITRATES	.400	*********	*********
TOTAL PHOSPHATE	7.300	*********	*********
ORTHO PHOSPHATE	5.100	*********	*********
OIL & GREASE	98.000	*********	*********
PHENOLS	.015	.015	.025
MBAS	1.800	2.300	2.260
MERCURY	*********	*********	*********
CHROMIUM	< .050	< .050	< .050
HEXAVALENT CHROMIUM	*********	*********	*********
LEAD	< .050	< .050	< .050
ZINC	*********	*********	*********
IRON	*********	*********	*********
COPPER	< .020	< .020	< .020
SILVER	*********	*********	*********
NICKEL	*********	*********	*********
ARSENIC	*********	*********	*********
CYANIDE	< .010	< .010	< .010
MANGANESE	*********	*********	*********
BARIUM	< 1.000	< 1.000	< 1.000
ALUMINUM	.560	.660	.340
CADMIUM	*********	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-30 Cont'd *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	6.600	7.400	6.987	.800	5.546	5.903	.191
ALKALINITY	47.000	88.000	77.333	41.000	39.224	13.793	9.778
COLOR	30.000	60.000	43.750	30.000	31.429	37.143	9.688
TURBIDITY	9.000	16.000	11.875	7.000	24.211	34.737	2.344
TOTAL SOLIDS	120.000	336.000	216.571	216.000	44.591	55.145	61.061
SUSPENDED SOLIDS	2.000	44.000	28.444	42.000	92.969	54.688	11.062
DISSOLVED SOLIDS	100.000	298.000	189.429	198.000	47.210	57.315	57.796
TOTAL ORGANIC CARBON	13.000	19.000	16.125	6.000	19.380	17.829	1.625
TOTAL OXYGEN DEMAND	68.000	92.000	81.143	24.000	16.197	13.380	6.449
TOTAL COD	17.000	64.000	42.600	47.000	60.094	50.235	8.760
BOD	9.900	17.800	< 12.267	7.900	19.293	45.109	1.281
BOD SOLUBLE	12.200	13.500	12.900	1.300	5.426	4.651	.467
KJELDAHL NITROGEN	5.000	13.500	10.562	8.500	52.663	27.811	1.812
AMMONIA NITROGEN	3.200	7.400	6.175	4.200	48.178	19.838	1.231
NITRITES	.100	.400	.237	.300	57.895	68.421	.097
NITRATES	.400	.900	.662	.500	39.623	35.849	.162
TOTAL PHOSPHATE	4.000	8.200	6.425	4.200	37.743	27.626	1.225
ORTHO PHOSPHATE	4.400	5.500	5.062	1.100	13.086	8.642	.297
OIL & GREASE	35.000	218.000	122.143	183.000	71.345	78.480	43.592
PHENOLS	< .001	.090	< .026	.089	96.183	243.511	.025
MBAS	1.460	2.400	1.978	.940	26.188	21.335	.290
MERCURY	< .005	< .005	< .005	.000	.000	.000	.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	< .001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	< .010	.020	< .014	.010	28.571	42.857	.005
IRON	1.550	1.800	1.708	.250	9.268	5.366	.075
COPPER	< .020	.040	< .022	.020	9.091	81.818	.004
SILVER	< .010	< .010	< .010	.000	-.000	.000	.000
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
ARSENIC	< .010	< .010	< .010	.000	.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.090	.250	.152	.160	40.659	64.835	.036
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	.200	.660	.367	.460	45.455	80.000	.147
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-31 *

SAMPLE POINT S5-CROSSWICKS CREEK AT BRINDLE LAKE RD

PARAMETER	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	[DAY 9]
PH	*********	7.300	7.000	6.400	6.900	6.900	6.900	6.800	¤ 6.500
ALKALINITY	*********	68.000	60.000	54.000	66.000	69.000	57.000	56.000	¤ 31.000
COLOR	*********	120.000	120.000	120.000	240.000	120.000	120.000	80.000	¤ 80.000
TURBIDITY	*********	14.000	10.000	10.000	12.000	10.000	9.000	11.000	¤ 33.000
TOTAL SOLIDS	*********	144.000	*********	172.000	216.000	224.000	196.000	156.000	¤ 188.000
SUSPENDED SOLIDS	*********	18.000	20.000	16.000	64.000	4.000	36.000	16.000	¤ 52.000
DISSOLVED SOLIDS	*********	126.000	*********	156.000	152.000	220.000	160.000	140.000	¤ 136.000
TOTAL ORGANIC CARBON	*********	20.000	18.000	17.000	18.000	16.000	14.000	16.000	¤ 20.000
TOTAL OXYGEN DEMAND	*********	81.000	78.000	71.000	94.000	80.000	64.000	60.000	*********
TOTAL COD	*********	61.000	49.000	11.000	49.000	49.000	44.000	16.000	¤ 38.000
BOD	*********	10.900	12.500	< 10.000	< 12.000	< 12.000	*********	< 10.000	¤ 10.000
BOD SOLUBLE	*********	*********	*********	10.900	11.600	14.800	*********	*********	*********
KJELDAHL NITROGEN	*********	9.500	10.500	10.000	10.000	11.000	< 7.500	7.000	¤ 2.500
AMMONIA NITROGEN	*********	4.900	5.400	5.400	6.000	6.000	4.100	4.900	¤ 5.400
NITRITES	*********	.200	.400	.200	.500	.400	.400	.200	¤ .200
NITRATES	*********	.600	.600	.400	.200	.800	.700	.300	¤ .200
TOTAL PHOSPHATE	*********	5.800	6.200	6.200	6.600	6.000	6.400	5.600	¤ 6.400
ORTHO PHOSPHATE	*********	4.800	4.600	5.500	4.900	4.800	4.800	4.700	¤ 4.900
OIL & GREASE	*********	150.000	137.000	*********	136.000	135.000	115.000	86.000	*********
PHENOLS	*********	< .001	< .001	.015	< .001	< .001	< .001	.015	¤ .010
MBAS	*********	2.300	2.000	1.560	1.600	1.100	.900	1.600	¤ .800
MERCURY	*********	< .005	*********	*********	*********	*********	*********	*********	*********
CHROMIUM	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
HEXAVALENT CHROMIUM	*********	< .001	< .001	< .001	< .001	< .001	< .001	*********	*********
LEAD	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
ZINC	*********	< .010	< .010	.020	*********	.010	.010	*********	*********
IRON	*********	3.900	3.500	3.540	3.220	3.130	2.620	*********	*********
COPPER	*********	< .020	< .020	< .020	< .020	< .020	< .020	< .020	¤ .020
SILVER	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
NICKEL	*********	< .040	< .040	< .040	< .040	< .040	< .040	*********	*********
ARSENIC	*********	< .010	*********	*********	*********	*********	*********	*********	*********
CYANIDE	*********	< .010	< .010	< .010	< .010	< .010	< .010	< .010	¤ .010
MANGANESE	*********	.100	.030	.040	.070	.030	.030	*********	*********
BARIUM	*********	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	¤ 1.000
ALUMINUM	*********	.340	*********	.280	.220	.280	.280	.400	¤ 2.700
CADMIUM	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-31 Cont'd *

SAMPLE POINT S5-CROSSWICKS CREEK AT BRINDLE LAKE RD

PARAMETER	[DAY 10]	[DAY 11]	[DAY 12]
PH	6.000	*********	*********
ALKALINITY	32.000	51.000	*********
COLOR	240.000	*********	*********
TURBIDITY	18.000	*********	*********
TOTAL SOLIDS	128.000	*********	*********
SUSPENDED SOLIDS	40.000	25.000	*********
DISSOLVED SOLIDS	88.000	*********	*********
TOTAL ORGANIC CARBON	22.000	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	44.000	64.000	37.000
BOD	< 10.000	< 12.000	< 12.000
BOD SOLUBLE	*********	*********	*********
KJELDAHL NITROGEN	5.500	*********	*********
AMMONIA NITROGEN	5.600	*********	*********
NITRITES	.100	*********	*********
NITRATES	.200	*********	*********
TOTAL PHOSPHATE	6.400	*********	*********
ORTHO PHOSPHATE	4.800	*********	*********
OIL & GREASE	*********	*********	*********
PHENOLS	.015	.010	< .001
MBAS	1.200	1.600	1.600
MERCURY	*********	*********	*********
CHROMIUM	< .050	< .050	< .050
HEXAVALENT CHROMIUM	*********	*********	*********
LEAD	< .050	< .050	< .050
ZINC	*********	*********	*********
IRON	*********	*********	*********
COPPER	< .020	< .020	< .020
SILVER	*********	*********	*********
NICKEL	*********	*********	*********
ARSENIC	*********	*********	*********
CYANIDE	< .010	< .010	< .010
MANGANESE	*********	*********	*********
BARIUM	< 1.000	< 1.000	< 1.000
ALUMINUM	.540	.400	.440
CADMIUM	*********	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-31 Cont'd *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	6.000	7.300	6.775	1.300	11.439	7.749	.288
ALKALINITY	32.000	69.000	57.000	37.000	43.860	21.053	7.778
COLOR	80.000	240.000	145.000	160.000	44.828	65.517	47.500
TURBIDITY	9.000	18.000	11.750	9.000	23.404	53.191	2.188
TOTAL SOLIDS	128.000	224.000	176.571	96.000	27.508	26.861	30.367
SUSPENDED SOLIDS	4.000	64.000	26.556	60.000	84.937	141.004	13.407
DISSOLVED SOLIDS	88.000	220.000	148.857	132.000	40.883	47.793	26.449
TOTAL ORGANIC CARBON	14.000	22.000	17.625	8.000	20.567	24.823	1.875
TOTAL OXYGEN DEMAND	60.000	94.000	75.429	34.000	20.455	24.621	8.939
TOTAL COD	11.000	64.000	42.400	53.000	74.057	50.943	12.640
BOD	< 10.000	12.500	< 11.267	2.500	11.243	10.947	.926
BOD SOLUBLE	10.900	14.800	12.433	3.900	12.332	19.035	1.578
KJELDAHL NITROGEN	5.500	11.000	< 8.875	5.500	38.028	23.944	1.656
AMMONIA NITROGEN	4.100	6.000	5.287	1.900	22.459	13.475	.491
NITRITES	.100	.500	.300	.400	66.667	66.667	.125
NITRATES	.200	.800	.475	.600	57.895	68.421	.200
TOTAL PHOSPHATE	5.600	6.600	6.150	1.000	8.943	7.317	.263
ORTHO PHOSPHATE	4.600	5.500	4.862	.900	5.398	13.111	.169
OIL & GREASE	86.000	150.000	126.500	64.000	32.016	18.577	17.333
PHENOLS	< .001	.015	< .006	.014	83.607	145.902	.006
MBAS	.900	2.300	1.546	1.400	41.785	48.771	.288
MERCURY	< .005	< .005	< .005	.000	.000	.000	.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	< .001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	< .010	.020	< .012	.010	16.667	66.667	.003
IRON	2.620	3.900	3.318	1.280	21.045	17.529	.328
COPPER	< .020	< .020	< .020	.000	-.000	.000	.000
SILVER	< .010	< .010	< .010	.000	-.000	.000	.000
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
ARSENIC	< .010	< .010	< .010	.000	.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.030	.100	.050	.070	40.000	100.000	.023
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	.220	.540	.353	.320	37.736	52.830	.081
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-32 *

SAMPLE POINT S6-CROSSWICKS CREEK AT BUNTING BRIDGE RD

PARAMETER	DAY 1	[DAY 2]	[DAY 3]	DAY 4	DAY 5	[DAY 6]	DAY 7	[DAY 8]	[DAY 9]
PH	*********	7.300	7.000	6.500	7.000	6.800	7.000	6.500	¤ 6.500
ALKALINITY	*********	69.000	132.000	53.000	66.000	62.000	59.000	39.000	¤ 16.000
COLOR	*********	160.000	160.000	120.000	200.000	40.000	160.000	160.000	¤ 120.000
TURBIDITY	*********	15.000	13.000	11.000	14.000	14.000	13.000	16.000	¤ 31.000
TOTAL SOLIDS	*********	140.000	232.000	204.000	228.000	106.000	224.000	56.000	¤ 260.000
SUSPENDED SOLIDS	*********	70.000	60.000	28.000	84.000	12.000	64.000	24.000	¤ 72.000
DISSOLVED SOLIDS	*********	70.000	172.000	176.000	144.000	94.000	160.000	32.000	¤ 188.000
TOTAL ORGANIC CARBON	*********	22.000	19.000	17.000	24.000	19.000	19.000	19.000	¤ 16.000
TOTAL OXYGEN DEMAND	*********	81.000	86.000	71.000	112.000	86.000	86.000	64.000	*********
TOTAL COD	*********	61.000	49.000	28.000	54.000	71.000	60.000	22.000	¤ 44.000
BOD	*********	10.600	12.700	< 10.000	< 12.000	< 12.000	*********	< 10.000	¤ 11.000
BOD SOLUBLE	*********	*********	*********	10.700	10.900	14.600	*********	*********	*********
KJELDAHL NITROGEN	*********	9.000	11.000	8.500	10.500	10.500	8.000	5.000	¤ 2.000
AMMONIA NITROGEN	*********	4.900	5.700	4.900	6.000	5.700	4.400	3.500	¤ 6.000
NITRITES	*********	.100	.300	.100	.200	.300	.200	.200	¤ .200
NITRATES	*********	.400	.400	.700	.200	.900	.500	.300	¤ .200
TOTAL PHOSPHATE	*********	5.900	6.700	6.000	5.600	7.500	7.100	4.700	¤ 7.700
ORTHO PHOSPHATE	*********	5.600	5.200	5.100	5.300	5.500	4.900	4.100	¤ 5.500
OIL & GREASE	*********	166.000	165.000	195.000	186.000	154.000	209.000	176.000	*********
PHENOLS	*********	.005	< .001	.013	.003	.005	< .001	< .001	¤ .005
MBAS	*********	1.800	1.900	.960	1.300	.700	.800	1.300	¤ .700
MERCURY	*********	< .005	*********	*********	*********	*********	*********	*********	*********
CHROMIUM	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
HEXAVALENT CHROMIUM	*********	< .001	< .001	< .001	< .001	< .001	< .001	*********	*********
LEAD	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
ZINC	*********	< .010	< .010	.020	*********	.020	< .010	*********	*********
IRON	*********	5.220	4.600	4.000	4.950	6.080	4.100	*********	*********
COPPER	*********	< .020	< .020	< .020	< .020	< .020	< .020	*********	*********
SILVER	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
NICKEL	*********	< .040	< .040	< .040	< .040	< .040	< .040	*********	*********
ARSENIC	*********	< .010	*********	*********	*********	*********	*********	*********	*********
CYANIDE	*********	< .010	< .010	< .010	< .010	< .010	< .010	< .010	¤ .010
MANGANESE	*********	.100	.070	.050	.050	.070	.030	*********	*********
BARIUM	*********	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	¤ 1.000
ALUMINUM	*********	.440	*********	.160	.280	.440	.520	.720	¤ 4.240
CADMIUM	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. ¤ INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS.
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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-32 Cont'd *

SAMPLE POINT S6-CROSSWICKS CREEK AT BUNTING BRIDGE RD

PARAMETER	[DAY 10]	[DAY 11]	[DAY 12]
PH	6.000	*********	*********
ALKALINITY	30.000	47.000	*********
COLOR	240.000	*********	*********
TURBIDITY	20.000	*********	*********
TOTAL SOLIDS	156.000	*********	*********
SUSPENDED SOLIDS	56.000	40.000	*********
DISSOLVED SOLIDS	100.000	*********	*********
TOTAL ORGANIC CARBON	21.000	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	35.000	59.000	53.000
BOD	< 10.000	< 12.000	< 12.000
BOD SOLUBLE	*********	*********	*********
KJELDAHL NITROGEN	5.000	*********	*********
AMMONIA NITROGEN	5.700	*********	*********
NITRITES	< .100	*********	*********
NITRATES	.100	*********	*********
TOTAL PHOSPHATE	6.000	*********	*********
ORTHO PHOSPHATE	5.300	*********	*********
OIL & GREASE	*********	*********	*********
PHENOLS	.010	.005	< .001
MBAS	1.000	1.400	1.540
MERCURY	*********	*********	*********
CHROMIUM	< .050	< .050	< .050
HEXAVALENT CHROMIUM	*********	*********	*********
LEAD	< .050	< .050	< .050
ZINC	*********	*********	*********
IRON	*********	*********	*********
COPPER	*********	*********	*********
SILVER	*********	*********	*********
NICKEL	*********	*********	*********
ARSENIC	*********	*********	*********
CYANIDE	< .010	< .010	< .010
MANGANESE	*********	*********	*********
BARIUM	< 1.000	< 1.000	< 1.000
ALUMINUM	.680	.680	1.760
CADMIUM	*********	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-32 Cont'd *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	6.000	7.300	6.762	1.300	11.275	7.948	.322
ALKALINITY	30.000	132.000	61.889	102.000	51.526	113.285	18.099
COLOR	40.000	240.000	155.000	200.000	74.194	54.839	37.500
TURBIDITY	11.000	20.000	14.500	9.000	24.138	37.931	1.875
TOTAL SOLIDS	56.000	232.000	168.250	176.000	66.716	37.890	53.750
SUSPENDED SOLIDS	12.000	84.000	48.667	72.000	75.342	72.603	20.148
DISSOLVED SOLIDS	32.000	176.000	118.500	144.000	72.996	48.523	44.500
TOTAL ORGANIC CARBON	17.000	24.000	20.000	7.000	15.000	20.000	1.750
TOTAL OXYGEN DEMAND	64.000	112.000	83.714	48.000	23.549	33.788	10.041
TOTAL COD	22.000	71.000	49.200	49.000	55.285	44.309	12.560
BOD	< 10.000	12.700	< 11.256	2.700	11.155	12.833	.983
BOD SOLUBLE	10.700	14.600	12.067	3.900	11.326	20.994	1.689
KJELDAHL NITROGEN	5.000	11.000	8.438	6.000	40.741	30.370	1.828
AMMONIA NITROGEN	3.500	6.000	5.100	2.500	31.373	17.647	.675
NITRITES	< .100	.300	< .187	.200	46.667	60.000	.066
NITRATES	.100	.900	.437	.800	77.143	105.714	.197
TOTAL PHOSPHATE	4.700	7.500	6.187	2.800	24.040	21.212	.684
ORTHO PHOSPHATE	4.100	5.600	5.125	1.500	20.000	9.268	.319
OIL & GREASE	154.000	209.000	178.714	55.000	13.829	16.946	15.388
PHENOLS	< .001	.013	< .004	.012	77.778	188.889	.003
MBAS	.700	1.900	1.270	1.200	44.882	49.606	.324
MERCURY	< .005	< .005	< .005	.000	.000	.000	.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	< .001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	< .010	.020	< .014	.010	28.571	42.857	.005
IRON	4.000	6.080	4.825	2.080	17.098	26.010	.592
COPPER	< .020	< .020	< .020	.000	-.000	.000	.000
SILVER	< .010	< .010	< .010	.000	-.000	.000	.000
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
ARSENIC	< .010	< .010	< .010	.000	.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.030	.100	.062	.070	51.351	62.162	.018
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	.160	1.760	.631	1.600	74.648	178.873	.292
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-33 *

SAMPLE POINT S7-NORTH RUN

PARAMETER	DAY 1	[DAY 2]	[DAY 3]	[DAY 4]	[DAY 5]	[DAY 6]	[DAY 7]	DAY 8	[DAY 9]
PH	*********	7.300	7.100	6.200	6.900	6.900	7.000	6.400	¤ 6.500
ALKALINITY	*********	34.000	38.000	44.000	22.000	37.000	42.000	38.000	¤ 7.000
COLOR	*********	60.000	30.000	30.000	30.000	20.000	30.000	40.000	¤ 100.000
TURBIDITY	*********	6.000	7.000	7.000	6.000	8.000	6.000	10.000	¤ 44.000
TOTAL SOLIDS	*********	180.000	164.000	164.000	252.000	106.000	200.000	140.000	¤ 344.000
SUSPENDED SOLIDS	*********	6.000	6.000	1.000	42.000	2.000	18.000	10.000	¤ 144.000
DISSOLVED SOLIDS	*********	174.000	158.000	160.000	210.000	104.000	182.000	130.000	¤ 200.000
TOTAL ORGANIC CARBON	*********	8.000	13.000	8.000	5.000	5.000	6.000	11.000	¤ 14.000
TOTAL OXYGEN DEMAND	*********	+ .000	+ .000	+ .000	+ .000	+ .000	+ .000	+ .000	*********
TOTAL COD	*********	22.000	11.000	5.000	16.000	82.000	22.000	+ .000	¤ 60.000
BOD	*********	< 2.000	< 2.000	3.100	2.300	8.800	*********	< 2.000	¤ 4.900
BOD SOLUBLE	*********	*********	*********	4.500	5.500	6.300	*********	*********	*********
KJELDAHL NITROGEN	*********	1.000	1.000	< .500	< .500	< .500	< .500	< .500	¤ 1.000
AMMONIA NITROGEN	*********	.100	< .100	< .100	< .100	< .100	< .100	< .100	¤ .100
NITRITES	*********	< .100	< .100	< .100	< .100	< .100	< .100	< .100	¤ .100
NITRATES	*********	.700	.900	.700	.700	1.400	.700	.500	¤ .400
TOTAL PHOSPHATE	*********	2.100	2.100	2.800	2.300	2.500	7.300	2.000	¤ 4.500
ORTHO PHOSPHATE	*********	.600	1.200	1.400	1.000	1.200	1.000	1.700	¤ 1.300
OIL & GREASE	*********	177.000	255.000	246.000	265.000	171.000	218.000	178.000	*********
PHENOLS	*********	.170	.150	.013	.195	.030	.250	.005	¤ .005
MBAS	*********	.200	.200	.100	.150	.250	.250	.250	¤ .150
MERCURY	*********	< .005	*********	*********	*********	*********	*********	*********	*********
CHROMIUM	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
HEXAVALENT CHROMIUM	*********	< .001	< .001	< .001	< .001	< .001	< .001	*********	*********
LEAD	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
ZINC	*********	< .010	< .010	< .010	.050	< .010	< .010	*********	*********
IRON	*********	.570	.500	.620	.710	.580	.700	*********	*********
COPPER	*********	< .020	< .020	< .020	< .020	< .020	< .020	*********	*********
SILVER	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
NICKEL	*********	< .040	.040	< .040	< .040	< .040	< .040	*********	*********
ARSENIC	*********	< .010	*********	*********	*********	*********	*********	*********	*********
CYANIDE	*********	< .010	< .010	< .010	< .010	< .010	< .010	< .010	¤ .010
MANGANESE	*********	.050	.040	.060	.040	.040	.040	*********	*********
BARIUM	*********	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	¤ 1.000
ALUMINUM	*********	.200	*********	.260	.160	.280	.280	.280	¤ 3.000
CADMIUM	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-33 Cont'd *

SAMPLE POINT S7-NORTH RUN

PARAMETER	[DAY 10]	[DAY 11]	[DAY 12]
PH	6.100	*********	*********
ALKALINITY	22.000	34.000	*********
COLOR	50.000	*********	*********
TURBIDITY	8.000	*********	*********
TOTAL SOLIDS	44.000	*********	*********
SUSPENDED SOLIDS	40.000	28.000	*********
DISSOLVED SOLIDS	4.000	*********	*********
TOTAL ORGANIC CARBON	8.000	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	5.000	27.000	+ .000
BOD	< 3.000	< 3.000	< 3.000
BOD SOLUBLE	*********	*********	*********
KJELDAHL NITROGEN	1.000	*********	*********
AMMONIA NITROGEN	< .100	*********	*********
NITRITES	< .100	*********	*********
NITRATES	.300	*********	*********
TOTAL PHOSPHATE	2.600	*********	*********
ORTHO PHOSPHATE	1.200	*********	*********
OIL & GREASE	*********	*********	*********
PHENOLS	.010	< .001	.005
MBAS	.150	.150	.100
MERCURY	*********	*********	*********
CHROMIUM	< .050	< .050	< .050
HEXAVALENT CHROMIUM	*********	*********	*********
LEAD	< .050	< .050	< .050
ZINC	*********	*********	*********
IRON	*********	*********	*********
COPPER	*********	*********	*********
SILVER	*********	*********	*********
NICKEL	*********	*********	*********
ARSENIC	*********	*********	*********
CYANIDE	< .010	< .010	< .010
MANGANESE	*********	*********	*********
BARIUM	< 1.000	< 1.000	< 1.000
ALUMINUM	.360	.520	.260
CADMIUM	*********	*********	*********

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-33 Cont'd *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	6.100	7.300	6.737	1.200	9.462	8.349	.378
ALKALINITY	22.000	44.000	34.556	22.000	36.334	27.331	5.827
COLOR	20.000	60.000	36.250	40.000	44.828	65.517	10.312
TURBIDITY	6.000	10.000	7.250	4.000	17.241	37.931	1.062
TOTAL SOLIDS	44.000	252.000	156.250	208.000	71.840	61.280	44.687
SUSPENDED SOLIDS	1.000	42.000	17.000	41.000	94.118	147.059	13.333
DISSOLVED SOLIDS	4.000	210.000	140.250	206.000	97.148	49.733	45.687
TOTAL ORGANIC CARBON	5.000	13.000	8.000	8.000	37.500	62.500	2.000
TOTAL OXYGEN DEMAND	.000	.000	+ .000	.000	.000	.000	.000
TOTAL COD	.000	82.000	+ 19.000	82.000	100.000	331.579	15.400
BOD	< 2.000	8.800	< 3.244	6.800	38.356	171.233	1.235
BOD SOLUBLE	4.500	6.300	5.433	1.800	17.178	15.951	.622
KJELDAHL NITROGEN	< .500	1.000	< .688	.500	27.273	45.455	.234
AMMONIA NITROGEN	< .100	.100	< .100	.000	-.000	.000	.000
NITRITES	< .100	< .100	< .100	.000	-.000	.000	.000
NITRATES	.300	1.400	.737	1.100	59.322	89.831	.206
TOTAL PHOSPHATE	2.000	7.300	2.962	5.300	32.489	146.414	1.084
ORTHO PHOSPHATE	.600	1.700	1.162	1.100	48.387	46.237	.222
OIL & GREASE	171.000	265.000	215.714	94.000	20.728	22.848	34.612
PHENOLS	< .001	.250	< .083	.249	98.794	201.568	.087
MBAS	.100	.250	.180	.150	44.444	38.889	.050
MERCURY	< .005	< .005	< .005	.000	.000	.000	.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	< .001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	< .010	.050	< .017	.040	40.000	200.000	.011
IRON	.500	.710	.613	.210	18.478	15.761	.063
COPPER	< .020	< .020	< .020	.000	-.000	.000	.000
SILVER	< .010	< .010	< .010	.000	-.000	.000	.000
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
ARSENIC	< .010	< .010	< .010	.000	.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	.040	.060	.045	.020	11.111	33.333	.007
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	.160	.520	.269	.360	44.615	80.000	.067
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

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USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
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* Table C-34 *

SAMPLE POINT S8-CROSSWICKS CREEK BELOW NEW EGYPT

PARAMETER	DAY 1	[DAY 2]	[DAY 3]	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	[DAY 9]
PH	*********	7.300	7.000	6.500	6.800	6.900	7.100	6.500	¤ 6.700
ALKALINITY	*********	55.000	61.000	56.000	56.000	55.000	56.000	48.000	¤ 22.000
COLOR	*********	100.000	¤ 400.000	80.000	160.000	80.000	160.000	120.000	¤ 80.000
TURBIDITY	*********	15.000	36.000	19.000	16.000	15.000	16.000	20.000	¤ 23.000
TOTAL SOLIDS	*********	180.000	304.000	236.000	267.000	232.000	260.000	212.000	¤ 252.000
SUSPENDED SOLIDS	*********	6.000	4.000	20.000	76.000	48.000	68.000	68.000	¤ 72.000
DISSOLVED SOLIDS	*********	174.000	300.000	216.000	191.000	184.000	192.000	144.000	¤ 180.000
TOTAL ORGANIC CARBON	*********	12.000	31.000	17.000	17.000	13.000	15.000	12.000	¤ 12.000
TOTAL OXYGEN DEMAND	*********	32.000	82.000	54.000	66.000	56.000	56.000	49.000	*********
TOTAL COD	*********	11.000	82.000	5.000	43.000	55.000	82.000	16.000	¤ 38.000
BOD	*********	5.200	15.900	8.000	< 10.000	< 10.000	*********	< 10.000	¤ 10.000
BOD SOLUBLE	*********	*********	*********	10.700	8.500	15.000	*********	*********	*********
KJELDAHL NITROGEN	*********	5.500	6.500	5.500	5.500	6.000	5.000	3.000	¤ 3.500
AMMONIA NITROGEN	*********	3.000	3.100	3.000	3.600	3.700	3.500	2.800	¤ 3.000
NITRITES	*********	.200	.200	.100	.200	.100	.300	.100	¤ .100
NITRATES	*********	.700	1.000	.800	.600	.900	.600	.500	¤ .100
TOTAL PHOSPHATE	*********	4.200	4.400	4.900	4.800	4.600	5.000	3.300	¤ 5.300
ORTHO PHOSPHATE	*********	2.500	2.600	3.000	2.600	2.600	3.000	2.700	¤ 2.800
OIL & GREASE	*********	223.000	*********	228.000	242.000	162.000	116.000	109.000	*********
PHENOLS	*********	< .001	< .001	.015	< .001	< .001	.010	< .001	¤ .005
MBAS	*********	.100	.450	.500	.500	.500	.500	.400	¤ .700
MERCURY	*********	< .005	*********	*********	*********	*********	*********	*********	*********
CHROMIUM	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
HEXAVALENT CHROMIUM	*********	< .001	< .001	< .001	< .001	< .001	< .001	*********	*********
LEAD	*********	< .050	< .050	< .050	< .050	< .050	< .050	< .050	¤ .050
ZINC	*********	< .010	< .010	< .010	*********	< .010	< .010	*********	*********
IRON	*********	1.910	2.200	2.990	3.060	3.330	2.560	*********	*********
COPPER	*********	< .020	< .020	< .020	< .020	< .020	< .020	*********	*********
SILVER	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********
NICKEL	*********	< .040	< .040	< .040	< .040	< .040	< .040	*********	*********
ARSENIC	*********	< .010	*********	*********	*********	*********	*********	*********	*********
CYANIDE	*********	< .010	< .010	< .010	< .010	< .010	< .010	< .010	¤ .010
MANGANESE	*********	.040	< .020	< .020	< .020	< .020	< .020	*********	*********
BARIUM	*********	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	< 1.000	¤ 1.000
ALUMINUM	*********	.960	*********	1.520	.820	1.280	1.380	.520	¤ 1.220
CADMIUM	*********	< .010	< .010	< .010	< .010	< .010	< .010	*********	*********

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. ¤ INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS.
ALL SAMPLE DAY ENTRIES INCLOSED IN [ ] ARE GRAB-SAMPLES TREATED AS COMPOSITES FOR EVALUATION.
MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-34 Cont'd *

SAMPLE POINT S8-CROSSWICKS CREEK BELOW NEW EGYPT

PARAMETER	[DAY 10]	[DAY 11]	[DAY 12]
PH	6.000	*********	*********
ALKALINITY	25.000	42.000	*********
COLOR	80.000	*********	*********
TURBIDITY	9.000	*********	*********
TOTAL SOLIDS	¤ 72.000	*********	*********
SUSPENDED SOLIDS	68.000	16.000	*********
DISSOLVED SOLIDS	¤ 4.000	*********	*********
TOTAL ORGANIC CARBON	12.000	*********	*********
TOTAL OXYGEN DEMAND	*********	*********	*********
TOTAL COD	27.000	64.000	21.000
BOD	< 10.000	< 12.000	< 12.000
BOD SOLUBLE	*********	*********	*********
KJELDAHL NITROGEN	2.500	*********	*********
AMMONIA NITROGEN	1.400	*********	*********
NITRITES	< .100	*********	*********
NITRATES	.300	*********	*********
TOTAL PHOSPHATE	4.200	*********	*********
ORTHO PHOSPHATE	2.500	*********	*********
OIL & GREASE	115.000	*********	*********
PHENOLS	.005	.005	.005
MBAS	.600	.900	.770
MERCURY	*********	*********	*********
CHROMIUM	< .050	< .050	< .050
HEXAVALENT CHROMIUM	*********	*********	*********
LEAD	< .050	< .050	< .050
ZINC	*********	*********	*********
IRON	*********	*********	*********
COPPER	*********	*********	*********
SILVER	*********	*********	*********
NICKEL	*********	*********	*********
ARSENIC	*********	*********	*********
CYANIDE	< .010	< .010	< .010
MANGANESE	*********	*********	*********
BARIUM	< 1.000	< 1.000	< 1.000
ALUMINUM	.820	.600	.740
CADMIUM	*********	*********	*********

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. ¤ INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS. ALL SAMPLE DAY ENTRIES INCLOSED IN [ ] ARE GRAB-SAMPLES TREATED AS COMPOSITES FOR EVALUATION. MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

USAF EHL/K WATER POLLUTION SURVEY-SPECIAL PROJECT 72-1, MCGUIRE AFB
FORT DIX, NEW JERSEY, 10-26 SEPTEMBER 1972

* Table C-34 Cont'd *

STATISTICAL EVALUATION

	MINIMUM	MAXIMUM	MEAN	RANGE	MINIMUM DEV	MAXIMUM DEV	MEAN DEV
PH	6.000	7.300	6.762	1.300	11.275	7.948	.322
ALKALINITY	25.000	61.000	50.444	36.000	50.441	20.925	8.074
COLOR	80.000	160.000	111.429	30.000	28.205	43.590	30.204
TURBIDITY	9.000	36.000	18.250	27.000	50.685	97.260	5.062
TOTAL SOLIDS	180.000	304.000	241.571	124.000	25.488	25.843	30.367
SUSPENDED SOLIDS	4.000	76.000	41.556	72.000	90.374	82.888	26.716
DISSOLVED SOLIDS	144.000	300.000	200.143	156.000	28.051	49.893	33.061
TOTAL ORGANIC CARBON	12.000	31.000	16.125	19.000	25.581	92.248	4.156
TOTAL OXYGEN DEMAND	32.000	82.000	56.429	50.000	43.291	45.316	10.041
TOTAL COD	5.000	82.000	40.600	77.000	87.685	101.970	24.600
BOD	5.200	15.900	< 10.344	10.700	49.731	53.706	1.970
BOD SOLUBLE	8.500	15.000	11.400	6.500	25.439	31.579	2.400
KJELDAHL NITROGEN	2.500	6.500	4.937	4.000	49.367	31.646	1.094
AMMONIA NITROGEN	1.400	3.700	3.012	2.300	53.527	22.822	.462
NITRITES	< .100	.300	< .162	.200	38.462	84.615	.063
NITRATES	.300	1.000	.675	.700	55.556	48.148	.175
TOTAL PHOSPHATE	3.300	5.000	4.425	1.700	25.424	12.994	.400
ORTHO PHOSPHATE	2.500	3.000	2.687	.500	6.977	11.628	.159
OIL & GREASE	109.000	242.000	170.714	133.000	36.151	41.757	51.673
PHENOLS	< .001	.015	< .004	.014	77.778	233.333	.003
MBAS	.100	.900	.522	.800	80.843	72.414	.141
MERCURY	< .005	< .005	< .005	.000	.000	.000	.000
CHROMIUM	< .050	< .050	< .050	.000	-.000	.000	.000
HEXAVALENT CHROMIUM	< .001	< .001	< .001	.000	-.000	.000	.000
LEAD	< .050	< .050	< .050	.000	-.000	.000	.000
ZINC	< .010	< .010	< .010	.000	-.000	.000	.000
IRON	1.910	3.330	2.675	1.420	28.598	24.486	.452
COPPER	< .020	< .020	< .020	.000	-.000	.000	.000
SILVER	< .010	< .010	< .010	.000	-.000	.000	.000
NICKEL	< .040	< .040	< .040	.000	-.000	.000	.000
ARSENIC	< .010	< .010	< .010	.000	.000	.000	.000
CYANIDE	< .010	< .010	< .010	.000	-.000	.000	.000
MANGANESE	< .020	.040	< .023	.020	14.286	71.429	.006
BARIUM	< 1.000	< 1.000	< 1.000	.000	.000	.000	.000
ALUMINUM	.520	1.520	.960	1.000	45.833	58.333	.289
CADMIUM	< .010	< .010	< .010	.000	-.000	.000	.000

NOTES: UNITS ARE AS FOLLOWS: TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L. < INDICATES LESS THAN. # INDICATES DATA NOT INCLUDED IN STATISTICAL COMPUTATIONS.
ALL SAMPLE DAY ENTRIES INCLOSED IN [ ] ARE GRAB-SAMPLES TREATED AS COMPOSITES FOR EVALUATION.
MAX DEV AND MIN DEV ARE EXPRESSED AS PERCENTAGE.

Table C-35. Grab Sample Data Tabulations Special Project 72-1, Ft Dix, MAFB Water Pollution Survey, Sep 1972

	Station Number[1]					
Parameter	S-2A	S-3A	S-3A	S-3A	S-6A	Tapwater
Date/Time	20/1130	14/1000	19/1400	20/1530	22/0800	19/1400
Total Oxygen Demand	-	56	-	-	-	-
Total Organic Carbon	13	34	31	22	-	-
Chemical Oxygen Demand	49	114	-	104	0	0
Biochemical Oxygen Demand	<6.	42.1	27.6	10.8	6.0	-
Total Solids	236	288	-	224	108	-
Total Dissolved Solids	204	262	-	182	102	120
Suspended Solids	32	16	-	42	6.0	-
MBAS (LAS)	0.10	38	-	1.8	0.15	<0.01
Phenol	0.010	0.105	-	0.010	0.001	0.015
Total A/K ($CaCO_3$)	72	62	-	90	14.0	44
pH	6.6	6.4	-	7.1	6.1	6.6
Turbidity	9.0	26	-	15	3.9	2.0
Color	-	80	-	-	30	20
Total Hord ($CaCO_3$)	144	-	-	-	136	144
Oil and Grease	74	-	-	79	-	-
Kjeldahl-N	18.0	<0.5	2.5	0.5	-	-
Ammonia-N	0.4	<0.05	-	-	-	-
Nitrate-N	0.9	-	-	0.9	-	-
Ortho Phosphate (P)	2.1	2.4	2.4	5.5	-	-
Total Phosphate (P)	4.4	5.2	2.4	6.0	-	-
Cadmium	-	<0.01	-	-	-	-
Copper	-	<0.02	-	-	-	-
Hex. Chromium	<0.001	<0.001	<0.001	<0.001	-	<0.001
Iron	-	3.15	-	-	-	-
Nickel	-	<0.04	-	-	-	-
Silver	-	<0.01	-	-	-	-
Zinc	-	0.06	-	-	-	-
Manganese	-	0.09	-	-	-	-

Notes: 1. Sampling station locations contained in Appendix B.

APPENDIX D

Sewage Treatment Plant Historical Data Summaries

Contents

Page

This appendix contains historical data summaries for both the Ft Dix and MAFB sewage treatment plants.

Sewage plant operating logs for several extended periods were analyzed for raw sewage flow, effluent characteristics, and unit process and overall removal efficiencies for Suspended Solids (SS) and 5-Day Biochemical Oxygen Demand (BOD_5). These analyses included development of frequency distribution curves for these selected parameters.

I. Ft Dix Historical Data. The following tables and figures are summaries of historical data for the Ft Dix Sewage treatment plant.

Table D-1
FT DIX SEWAGE PLANT OPERATING LOG DATA SUMMARY - FIVE-DAY BOD- AUG 70-JUL 71

Month	Avg Flow	Infl BOD mg/1	Infl BOD #/day	P.C. Effl mg/1	P.C. Effl #/day	% Rem P.C.	Trickling Filter #/day App	Trickling Filter #/day Rem	% Rem TF & FC	Effluent BOD mg/1	Effluent BOD #/day	Overall Rem Eff
Aug	3.07	274	7015	93	2381	66.0	2381	1792	75.3	23	589	91.6
Sep	3.04	296	7504	124	3144	58.0	3143	2484	79.0	26	659	91.2
Oct	3.10	266	6877	118	3051	55.6	3050	2507	82.2	21	543	92.1
Nov	2.81	274	6421	113	2648	58.8	2648	2039	77.0	26	609	90.5
Dec	2.61	227	4941	115	2503	49.3	2503	2024	80.8	22	479	90.3
Jan	3.03	219	5534	116	2931	47.0	2931	2375	81.0	22	556	89.9
Feb	3.69	205	6309	103	3169	49.7	3170	2493	78.6	22	677	89.3
Mar	3.45	250	7193	111	3193	55.6	3194	2417	75.7	27	777	89.2
Apr	3.31	225	6211	128	3533	43.1	3533	2898	82.0	23	635	89.8
May	2.98	244	6064	81	2013	66.8	2013	1392	69.1	25	621	89.8
Jun	3.22	252	6767	66	1772	73.8	1772	1128	63.6	24	644	90.5
Jul	3.14	246	6442	105	2749	57.3	2750	2147	78.1	23	602	90.6

Table D-2
FT DIX SEWAGE PLANT OPERATING LOG DATA SUMMARY -
SUSPENDED SOLIDS - AUG 70-JUL 71

Month	Avg Flow	Infl SS mg/1	Infl SS #/day	P.C. Effluent mg/1	P.C. Effluent #/day	P.C. Effluent % Rem	Trickling Filter #/day App.	Trickling Filter #/day Rem	Trickling Filter % Rem	Final Effluent SS mg/1	Final Effluent SS #/day	Overall Rem Eff
Aug	3.07	155	3968	60	1536	61.3	1536	1254	81.7	11	281	92.9
Sep	3.04	189	4791	64	1623	66.1	1623	1268	78.1	14	355	92.6
Oct	3.10	168	4343	60	1551	64.3	1551	1086	70.0	18	465	89.3
Nov	2.81	159	3726	106	2484	33.3	2484	2133	85.8	15	351	90.6
Dec	2.61	178	3874	108	2351	39.3	2350	1894	80.5	21	457	88.2
Jan	3.03	206	5206	111	2805	46.1	2805	2274	81.1	21	531	89.8
Feb	3.69	196	6032	104	3200	46.9	3200	2585	80.7	20	615	89.8
Mar	3.45	165	4748	86	2474	47.9	2474	1956	79.1	18	518	89.1
Apr	3.31	217	5990	127	3505	41.5	3506	3036	86.6	17	469	92.2
May	2.98	198	4921	114	2833	42.4	2833	2336	82.4	20	497	89.9
Jun	3.22	183	4914	73	1960	60.1	1960	1450	73.9	19	510	89.6
Jul	3.14	228	5971	136	3562	40.4	3562	3038	85.3	20	524	91.2

Table D-3
Ft Dix Sewage Plant Operating Log Data - Flow, BOD_5, SS, Effluent Dissolved Oxygen (DO), and Maximum Temp - Jan-Sept 1972

	Flow (MGD)		Average BOD_5				Average SS				Effl DO(mg/1)		
Month (1972)	Max	Avg	Infl (mg/1)	Effl (mg/1)	%Rem	#/Day	Infl (mg/1)	Effl (mg/1)	%Rem	#/Day	Min	Max	Max Temp (^oF)
Jan	4.04	3.18	188	26	86.2	689	155	26	83.2	689	3.2	5.0	65
Feb	4.12	2.97	263	31	88.2	768	148	31	79.1	768	4.3	6.0	64
Mar	3.38	2.77	216	23	89.4	531	155	24	84.5	554	4.5	5.9	64
Apr	3.18	2.66	218	29	86.7	643	170	39	77.1	900	3.0	4.8	67
May	3.11	2.63	205	19	90.6	417	155	20	87.1	439	3.8	4.9	70
June	3.29	2.58	258	24	90.7	516	198	17	91.4	366	3.3	4.3	70
July	3.47	2.76	221	26	88.2	598	180	19	89.4	437	2.6	3.5	72
Aug	3.97	2.91	237	28	88.2	679	166	15	90.9	364	2.9	3.9	78
Sept	3.11	2.74	228	20	91.2	457	182	16	91.2	366	3.0	4.2	-

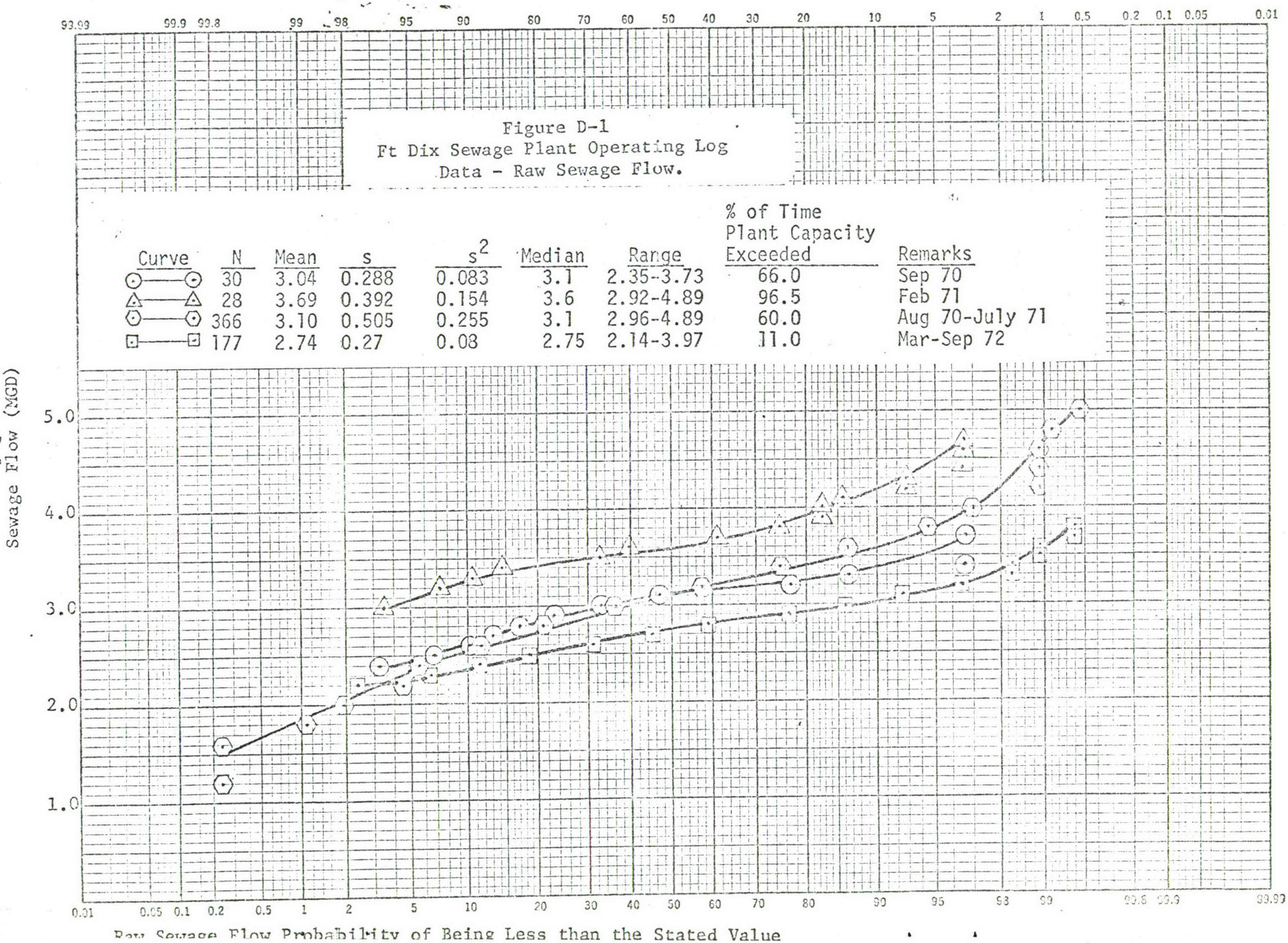


Figure D-1
Ft Dix Sewage Plant Operating Log
Data - Raw Sewage Flow.

Curve	N	Mean	s	s^2	Median	Range	% of Time Plant Capacity Exceeded	Remarks
⊙——⊙	30	3.04	0.288	0.083	3.1	2.35-3.73	66.0	Sep 70
△——△	28	3.69	0.392	0.154	3.6	2.92-4.89	96.5	Feb 71
⬡——⬡	366	3.10	0.505	0.255	3.1	2.96-4.89	60.0	Aug 70-July 71
⊡——⊡	177	2.74	0.27	0.08	2.75	2.14-3.97	11.0	Mar-Sep 72

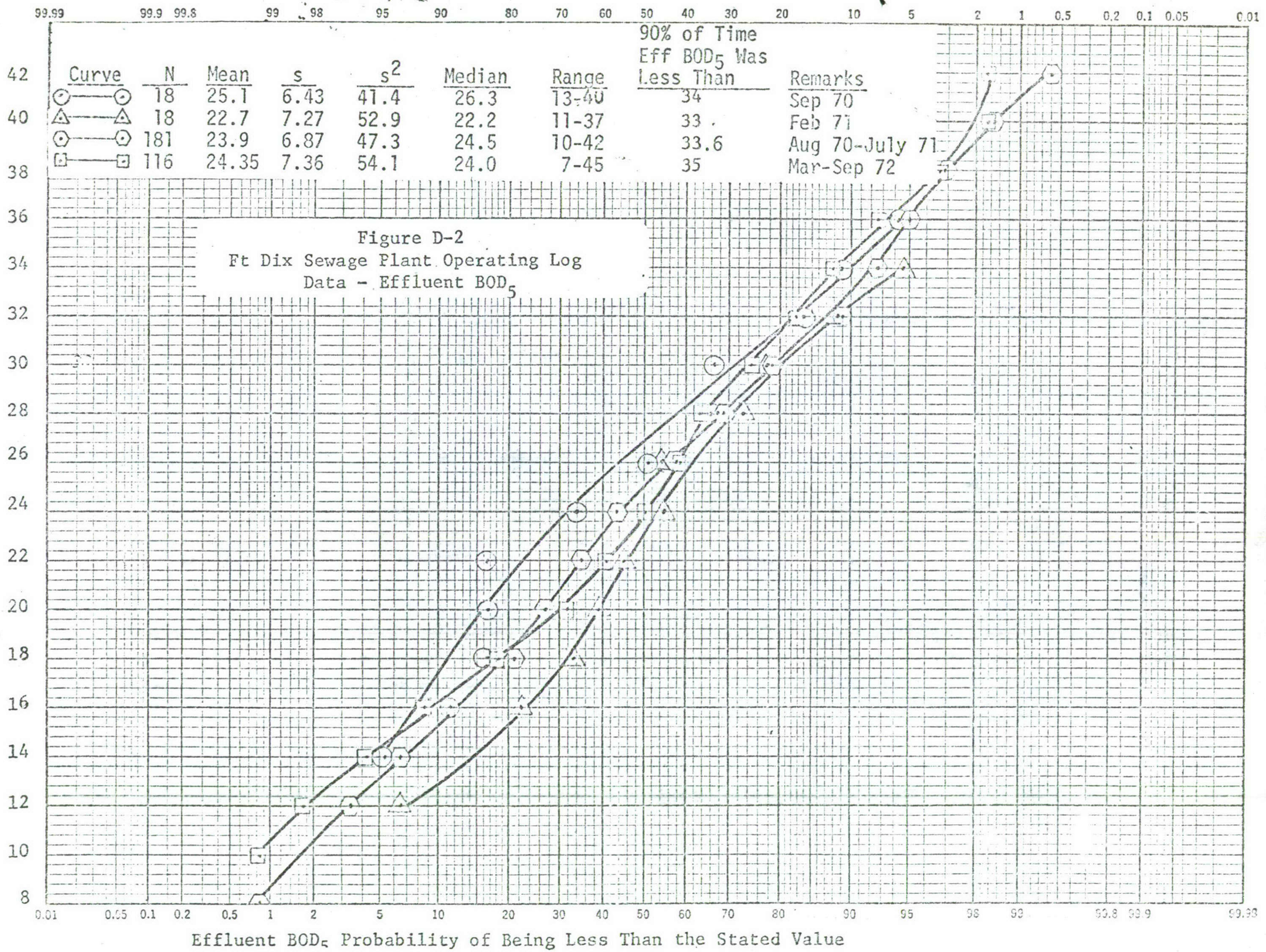


Figure D-2
Ft Dix Sewage Plant Operating Log
Data - Effluent BOD_5

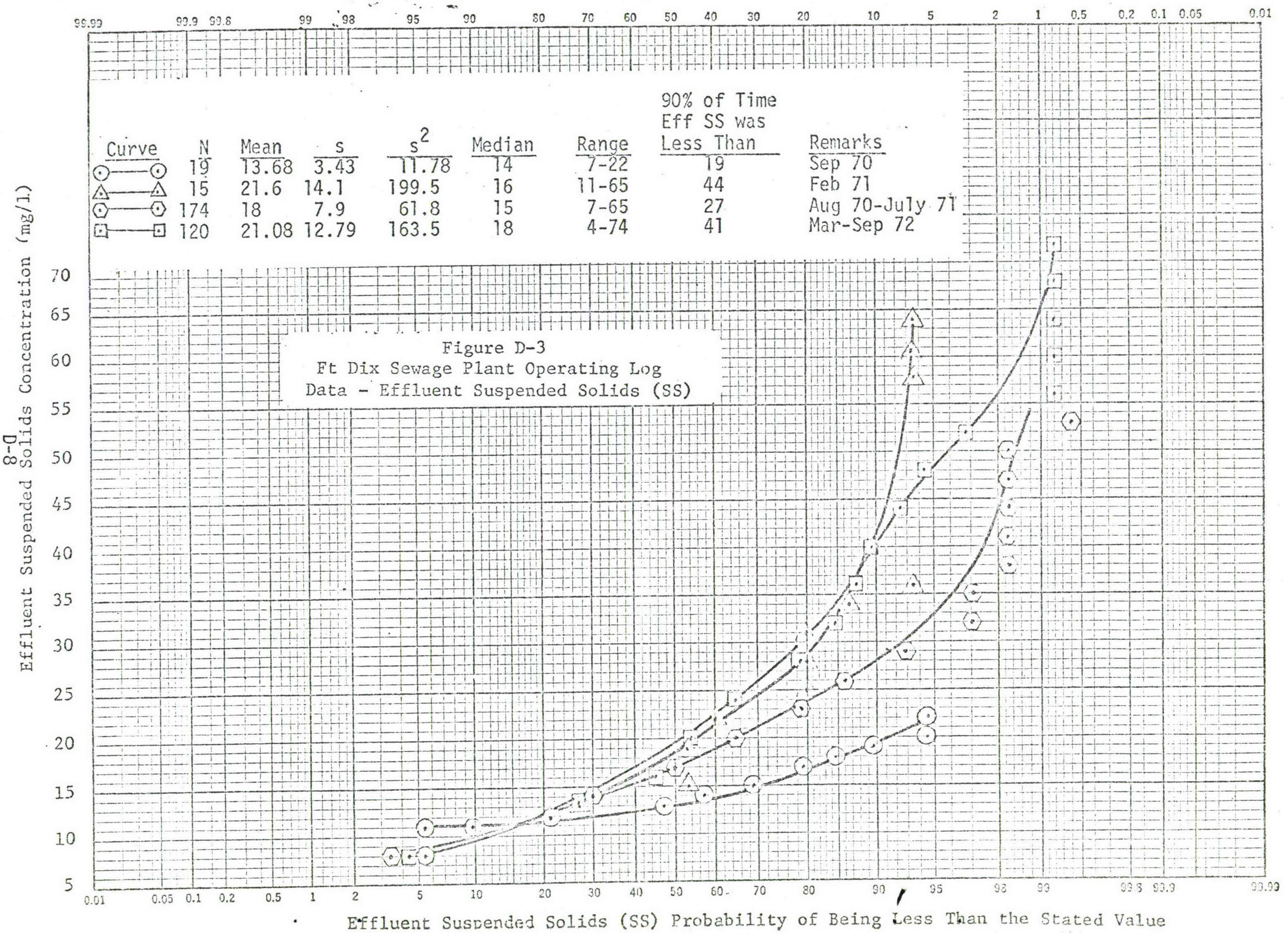
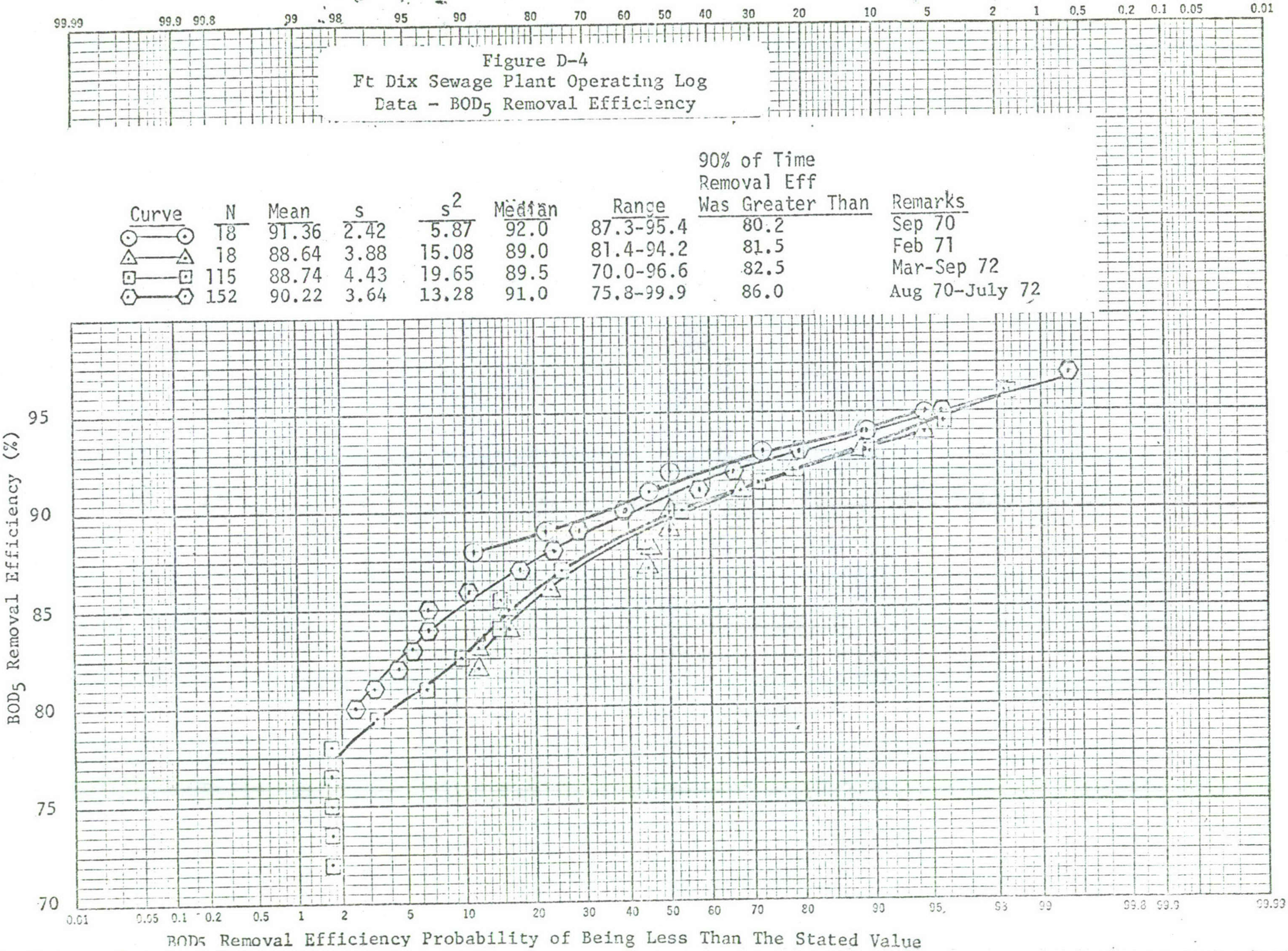


Figure D-3
Ft Dix Sewage Plant Operating Log
Data - Effluent Suspended Solids (SS)

Figure D-4
Ft Dix Sewage Plant Operating Log
Data - BOD_5 Removal Efficiency

Curve	N	Mean	s	s^2	Median	Range	90% of Time Removal Eff Was Greater Than	Remarks
⊙——⊙	18	91.36	2.42	5.87	92.0	87.3-95.4	80.2	Sep 70
△——△	18	88.64	3.88	15.08	89.0	81.4-94.2	81.5	Feb 71
⊡——⊡	115	88.74	4.43	19.65	89.5	70.0-96.6	82.5	Mar-Sep 72
⬡——⬡	152	90.22	3.64	13.28	91.0	75.8-99.9	86.0	Aug 70-July 72



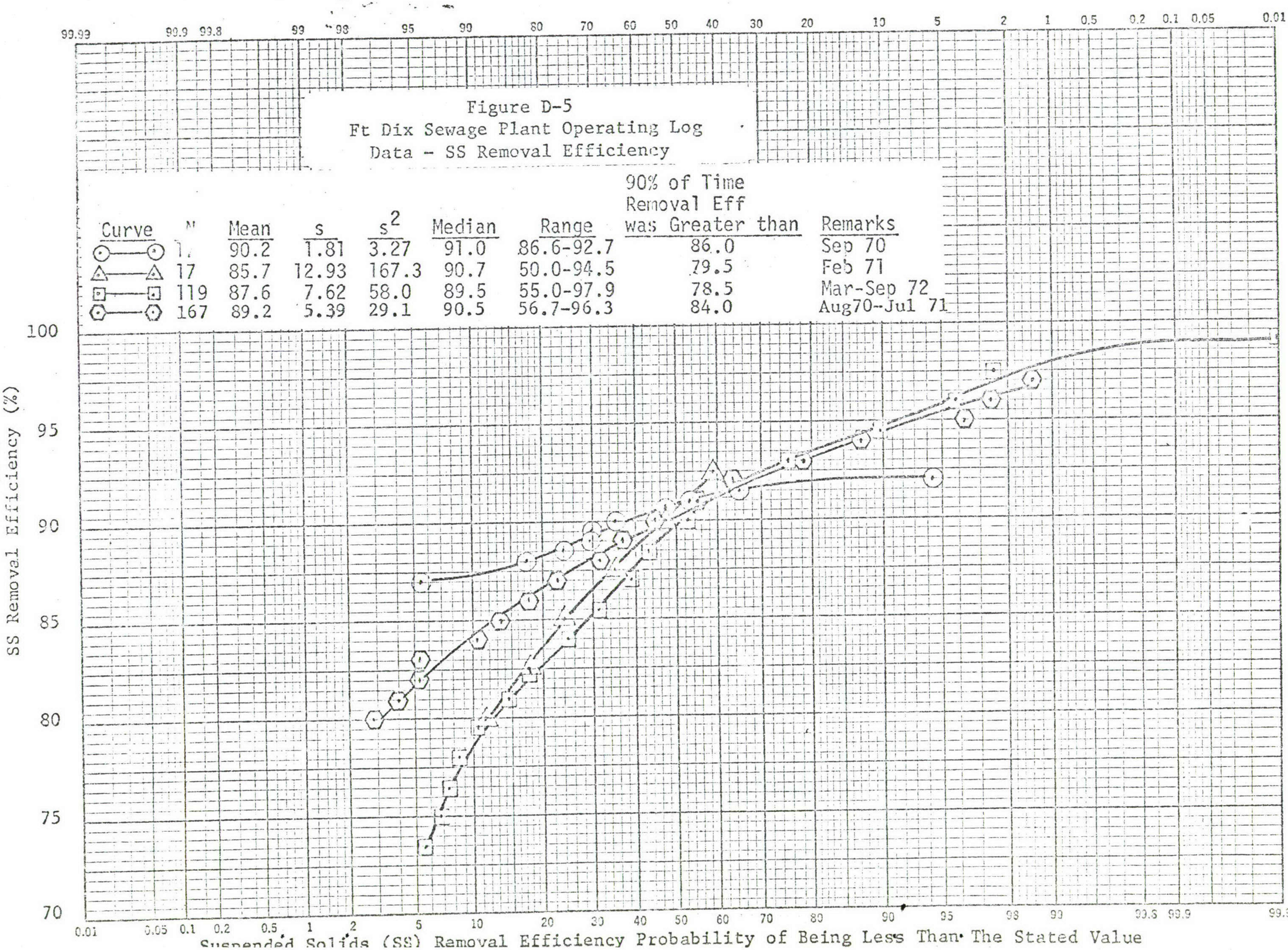


Figure D-5
Ft Dix Sewage Plant Operating Log
Data - SS Removal Efficiency

Curve	N	Mean	s	s^2	Median	Range	90% of Time Removal Eff was Greater than	Remarks
⊙——⊙	1[illegible]	90.2	1.81	3.27	91.0	86.6-92.7	86.0	Sep 70
△——△	17	85.7	12.93	167.3	90.7	50.0-94.5	79.5	Feb 71
⊡——⊡	119	87.6	7.62	58.0	89.5	55.0-97.9	78.5	Mar-Sep 72
⬡——⬡	167	89.2	5.39	29.1	90.5	56.7-96.3	84.0	Aug70-Jul 71

II. McGuire AFB Historical Data. The following tables and figures are summaries of historical data for the MAFB Sewage treatment plant.

Table D-4

MCGUIRE AFB SEWAGE PLANT OPERATING LOG DATA SUMMARY - FIVE-DAY BOD - AUG 70-JUL 71

Month	Avg	Infl BOD		P.C. Effl		% Rem	Trickling Filter		% Rem	Effluent BOD		Overall
	Flow	mg/1	#/day	mg/1	#/day	P.C.	#/day App	#/day Rem	TF & FC	mg/1	#/day	Rem Eff
Aug	1.214	178	1802	123	1245	30.8	1314	1053	80.1	19	192	89.3
Sep	1.153	182	1750	125	1202	31.3	1274	1010	79.2	20	192	89.0
Oct	1.110	223	2064	146	1351	34.5	1438	1129	78.5	24	222	89.2
Nov	1.478	204	2514	135	1664	33.8	1746	1381	79.0	23	284	88.7
Dec	1.355	203	2294	131	1480	35.4	1560	1232	78.9	22	249	89.2
Jan	1.515	211	2666	128	1617	39.3	1700	1327	78.0	23	291	89.1
Feb	1.660	185	2561	137	1896	25.9	1980	1578	79.7	23	318	87.6
Mar	1.406	177	2076	113	1325	36.1	1400	1079	77.0	21	246	88.1
Apr	1.515	189	2388	117	1478	38.0	1561	1188	76.0	23	291	87.8
May	1.498	188	2349	120	1499	36.1	1575	1237	78.5	21	262	88.8
Jun	1.081	204	1839	121	1091	40.7	1170	892	76.3	22	198	89.2
Jul	1.584	179	2364	114	1506	36.3	1581	1228	77.7	21	277	88.3

Table D-5
MCGUIRE AFB SEWAGE PLANT OPERATING LOG DATA SUMMARY -
SUSPENDED SOLIDS - AUG 70-JUL 71

Month	Avg Flow	Infl SS		P.C. Effluent			Trickling Filter			Final Effluent SS		Overall Rem Eff
		mg/1	#/day	mg/1	#/day	% Rem	#/day App.	#/day Rem	% Rem	mg/1	#/day	
Aug	1.214	164	1660	94	952	42.7	1027	739	71.9	21	213	87.2
Sep	1.153	178	1712	120	1154	32.6	1226	962	78.4	20	192	88.7
Oct	1.110	203	1879	132	1222	34.9	1308	1000	76.4	24	222	88.2
Nov	1.478	169	2083	97	1196	42.6	1278	912	71.3	23	284	86.4
Dec	1.355	195	2204	128	1446	34.4	1529	1186	77.6	23	260	88.2
Jan	1.515	198	2502	123	1554	37.9	1637	1264	77.2	23	291	88.4
Feb	1.660	185	2561	117	1620	36.8	1710	1274	74.5	25	346	86.5
Mar	1.406	169	1982	93	1090	44.9	1170	832	71.2	22	258	86.9
Apr	1.515	182	2300	103	1301	43.4	1388	998	71.9	24	303	86.8
May	1.498	166	2074	97	1212	41.6	1295	924	71.4	23	287	86.1
Jun	1.081	187	1686	111	1001	40.6	1087	784	78.4	24	216	87.2
Jul	1.584	152	2008	87	1149	42.8	1225	872	71.2	21	277	86.2

Table D-6

McGuire AFB Sewage Plant Operating Log Data - Flow, BOD_5, SS, Effluent Dissolved Oxygen (DO), and Maximum Temp --- March --- Sept 1972

Month (1972)	Flow (MGD)		Average BOD_5				Average SS				Effl DO(mg/1)		Max Temp (of)
	Max	Avg	Infl (mg/1)	Effl (mg/1)	%Rem	#/Day	Infl (mg/1)	Effl (mg/1)	%Rem	#/Day	Min	Avg	
Mar	1.67	1.27	183	21	88.5	222	159	23	85.5	244	3.0	4.6	64
Apr	1.77	1.18	112	15	86.6	148	107	17	84.1	167	1.4	4.0	65
May	1.61	1.29	160	22	86.2	237	140	23	83.6	247	3.4	4.5	72
June	1.71	1.29	138	19	86.2	204	157	20	87.3	215	3.1	4.4	75
July	2.36	1.40	139	26	81.3	304	159	24	84.9	280	2.6	4.6	84
Aug	2.53	1.62	155	22	85.8	297	151	22	85.4	297	4.0	4.7	82
Sept	2.20	1.33	117	18	84.6	200	181	25	86.2	277	4.4	4.8	80

Table D-7

MCGUIRE AFB AVERAGE SLUDGE CONDITIONS - AUG 70-JUL 71

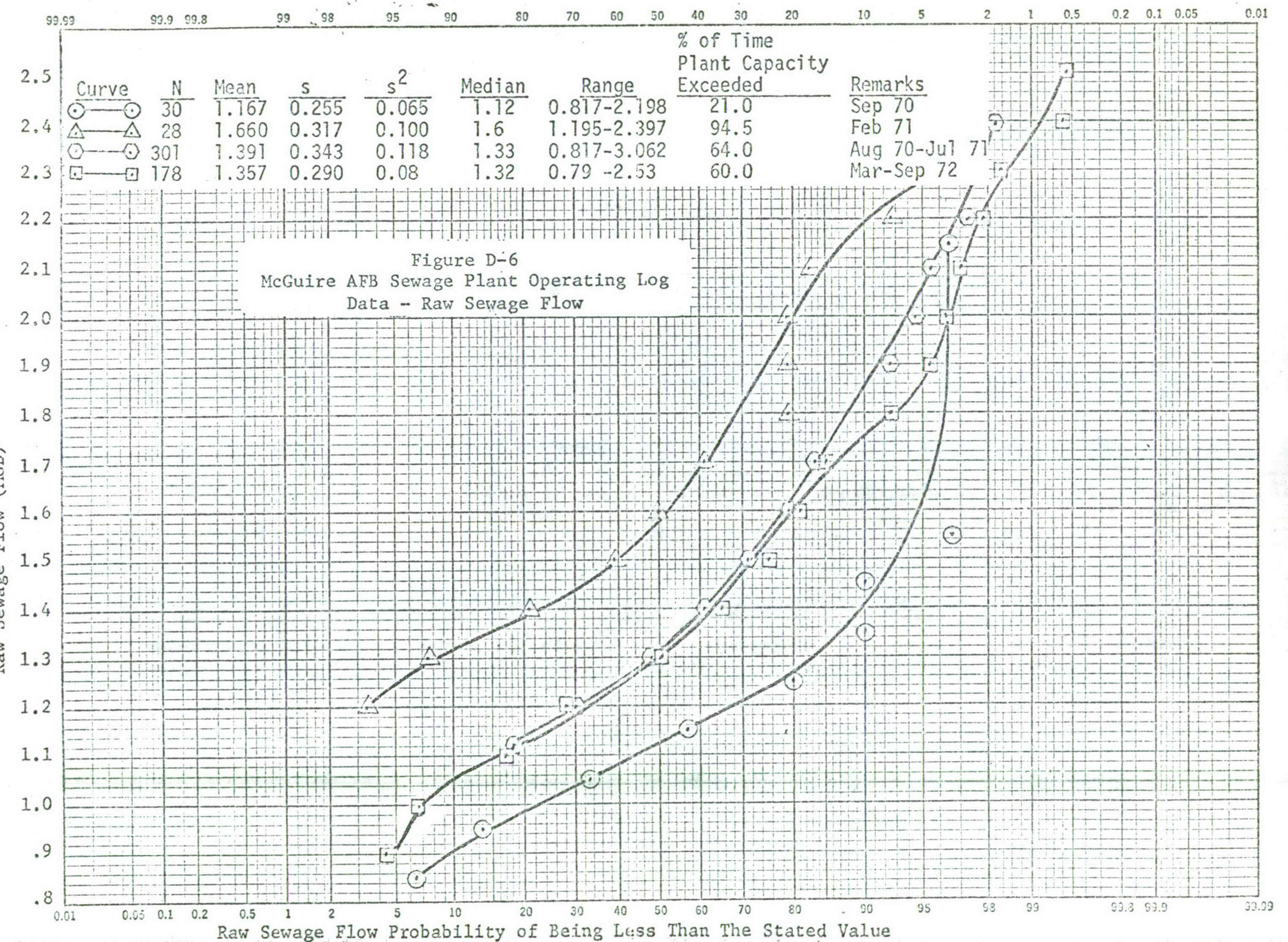
Month	Raw Sludge		Digested Sludge*		Temp	% Red. in Vol. Sol.
	% Solids	% Volume	% Solids	% Volume		
August	5.1	75	4.0	67	84	30
September	4.8	76	4.8	68	87	34
October	4.9	76	9.6	68	84	33
November	5.1	76	5.0	58	88	66.5
December	4.8	77	8.6	57	85	60.0
January	4.9	76	6.2	56	85	60.0
February	5.0	76	5.2	58	85	58.0
March	5.0	75	4.5	57	84	56.0
April	5.2	76	5.6	62	84	52.0
May	5.1	76	5.2	59	80	55.0
June	5.0	76	5.0	64	84	44.0
July	4.5	77	5.2	58	82	59.0

*Digested sludge sample 15 ft depth

Table D-8

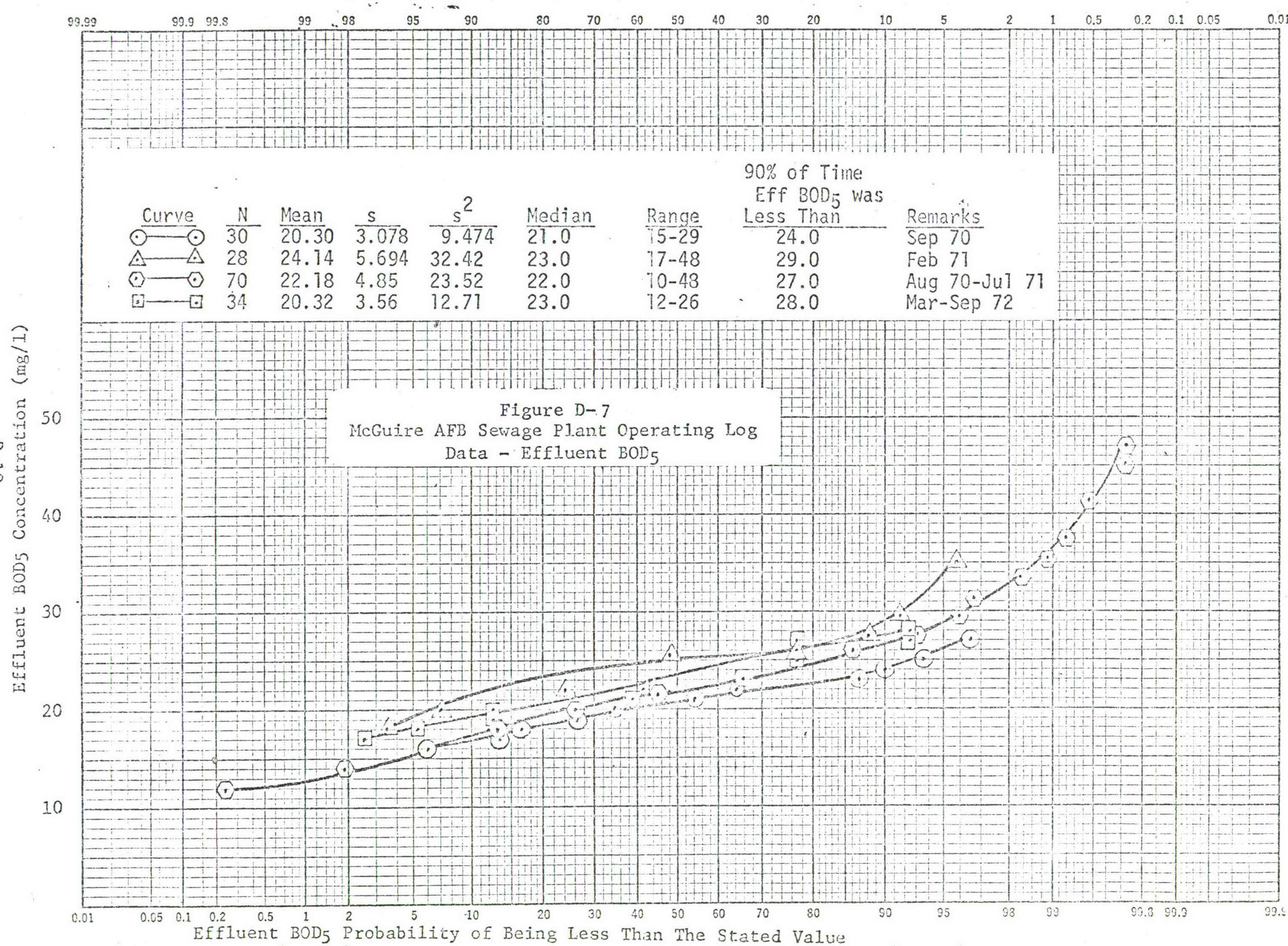
MCGUIRE AFB ANAEROBIC DIGESTER DATA - AUG 70-JUL 71

Month	No. of Days Sludge Pumped	Total Supernatant Pumped From Digester to Headworks	Raw Sludge Pumped	Digested Sludge to Dry Beds	Supernatant fm #1 ⟶ #2
August	12	96,700	181,700	36,000	55,800
September	12	93,100	176,400	-	79,300
October	13	106,400	232,100	-	69,000
November	20	145,200	227,300	30,000	88,200
December	15	84,800	230,200	-	-
Jan	15	76,400	211,700	-	26,400
February	16	93,100	173,100	21,800	-
March	10	59,400	197,850	43,200	-
April	9	51,800	209,000	52,800	33,600
May	8	49,800	229,200	-	60,000
June	14	118,900	226,000	33,600	102,600
July	9	83,500	176,100	19,800	75,600
Totals	153	1,059,100	2,470,650	237,200	590,500



Curve	N	Mean	s	s^2	Median	Range	% of Time Plant Capacity Exceeded	Remarks
⊙——⊙	30	1.167	0.255	0.065	1.12	0.817-2.198	21.0	Sep 70
△——△	28	1.660	0.317	0.100	1.6	1.195-2.397	94.5	Feb 71
⬡——⬡	301	1.391	0.343	0.118	1.33	0.817-3.062	64.0	Aug 70-Jul 71
⊡——⊡	178	1.357	0.290	0.08	1.32	0.79 -2.53	60.0	Mar-Sep 72

Figure D-6
McGuire AFB Sewage Plant Operating Log
Data - Raw Sewage Flow



Curve	N	Mean	s	s^2	Median	Range	90% of Time Eff BOD_5 was Less Than	Remarks
⊙—⊙	30	20.30	3.078	9.474	21.0	15-29	24.0	Sep 70
△—△	28	24.14	5.694	32.42	23.0	17-48	29.0	Feb 71
⬡—⬡	70	22.18	4.85	23.52	22.0	10-48	27.0	Aug 70-Jul 71
⊡—⊡	34	20.32	3.56	12.71	23.0	12-26	28.0	Mar-Sep 72

Figure D-7
McGuire AFB Sewage Plant Operating Log
Data - Effluent BOD_5

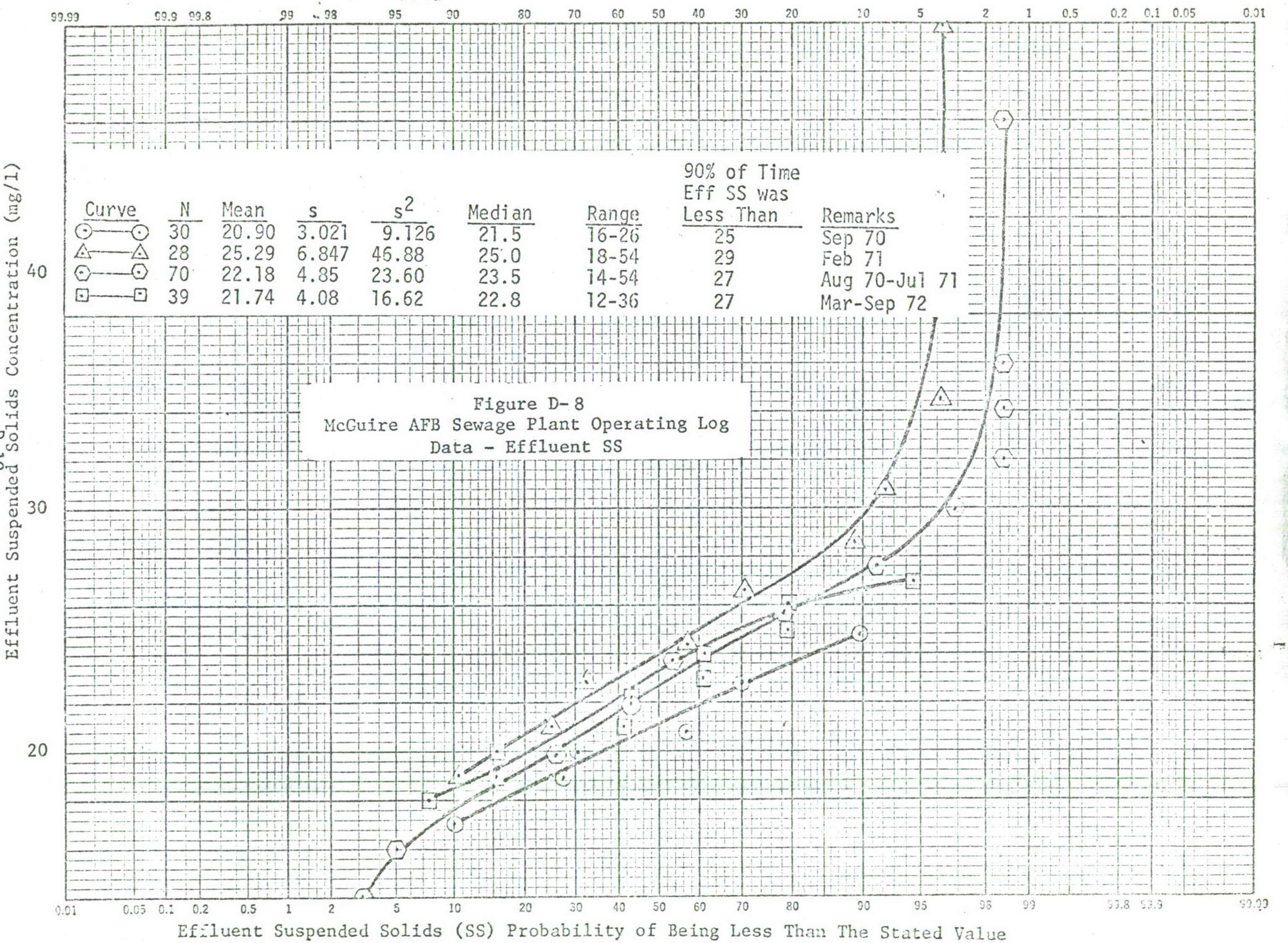


Figure D-8
McGuire AFB Sewage Plant Operating Log
Data - Effluent SS

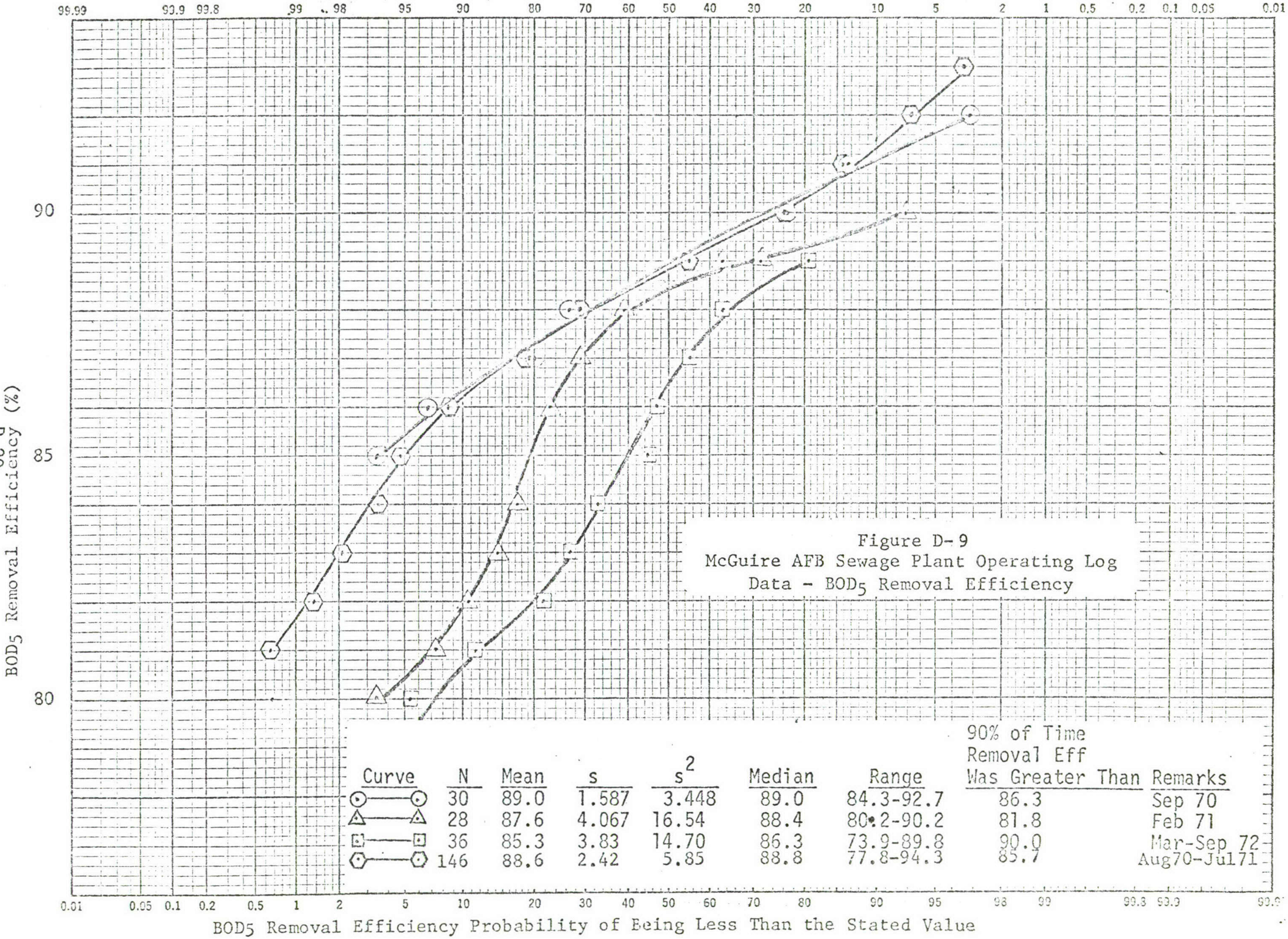


Figure D-9
McGuire AFB Sewage Plant Operating Log
Data - BOD_5 Removal Efficiency

Curve	N	Mean	s	s^2	Median	Range	90% of Time Removal Eff Was Greater Than	Remarks
⊙——⊙	30	89.0	1.587	3.448	89.0	84.3-92.7	86.3	Sep 70
△——△	28	87.6	4.067	16.54	88.4	80.2-90.2	81.8	Feb 71
⊡——⊡	36	85.3	3.83	14.70	86.3	73.9-89.8	90.0	Mar-Sep 72
⬡——⬡	146	88.6	2.42	5.85	88.8	77.8-94.3	85.7	Aug70-Jul71

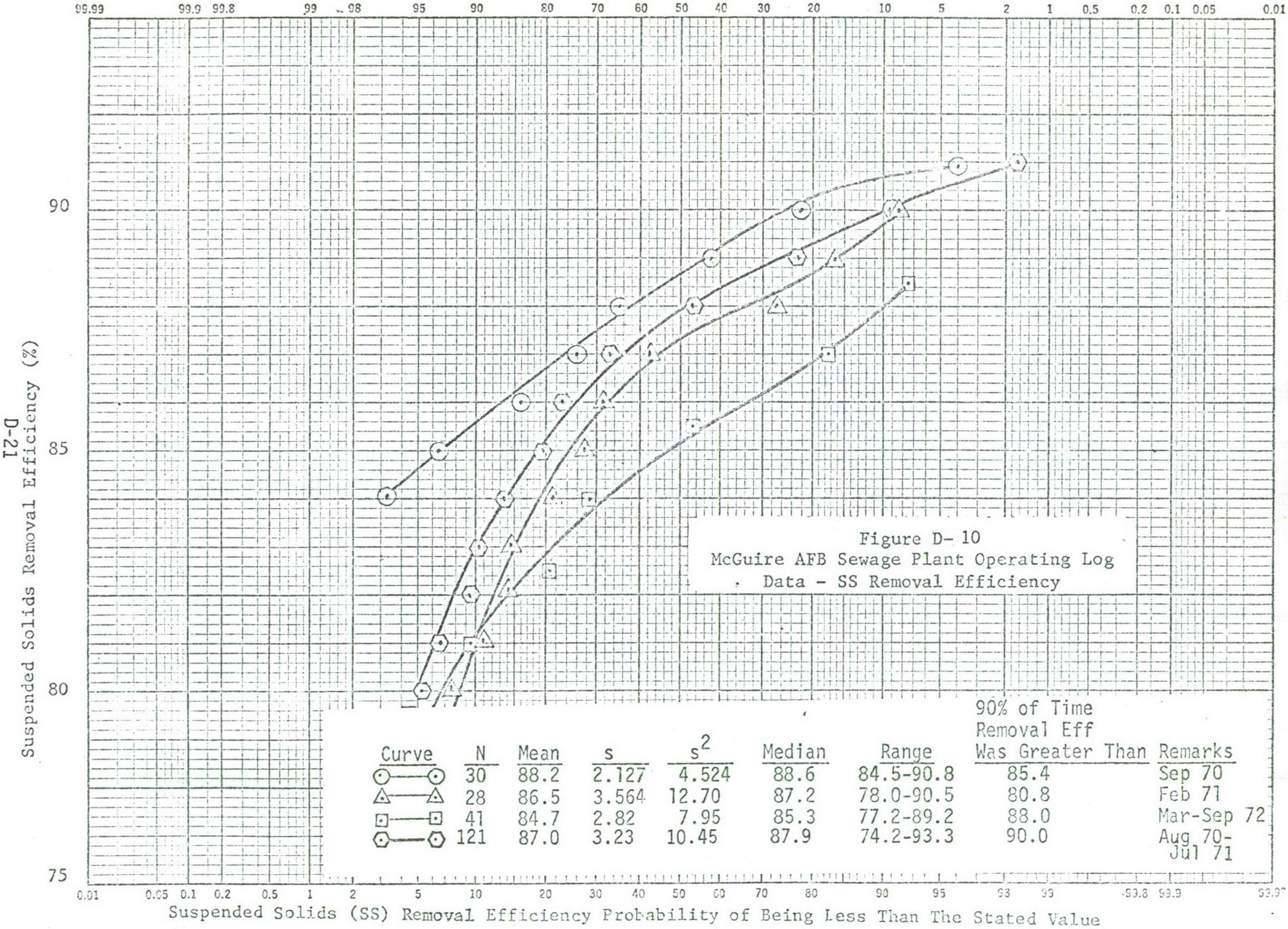


Figure D- 10
McGuire AFB Sewage Plant Operating Log
Data - SS Removal Efficiency

Curve	N	Mean	s	s^2	Median	Range	90% of Time Removal Eff Was Greater Than	Remarks
⊙——⊙	30	88.2	2.127	4.524	88.6	84.5-90.8	85.4	Sep 70
△——△	28	86.5	3.564	12.70	87.2	78.0-90.5	80.8	Feb 71
⊡——⊡	41	84.7	2.82	7.95	85.3	77.2-89.2	88.0	Mar-Sep 72
⬡——⬡	121	87.0	3.23	10.45	87.9	74.2-93.3	90.0	Aug 70-Jul 71

APPENDIX E

Field Bench-Scale Testing

APPENDIX E (contd)

I. CHEMICAL COAGULATION JAR TESTS

A. INTRODUCTION

Jar tests were conducted on selected wastewaters, i.e., primary clarifier influent, and secondary clarifier influent and effluent, from both the Ft Dix and McGuire AFB sewage plants. Alum was used as the coagulant and sulfuric acid was used for pH adjustments. The purpose of the jar tests was to determine the treatability of the wastewaters as regards chemical coagulation, flocculation, and sedimentation. The objective of the tests was to obtain data which could be used to determine the suitability and applicability of chemical treatment in the existing sewage plant units and final effluent.

B. METHODS AND MATERIALS

1. The jar test procedures were designed to determine the optimum pH and alum dosage for coagulation, flocculation, and sedimentation as determined by turbidity measurements according to Eckenfelder.[1] The final part of the procedures includes a jar test to obtain a "settling curve" based on turbidity measurements when the wastewater is treated with the optimum alum dosage at the optimum pH. In addition, various parameters were determined at the start and the end of the settling curve test procedure.

2. There are five graphs presented in this Appendix for each wastewater which was subjected to a jar test. A description of each graph will illustrate the results of the jar test. For example, concerning the McGuire AFB primary clarifier influent.

a. Figure E-2, "Turbidity Versus pH," was used to determine the optimum pH, "Turbidity Versus Alum Dose" was used to determine the optimum alum dosage, and "Final pH Versus Initial pH," was used to show the change in pH resulting from the alum application.

b. Figure E-4, "Turbidity Versus Settling Time" for untreated wastewater (3 test jars subjected to the test conditions but not treated with chemicals) and for treated wastewater (3 test jars at optimum chemical dosages). The initial and final chemical parameters and their respective removal percentages are also shown.

c. Figure E-6 is the same as Figure E-4 except that the turbidity is expressed as "Percent Turbidity Remaining."

3. A Phipps and Bird jar test apparatus was utilized. Rapid sampling of the supernatant was accomplished simultaneously in each jar utilizing a sampling apparatus described in an EPA technology transfer manual.[2]

C. DATA ANALYSES

1. Figures E-1 to E-16 describe the results of the jar tests performed on the primary clarifier influent, and secondary clarifier influent and effluent at both the Ft Dix and McGuire AFB treatment plants. The optimum alum dosage was 150 to 250 mg/l and the optimum pH was 6.0 to 6.5. For all wastewaters the COD, SS, turbidity, and phosphate concentrations were significantly reduced over the untreated wastewaters. The alkalinity and pH were reduced and the total dissolved solids increased as a result of the chemical treatment.

a. The wastewaters tested were found to be amenable to chemical treatment. Chemical treatment could be incorporated into the existing treatment processes or could be applied directly to the final effluent.

b. The application of chemical treatment to the primary clarifier influent could result in the disturbance to the function of the existing plant. The solids loading to the digesters could be directly increased by as much as 50 percent, the pH in the digesters could be depressed, and the organic loading to the filters would be decreased.

c. Chemical treatment in the final clarifiers would not exert major changes in plant function. The solids loading to the digester would be indirectly increased, but the organic loading to the filters would not be significantly altered. Laughlin[3] revealed secondary clarifier effluent from a trickling filter plant (1.5 MGD) treated with approximately 50 mg/l alum resulted in reductions of BOD, SS, and phosphorous from 20 to 10 mg/l, 15 to 10 mg/l and 8 to 1 mg/l respectively.

d. Chemical treatment applied to the effluent would have a minimal impact on plant function but would require expensive construction. Adjustment of final effluent pH would be required before discharge. The costs of construction and of treatment units and procurement of chemicals would need to be balanced against a relatively small improvement in effluent quality. The average BOD and SS in the effluent during the EHL(K) survey was 22 mg/l and 35 mg/l; the COD and SS solids removal efficiencies obtained on the effluent by the jar tests were 70 percent and 60 percent indicating that chemical addition to the final clarifiers could result in final effluent BOD and SS of 15-20 mg/l and 20-25 mg/l.

e. Chemical treatment of the secondary sewage treatment plant effluents has been used to accomplish phosphorous removal and preparation of the effluent for subsequent treatment such as sand filtration. At the Manville NJ sewage treatment plant, 200 mg/l of alum and 0.5 mg/l of anionic polymer was used to pretreat settled trickling filter effluent (2 MGD) prior to application to a Johns-Manville moving bed filter. The effluent BOD, SS, turbidity and total phosphorous were 12, 15, 7, and 0.51 mg/l respectively (EPA).(2) This data indicates that in the chemical treatment and sand filtration of secondary treated effluent will result in a relatively small reduction in absolute concentration of effluent constituents.

D. CONCLUSION

Chemical treatment represents a means of improving the effluent quality of both the Ft Dix and McGuire AFB treatment plants. However, such treatment would not provide a wastewater which is completely devoid of organic and solid material. Chemical treatment would be most advantageously applied at influent to the secondary clarifier process. Improved SS and BOD removal efficiencies in the final clarifiers of both the Ft Dix and MAFB sewage plants could be realized by addition of chemical feed and coagulation facilities.

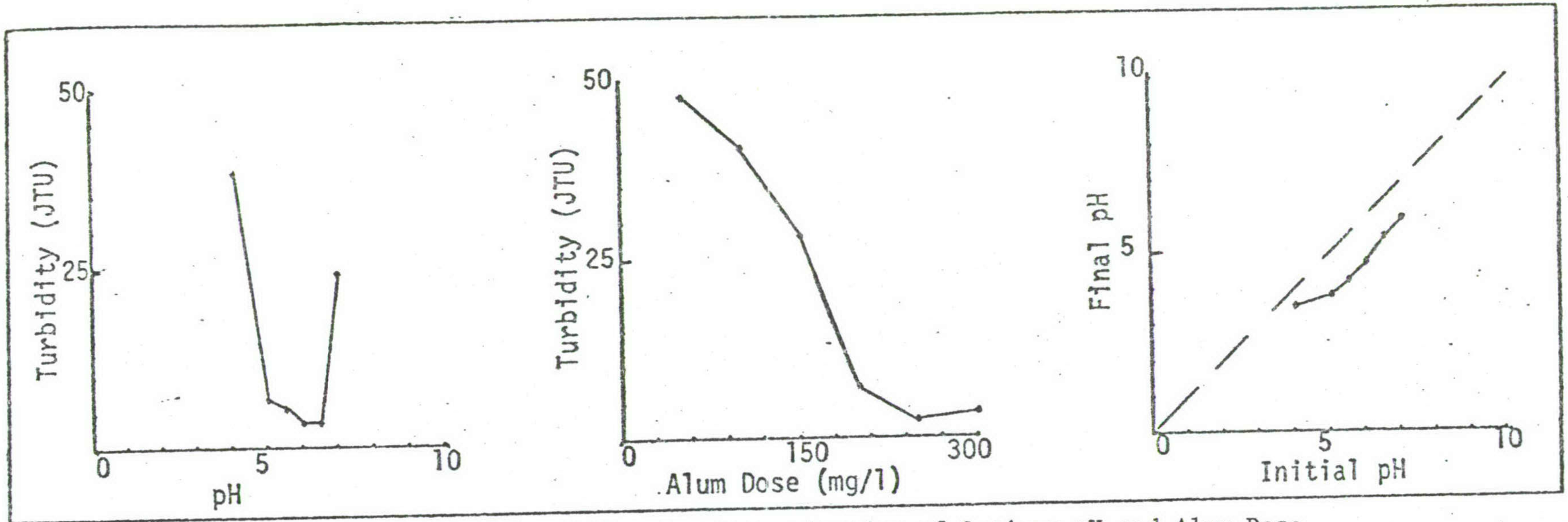


Figure E-1. Ft Dix Primary Clarifier Influent - Determination of Optimum pH and Alum Dose
USAF EHL/K, Sep 1972

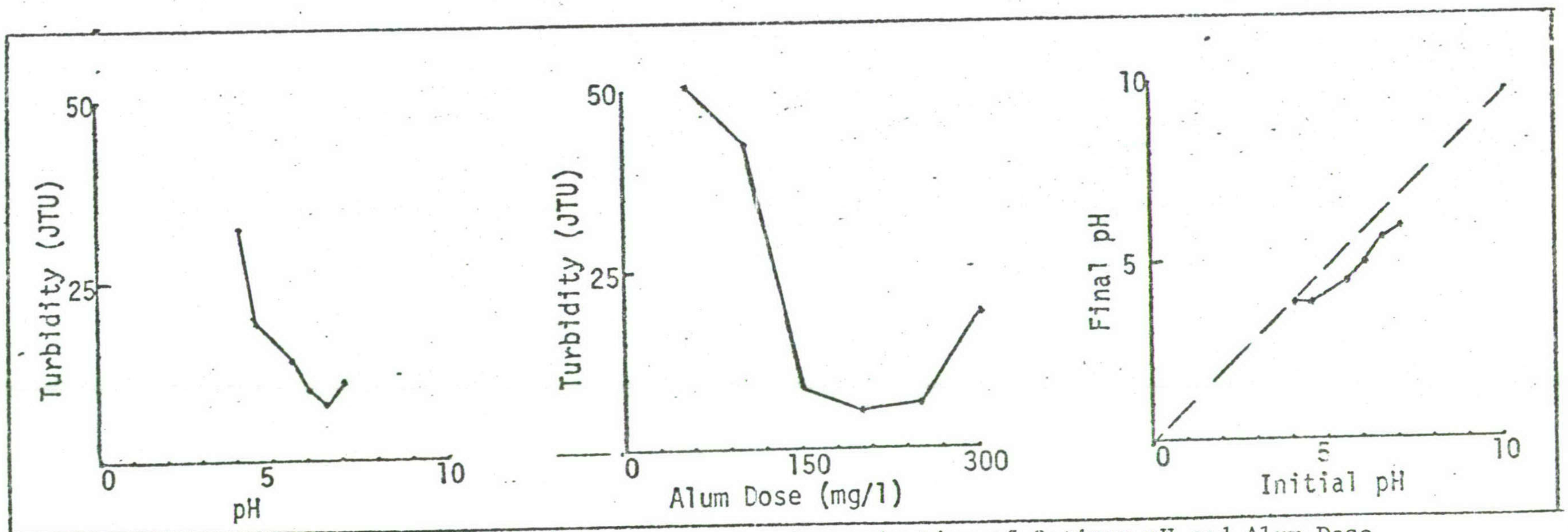


Figure E-2. McGuire AFB Primary Clarifier Influent - Determination of Optimum pH and Alum Dose
USAF EHL/K, Sep 1972

	COD	SS	Turb	TDS	Alk	T-PO_4
Initial (mg/l)	429	180	60	260	143	6.7
Final (mg/l)						
Treated	79	10	3.4	330	15	2.5
Untreated	209	60	46	282	148	6.5
Removal (%)						
Treated	82	94	94	+27	90	63
Untreated	51	67	23	-	-	3

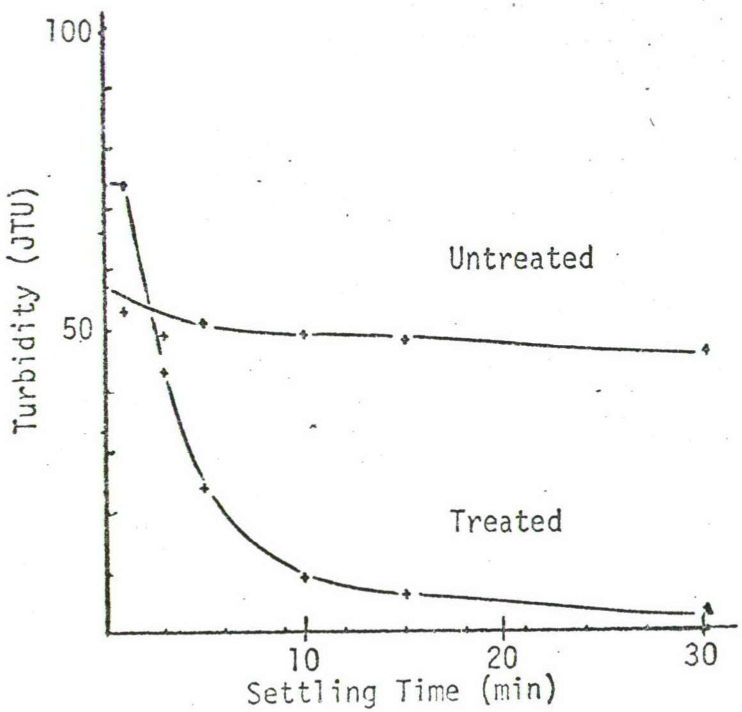


Figure E-3. Ft Dix Primary Clarifier Influent - Treated (Alum - 250 mg/1, pH - 6.5) and Untreated Removal Efficiencies USAF EHL/K, Sep 1972

	COD	SS	Turb	TDS	Alk	T-PO_4
Initial (mg/l)	249	70	40	320	122	7.4
Final (mg/l)						
Treated	53	30	5.6	375	12.2	0.1
Untreated	150	57	28.1	320	112	7.3
Removal (%)						
Treated	79	57	87	+17	90	99
Untreated	40	19	30	-	8	1

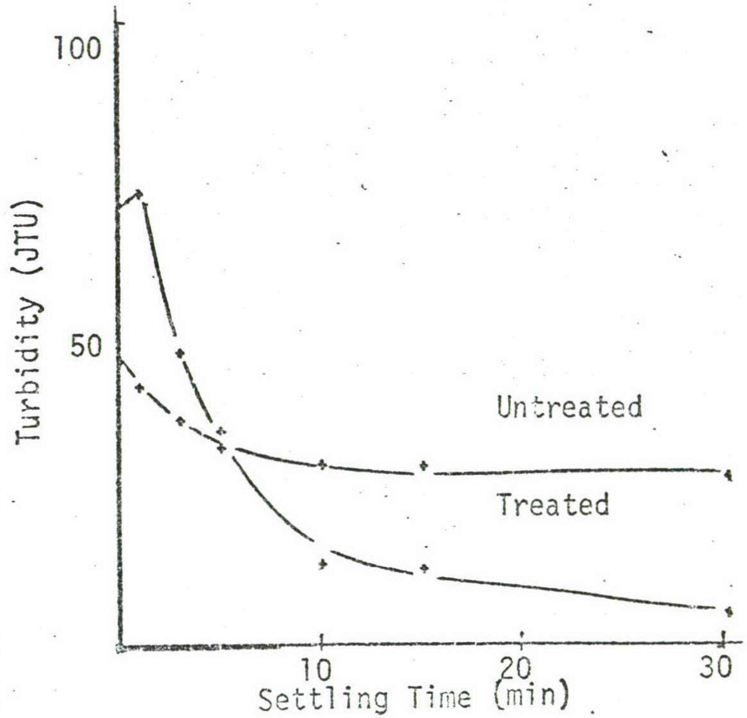


Figure E-4. McGuire AFB Primary Clarifier Influent - Treated (Alum - 200 mg/1, pH - 6.5) and Untreated Removal Efficiencies - USAF EHL/K, Sep 1972

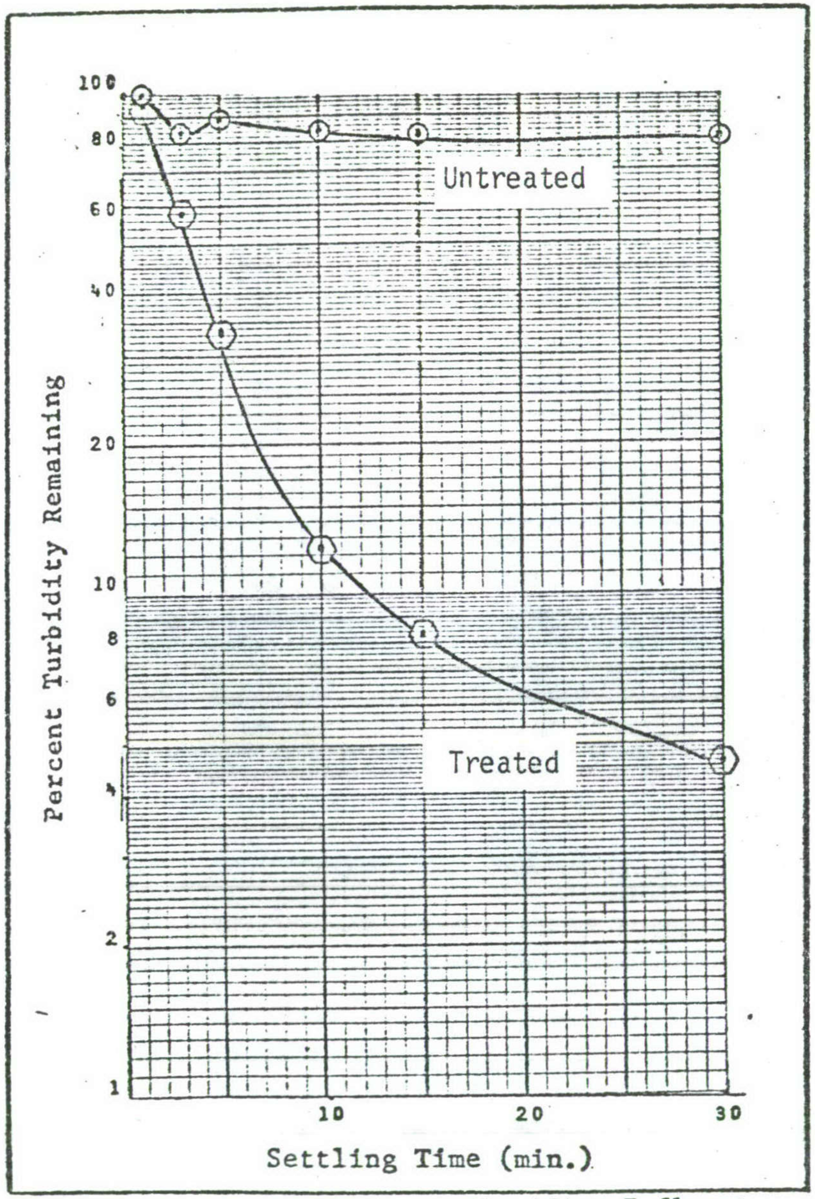


Figure E-5. Ft Dix Primary Clarifier Influent - Treated (Alum - 250 mg/1, pH - 6.5) and Untreated Percent Turbidity Remaining - USAF EHL/K, Sep 1972

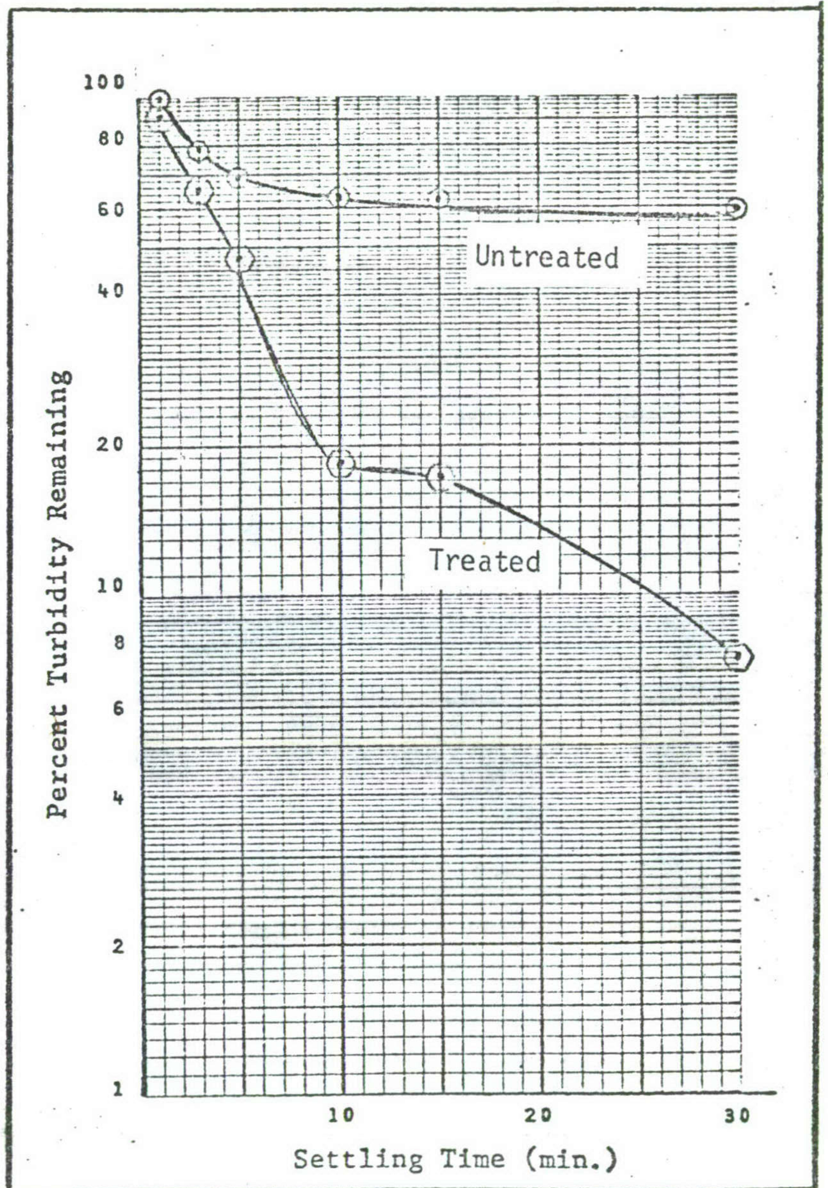


Figure E-6. McGuire AFB Primary Clarifier Influent - Treated (Alum - 200 mg/1, pH - 6.5) and Untreated Percent Turbidity Remaining - USAF EHL/K, Sep 1972

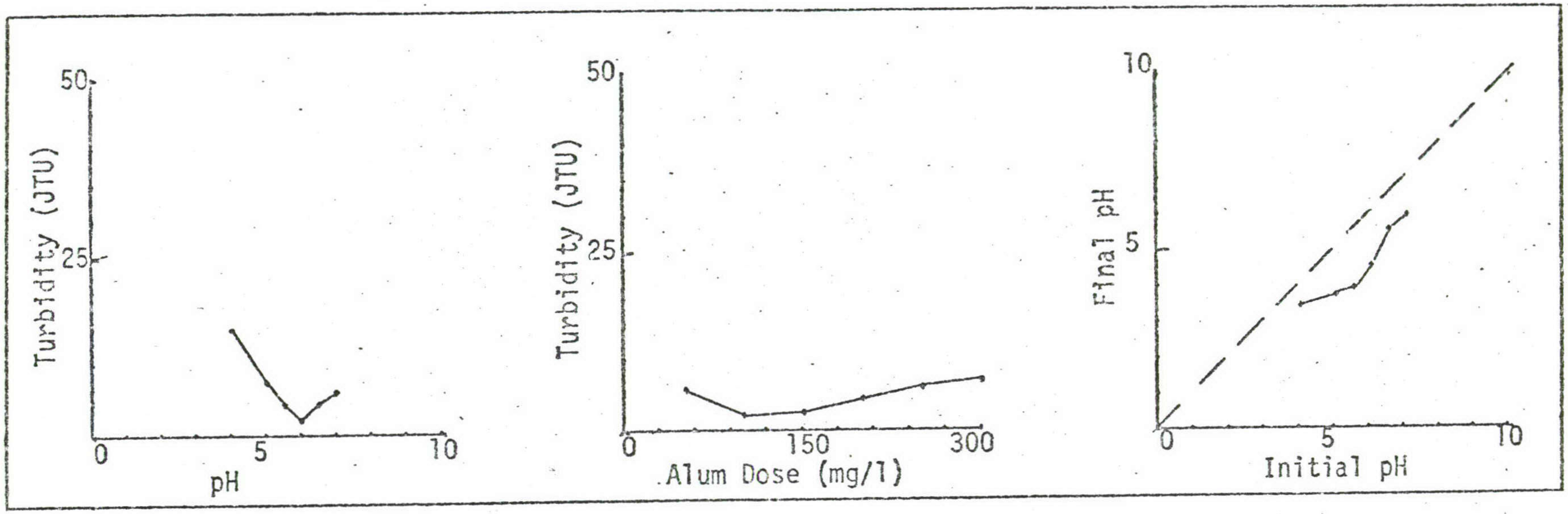


Figure E-7. Ft Dix Secondary Clarifier Influent - Determination of Optimum pH and Alum Dose
USAF EHL/K, Sep 1972

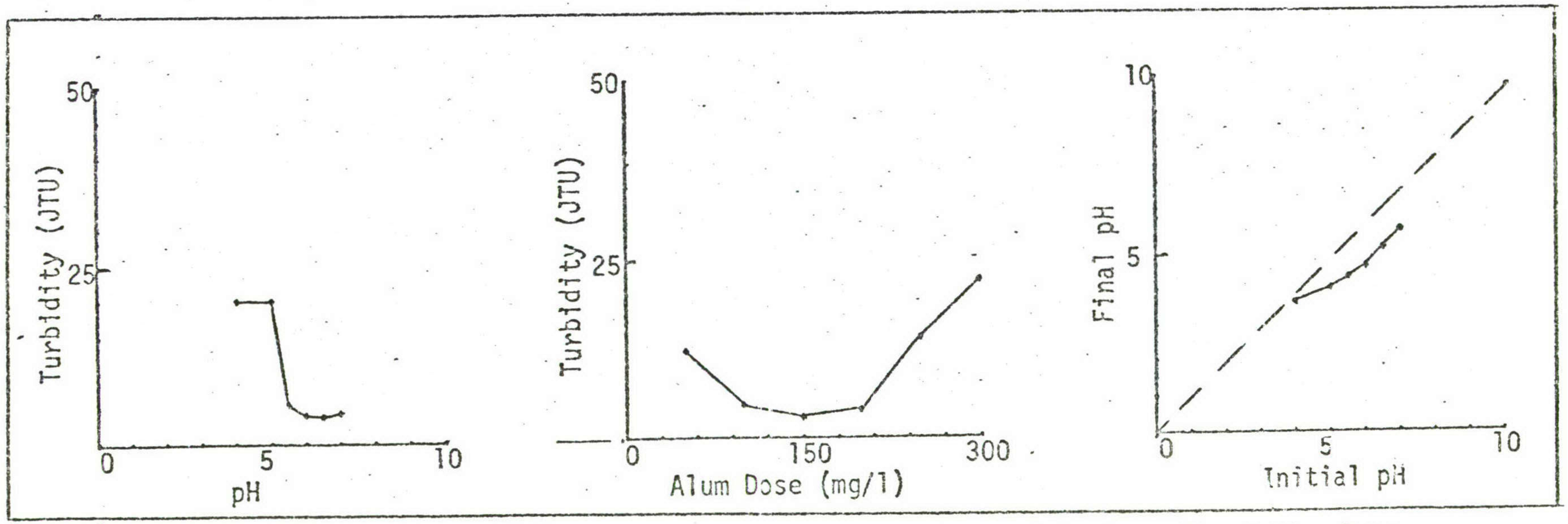


Figure E-8. McGuire AFB Secondary Clarifier Influent - Determination of Optimum pH and Alum Dose
USAF EHL/K, Sep 1972

	COD	SS	Turb	TDS	Alk	T-PO_4
Initial (mg/l)	71	65	18	380	116	
Final (mg/l)						
Treated	10	13	1.9	443	0	2.2
Untreated	63	33	10	365	118	6.4
Removal (%)						
Treated	86	80	89	+17	100	-
Untreated	11	49	44	4	-	-

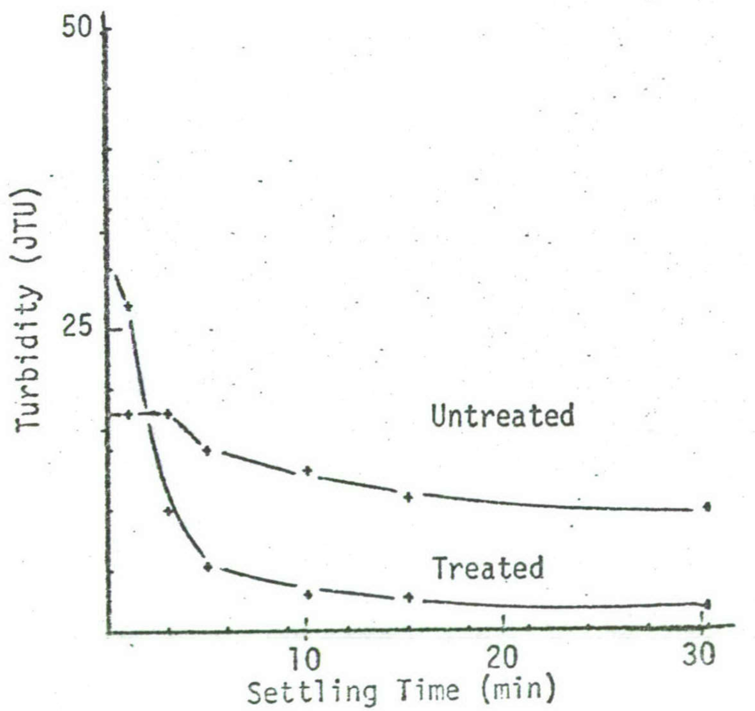


Figure E-9. Ft Dix Secondary Clarifier Influent - Treated (Alum 100 mg/1, pH 6.0) and Untreated Removal Efficiencies - USAF EHL/K, Sep 1972

	COD	SS	Turb	TDS	Alk	T-PO_4
Initial (mg/l)	97	80	18	300	104	13.9
Final (mg/l)						
Treated	62	16	2.6	366	18	2.6
Untreated	-	-	-	-	-	-
Removal (%)						
Treated	36	80	86	+22	83	81
Untreated	-	-	-	-	-	-

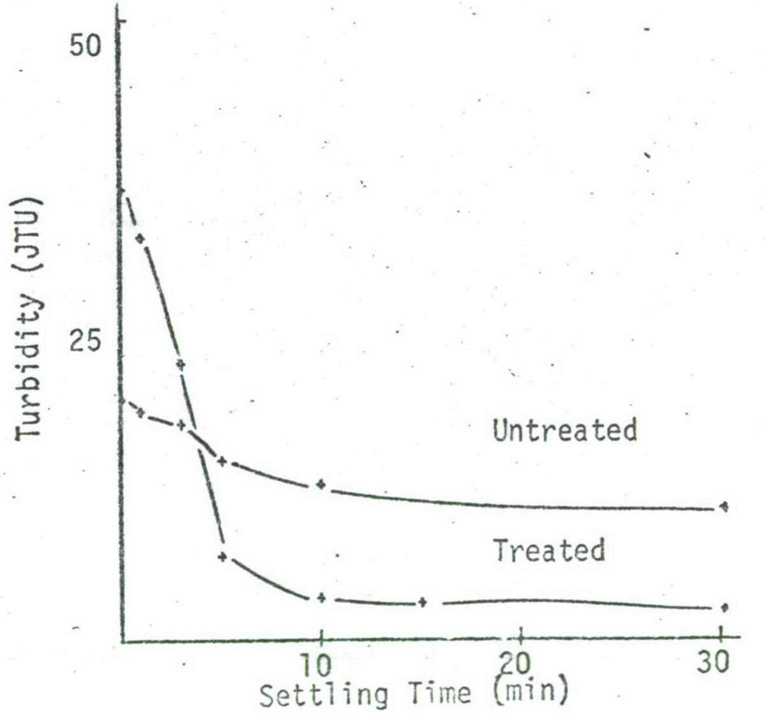


Figure E-10. McGuire AFB Secondary Clarifier Influent - Treated (Alum - 150 mg/1, pH - 6.5) and Untreated Removal Efficiencies - USAF EHL/K, Sep 1972

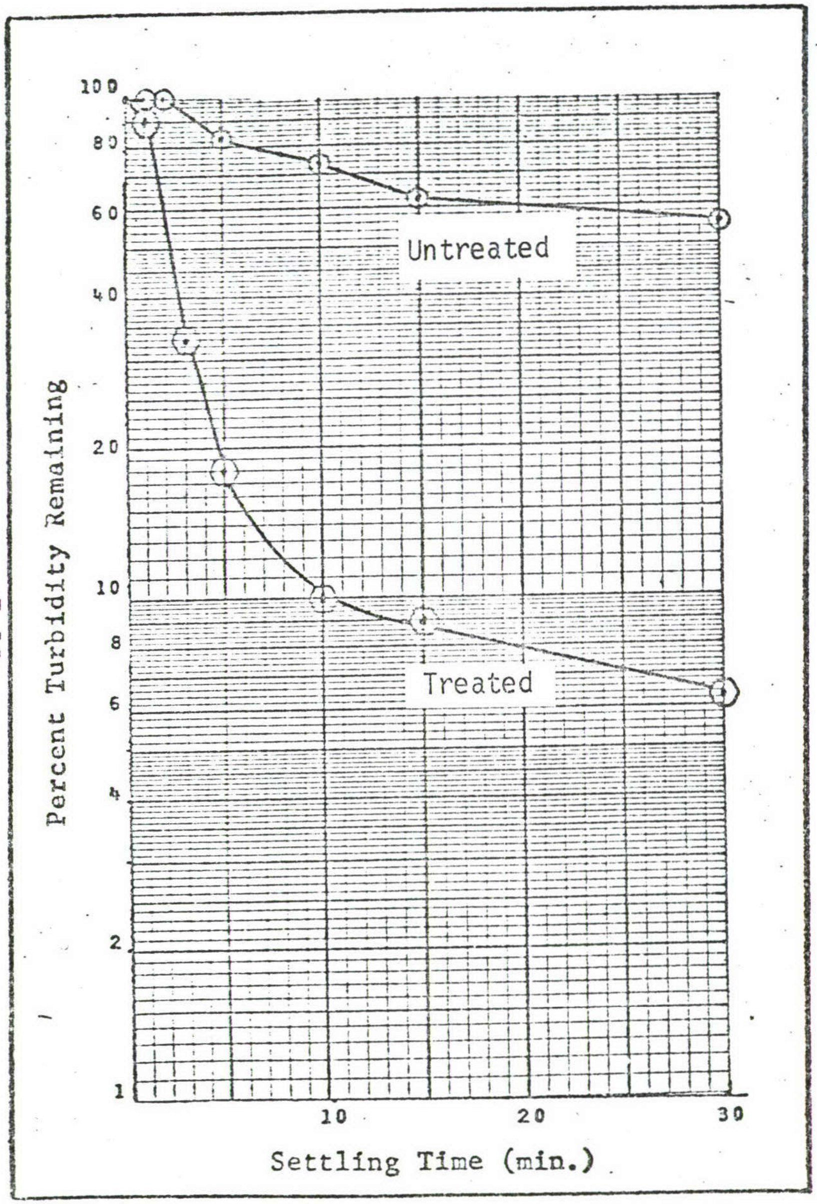


Figure E-11. Ft Dix Secondary Clarifier Influent - Treated (Alum - 100 mg/1, pH - 6.0) and Untreated Percent Turbidity Remaining - USAF EHL/K, Sep 1972

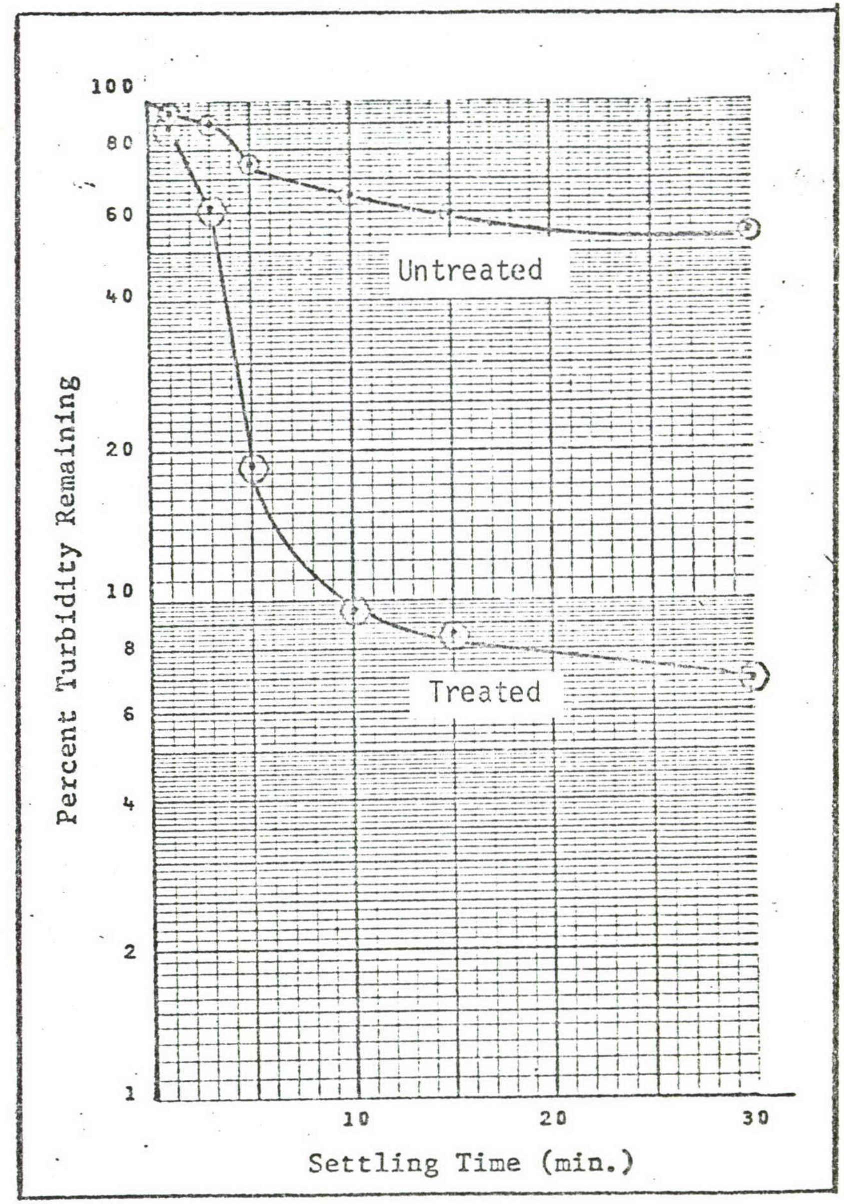


Figure E-12. McGuire AFB Secondary Clarifier Influent - Treated (Alum - 150 mg/1, pH - 6.5) and Untreated Percent Turbidity Remaining USAF EHL/K, Sep 1972

	COD	SS	Turb	TDS	Alk	T-PO_4
Initial (mg/l)	102	32	22	380	154	
Final (mg/l)						
Treated	43	25	6.4	500	48	
Untreated	91	40	17	468	150	
Removal (%)						
Treated	58	22	71	+32	69	
Untreated	11	+25	23	23	3	

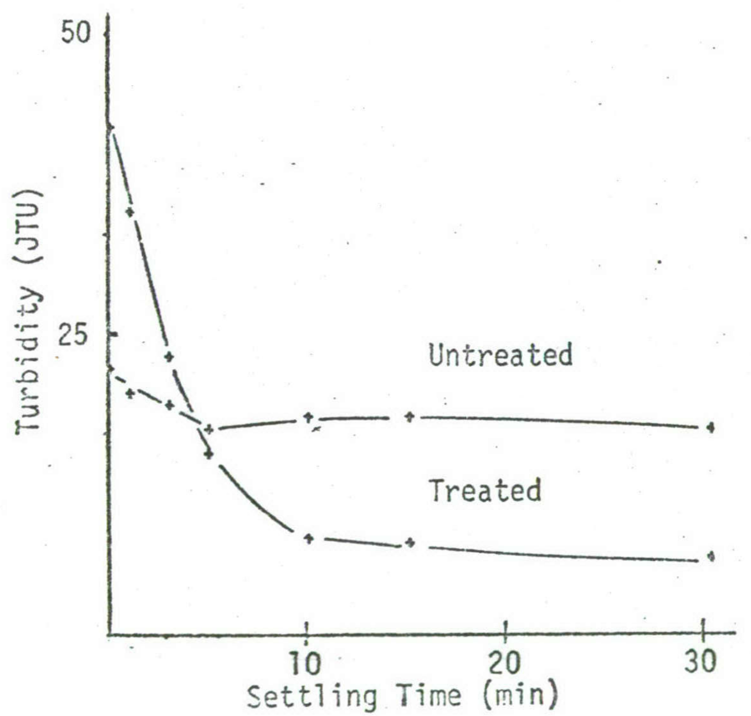


Figure E-13. Ft Dix Secondary Clarifier Effluent - Treated (Alum - 150 mg/l; pH -6.5) and Untreated Removal Efficiencies - USAF EHL/K, Sep 1972

	COD	SS	Turb	TDS	Alk	T-PO_4
Initial (mg/l)	75	20	20	270	82	
Final (mg/l)						
Treated	19	8	4	290	5	
Untreated	48	12	15	258	76	
Removal (%)						
Treated	75	60	80	+7	94	
Untreated	36	40	25	4	7	

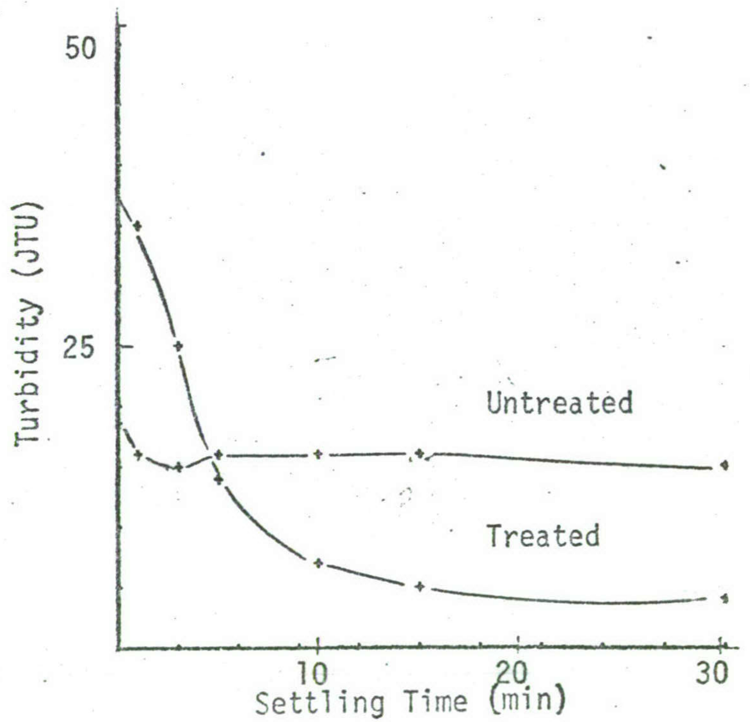


Figure E-14. McGuire AFB Secondary Clarifier Effluent - Treated (Alum - 150 mg/l, pH - 6.5) and Untreated Removal Efficiencies - USAF EHL/K, Sep 1972

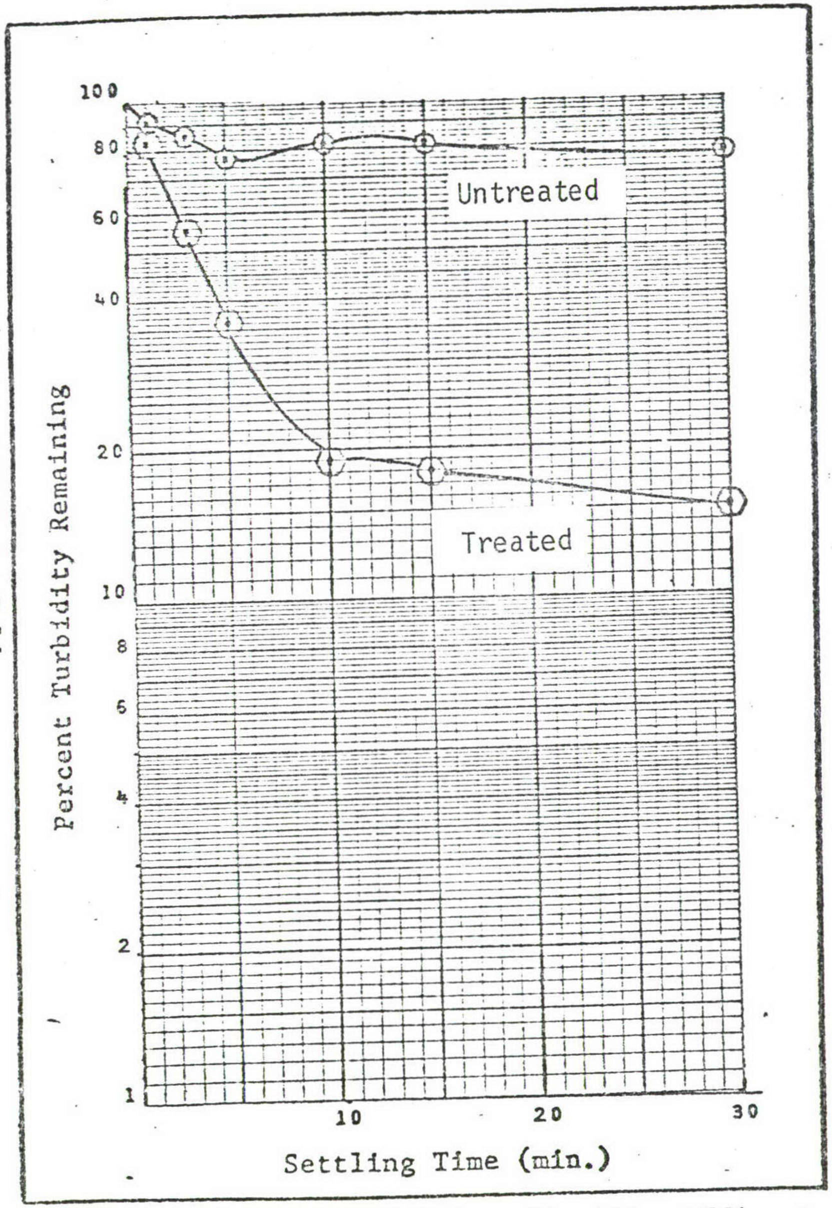


Figure E-15. Ft Dix Secondary Clarifier Effluent - Treated (Alum - 150 mg/1, pH - 6.5) and Untreated Percent Turbidity Remaining - USAF EHL/K, Sep 1972

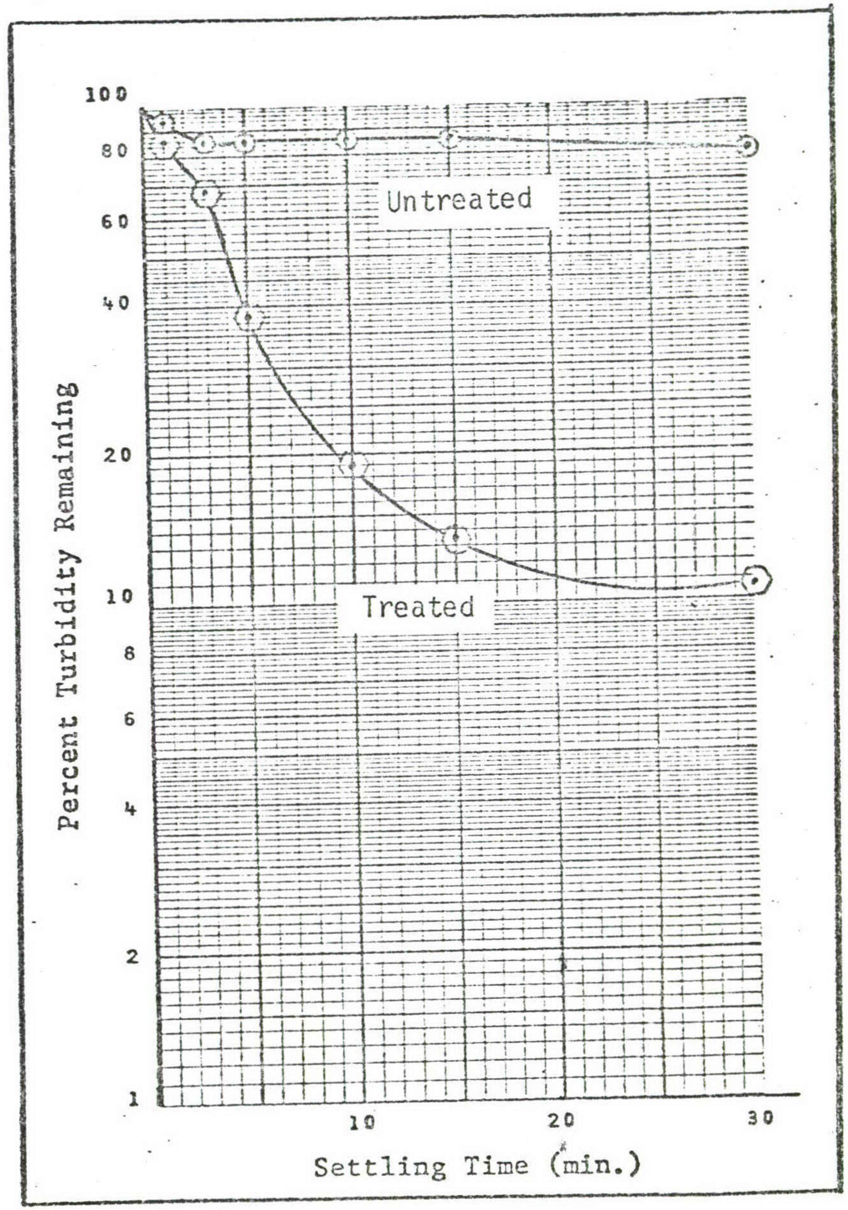


Figure E-16. McGuire AFB Secondary Clarifier Effluent - Treated (Alum - 150 mg/1, pH - 6.5) and Untreated Percent Turbidity Remaining USAF EHL/K, Sep 1972

II. ACTIVATED CARBON ADSORPTION ISOTHERM JAR TESTS

A. INTRODUCTION

Batch activated carbon isotherm tests were conducted on filtered and unfiltered prechlorinated effluent from the Ft Dix and McGuire AFB WWTP's. The purpose of the tests was to determine the treatability of selected wastewater constituents; i.e., COD, TOD, color, and MBAS with activated carbon. The objective of the tests was to obtain batch isotherms for each constituent and to determine the ultimate adsorptive capacity of the carbon. Dynamic column tests were not conducted.

B. METHODS AND MATERIALS

The wastewater was tested in both a filtered (Whatman 41) and unfiltered condition; the wastewater was analyzed prior to and after filtration. Two-liter portions of the wastewater were placed into six flasks and dosed with carbon at .2, .4, .8, 1.2, 2.0 and 3.0 mg/l. A Phipps and Bird jar test apparatus mixed the contents of the flasks for 60 min at 75 RPM. After this period, the wastewater samples were filtered to remove the activated carbon and analyzed for the selected constituents. (See Eckenfelder)[4]

C. DATA ANALYSES

These data were plotted according to the Freudlich isotherm in which "adsorption of a constituent/gram of activated carbon" is plotted against the "residual concentration of the constituent." (See Fair, et al)[5]

1. Adsorption Capacities

The adsorptive capacity of the carbon in a column application can be estimated from the isotherm by extending a vertical line from the point on the horizontal scale (residual equilibrium concentration of the contaminant) corresponding to the initial concentration of the contaminant, and extrapolating the isotherm to intersect this line. The corresponding value on the vertical scale (mass of contaminant adsorbed per unit mass of carbon) represents the ultimate amount of contaminant adsorbed where the carbon is in equilibrium with the initial concentration of contaminant. This condition should exist in the upper section of a carbon bed during column treatment, and it therefore represents the ultimate capacity of the carbon for the particular waste constituent.

a. Ultimate Capacities

The ultimate adsorptive capacity of the carbon in terms of pounds of contaminant adsorbed per pound of carbon can be calculated from the results of these analyses. The results of Freundlich isotherm analyses are contained in Tables E-1 through E-6, and Figures E-18 through E-21. Table E-7 contains the calculated ultimate adsorptive capacities. No TOD analyses were accomplished for the Ft Dix adsorption tests. The data derived from the MBAS adsorption tests for both the Ft Dix and MAFB wastes were insufficient for accurate analyses.

b. Adsorption Isotherm Interpretation

Worthy of special note are the differing ultimate capacities for chemical oxygen demand (COD) for the Ft Dix and MAFB secondary effluents. The significantly lower values for the MAFB effluent (0.156 - 0.293 lb COD/lb Carbon) as compared to the Ft Dix effluent (0.307 - 0.372 lb COD/lb Carbon) most likely are a result of higher adsorption of compounds present in the MAFB waste from industrial fractions. (See Eckenfelder)[4]. The range of the adsorptive capacity values determined during these field tests agrees with literature citations; i.e., 0.250 to 0.870 lb COD/lb Carbon (See EPA)[6].

2. The slope of the isotherm may be used to characterize the adsorption operation being tested. Very steep slopes are characteristic of very good adsorption of dissolved organics present in higher concentrations. Slight slopes indicate comparable adsorption over the entire range of organic concentrations. Higher slopes also indicate that greater adsorption efficiency in column operations may be expected. The slopes of the COD isotherms for filtered and unfiltered Ft Dix samples are quite similar and relatively steep. Conversely, the slopes of the COD isotherm for the filtered and unfiltered MAFB samples are quite different. The unfiltered sample COD isotherm slope is much steeper than for the filtered sample, suggesting some inhibitory effect from the filterable residue.

D. ADVANCED WASTE TREATMENT (AWT) PLANT DESIGN

The design of activated carbon regneration and transport facilities for the proposed AWT plant was based on the ultimate COD adsorption capacity of 1 lb COD per lb Carbon. Results of field adsorption isotherm tests indicate that the ultimate COD adsorptive capacity is far less than this value. Pilot scale adsorption testing would be required to determine design criteria such as: contact time, regeneration requirements, ultimate adsorptive capacity, headloss buildup, hydraulic loading, parallel versus series flow, single versus multi-stage configuration and process costs.

E. CONCLUSION

Removal of dissolved organic from the secondary effluents of both the Ft Dix and MAFB sewage plants is technically feasible. Results of activated carbon adsorption isotherm tests revealed that additional field pilot scale tests would be required before selecting design criteria for an advanced waste treatment plant.

Table E-1. Activated Carbon Adsorption Isotherm Data - Ft Dix Sewage Plant Secondary Effluent - EHL/K, Sep 1972*

	Sample No.	Carbon Dose (gm/l)	COD (mg/l)	MBAS (mg/l)	Color (units)
Unfiltered	D-1	0	60	2.40	50
	D-2	0.2	22	0.10	5
	D-3	0.4	22	0.10	<1.0
	D-4	0.8	22	0.10	<1.0
	D-5	1.2	11	0.03	<1.0
	D-6	2.0	11	0.03	<1.0
	D-7	3.0	0	<0.01	<1.0
Filtered (Whatman 41)	D-8	0	55	2.40	50
	D-9	0.2	16	0.05	5
	D-10	0.4	16	0.05	<1.0
	D-11	0.8	16	0.05	<1.0
	D-12	1.2	11	<0.01	<1.0
	D-13	2.0	5	<0.01	<1.0
	D-4	3.0	16	<0.01	<1.0

*Powdered activated carbon - contact time of 60 minutes at jar test RPM = 75, Unfiltered SS = 30 mg/l; Filtered SS = 12 mg/l

Table E-2. Activated Carbon Adsorption Isotherm Data - McGuire AFB Sewage Plant Secondary Effluent - EHL/K, Sep 1972*

	Sample No.	Carbon Dose (gm/l)	COD (mg/l)	TOD (mg/l)	MBAS (mg/l)	Color (units)	pH (units)
Unfiltered	M-1	0	70	104	3.6	50	7.8
	M-2	0.2	39	65	0.3	5	8.0
	M-3	0.4	27	44	0.1	<1.0	8.1
	M-4	0.8	11	36	0.1	<1.0	8.0
	M-5	1.2	16	35	<0.01	<1.0	8.2
	M-6	2.0	5	32	<0.01	<1.0	8.2
	M-7	3.0	11	28	<0.01	<1.0	8.1
Filtered (Whatman 41)	M-8	0	59	104	3.8	50	7.3
	M-9	0.2	32	60	1.65	5	7.8
	M-10	0.4	22	44	0.10	<1.0	7.9
	M-11	0.8	16	34	0.03	<1.0	7.9
	M-12	1.2	11	32	<0.01	<1.0	7.8
	M-13	2.0	11	30	<0.01	<1.0	7.7
	M-14	3.0	16	29	<0.01	<1.0	8.0

*Powdered activated carbon - contact time of 60 minutes at jar test RPM = 75, Unfiltered SS = 34 mg/l; Filtered SS = 18 mg/l.

Table E-3. Freundlich Isotherm Data
Ft Dix - Chemical Oxygen Demand
USAF/K, Sep 1972

Carbon Dose (gm/l)	(C) Residual Conc. (mg/l)		(Y) Adsorbed (mg/l)		(Y/m) Adsorbed/Dose (mg/gm)	
	Unfilt.	Filt.	Unfilt.	Filt.	Unfilt.	Filt.
0	60	55	0	0	-	-
0.2	22	16	38	39	190	195
0.4	22	16	38	39	95	98
0.8	22	16	38	39	48	49
1.2	11	11	49	44	41	37
2.0	11	5	49	50	24	25
3.0	5	16	60	39	18	13

Freundlich Isotherm ($\frac{Y}{m} = AC^B$)

Ultimate Adsorption (lb/lb Carbon)		(A) Constant		(B) Constant		Correlation (r^2)	
Unfilt.	Filt.	Unfilt.	Filt.	Unfilt.	Filt.	Unfilt.	Filt.
0.307	0.372	2.226	3.143	1.191	1.203	0.67	0.55

Table E-4. Freundlich Isotherm Data
McGuire AFB - Chemical Oxygen Demand
USAF EHL/K, Sep 1972

Carbon Dose (gm/l)	(C) Residual Conc. (mg/l)		(Y) Adsorbed (mg/l)		(Y/m) Adsorbed/Dose (mg/gm)	
	Unfilt.	Filt.	Unfilt.	Filt.	Unfilt.	Filt.
0	70	59	0	0		
0.2	39	32	31	27	155	135
0.4	27	22	43	37	108	92
0.8	11	16	59	43	74	54
1.2	16	11	54	48	45	40
2.0	5	11	65	48	32	24
3.0	1	6	69	53	23	18

Freundlich Isotherm ($\frac{Y}{m} = AC^B$)

Ultimate Adsorption (lb/lb Carbon)		(A) Constant		(B) Constant		Correlation (r^2)	
Unfilt.	Filt.	Unfilt.	Filt.	Unfilt.	Filt.	Unfilt.	Filt.
0.156	0.293	18.90	1.59	0.49	1.28	0.82	0.94

Table E-5. Freundlich Isotherm Data
McGuire AFB - Total Oxygen Demand
USAF EHL/K, Sep 1972

Carbon Dose (gm/l)	(C) Residual Conc. (mg/l)		(Y) Adsorbed (mg/l)		(Y/m) Adsorbed/Dose (mg/gm)	
	Unfilt.	Filt.	Unfilt.	Filt.	Unfilt.	Filt.
0	104	104	0	0		
0.2	60	60	44	44	220	220
0.4	44	44	60	60	150	150
0.8	36	34	68	70	85	88
1.2	35	32	69	72	58	60
2.0	32	30	72	74	36	37
3.0	28	29	76	75	25	25

Freundlich Isotherm ($\frac{Y}{m} = AC^B$)

Ultimate Adsorption (lb/lb Carbon)		(A) Constant		(B) Constant		Correlation (r^2)	
Unfilt.	Filt.	Unfilt.	Filt.	Unfilt.	Filt.	Unfilt.	Filt.
1.200	1.200	0.002	0.004	2.94	2.72	0.91	0.86

Table E-6. Freundlich Isotherm Data
McGuire AFB - Methylene Blue Active Substances
USAF EHL/K, Sep 1972

Carbon Dose (gm/l)	(C) Residual Conc. (mg/l)		(Y) Adsorbed (mg/l)		(Y/m) Adsorbed/Dose (mg/gm)	
	Unfilt.	Filt.	Unfilt.	Filt.	Unfilt.	Filt.
0	3.60	3.8	0	0		
0.2	0.30	1.65	3.3	2.15	16.5	10.8
0.4	0.10	0.10	3.5	3.70	8.8	9.2
0.8	0.10	0.03	3.5	3.77	4.4	4.7
1.2	<0.01	<0.01	>3.59	>3.79	>2.9	>3.2
2.0	<0.01	<0.01	>3.59	>3.79	>1.8	>1.9
3.0	<0.01	<0.01	>3.59	>3.79	>1.2	>1.3

Freundlich Isotherm $\left(\frac{Y}{m} = AC^B\right)$

Ultimate Adsorption (lb/lb Carbon)		(A) Constant		(B) Constant		Correlation (r^2)	
Unfilt.	Filt.	Unfilt.	Filt.	Unfilt.	Filt.	Unfilt.	Filt.
0.064	0.026	22.34	11.15	0.471	0.236	0.77	0.82

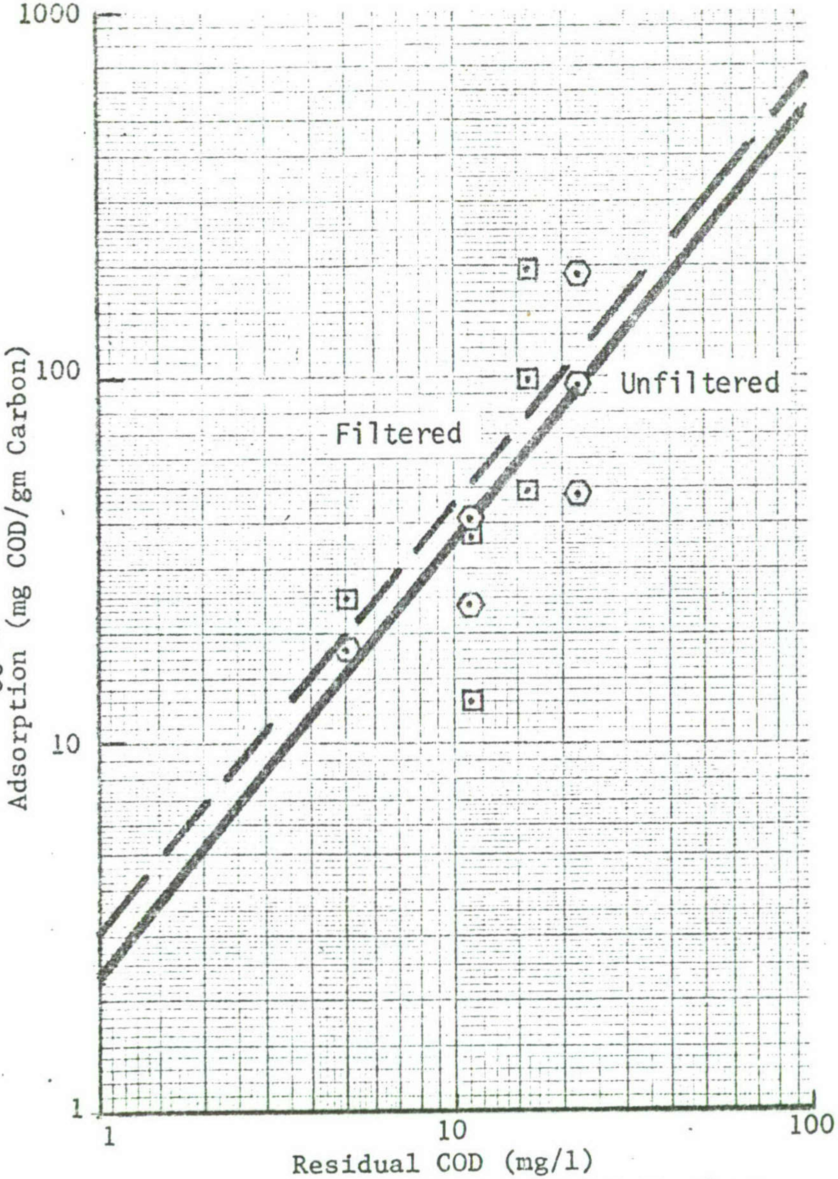


Figure E-18. Ft Dix COD Freundlich Isotherm - Sewage Plant Secondary Effluent - EHL/K, Sep 1972

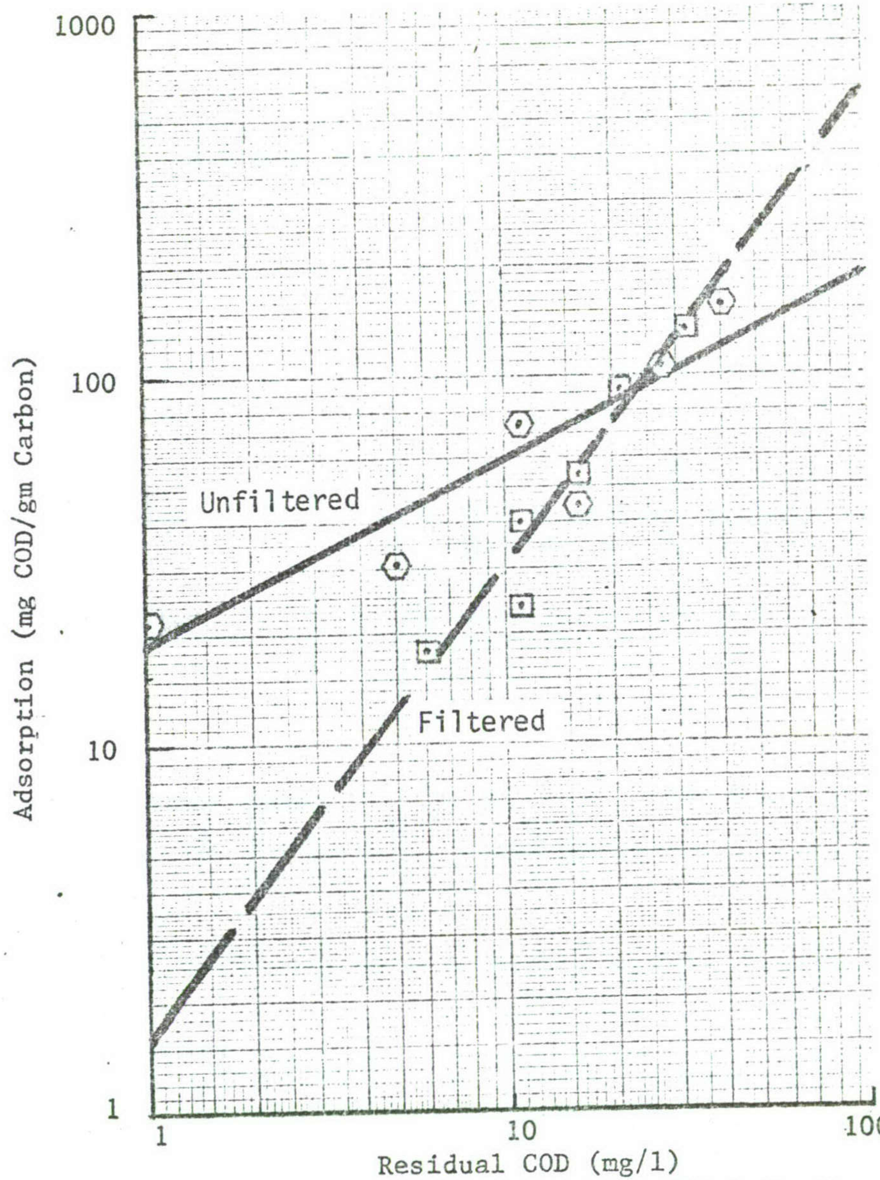


Figure E-19. McGuire AFB COD Freundlich Isotherm - Sewage Plant Secondary Effluent - EHL/K, Sep 1972

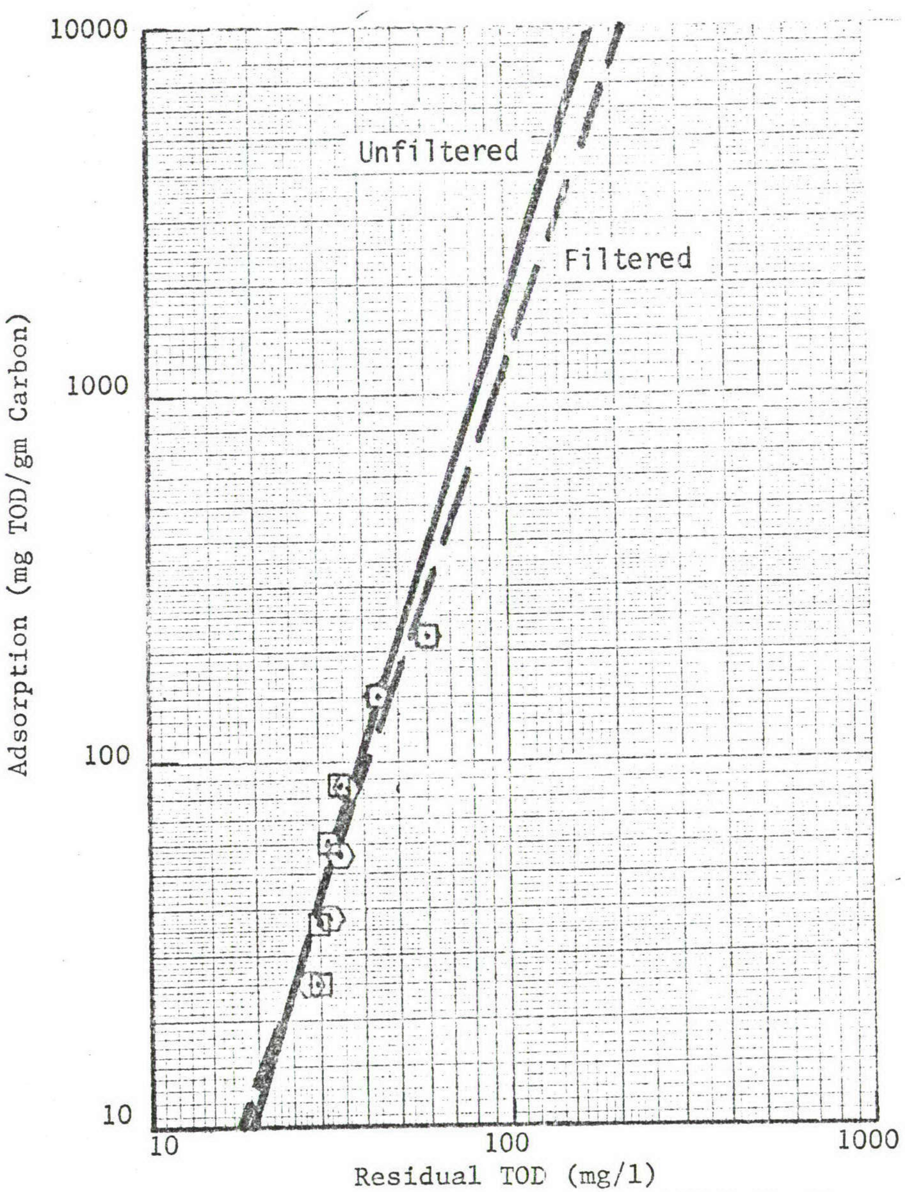


Figure E-20. McGuire AFB TOD Freundlich Isotherm - Sewage Plant Secondary Effluent - EHL/K, Sep 1972

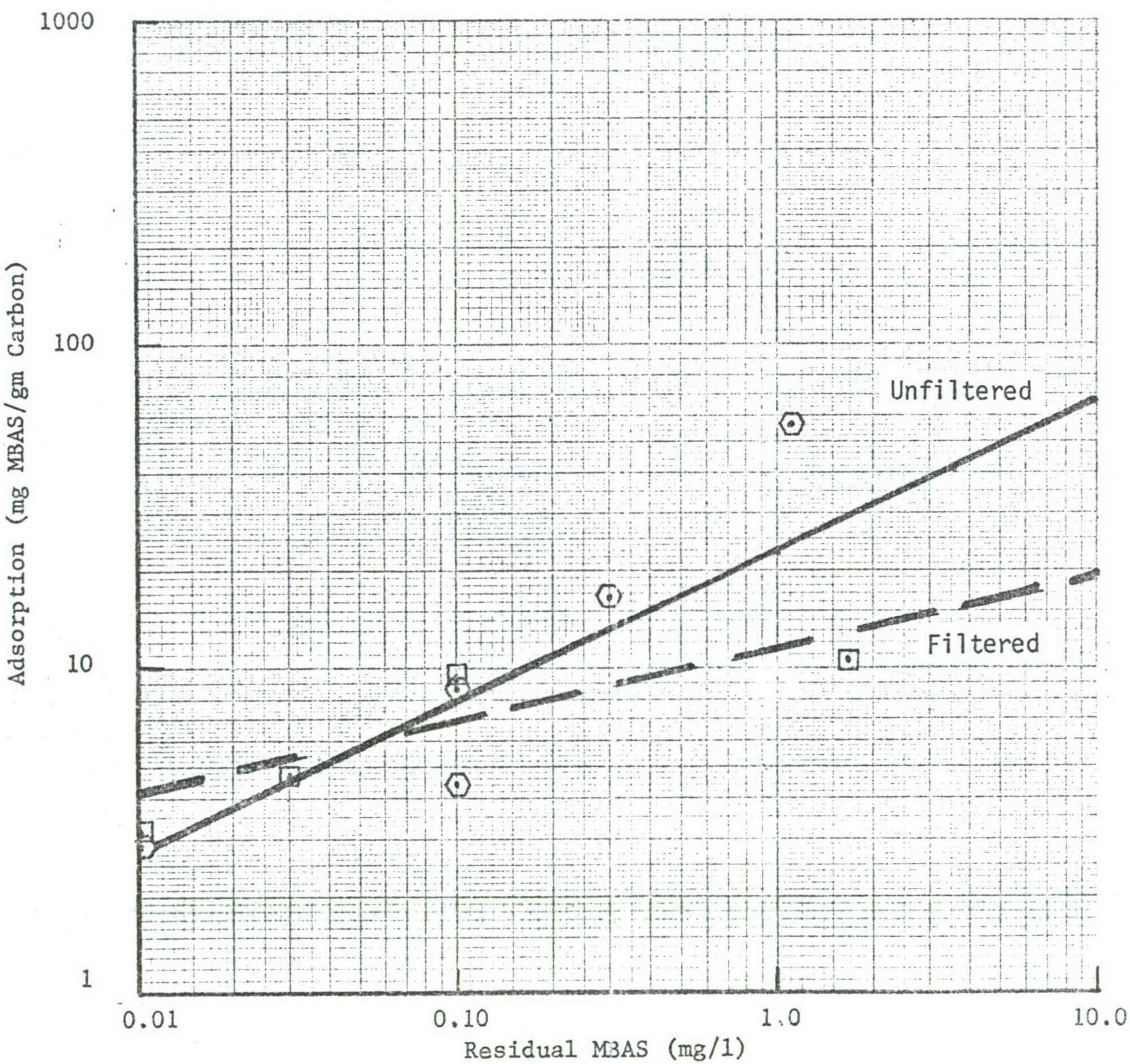


Figure E-21. McGuire AFB MBAS Freundlich Isotherm - Sewage Plant Secondary Effluent
EHL/K, Sep 1972

Table E-7. Ultimate Carbon Adsorption Capacities - Ft Dix/McGuire AFB NJ - USAF EHL/K Sep 1972

Parameter	Pounds Adsorbed/Pound Carbon	
	Unfiltered	Filtered
COD		
Dix	0.307	0.372
MAFB	0.156	0.293
TOD		
Dix	-	-
MAFB	1.200	1.20
MBAS		
Dix	-	-
MAFB	0.064	0.026

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1. Eckenfelder, W. W., Jr., "Industrial Water Pollution Control," McGraw Hill Book Co., New York NY, 1966, p. 93.

2. Environmental Protection Agency (EPA), "Process Design Manual for Suspended Solids Removal," Ch. 4, Burns and Roe, Inc., Oakdell NJ, Oct 1971.

3. Laughlin, J., "Modifications of a Trickling Filter Plant to Allow Chemical Precipitation," Advanced Waste Treatment and Water Reuse Symposium, Presented by Env Prot Agency, Dallas TX, Jan 12-14 1971.

4. Eckenfelder, W. W., and D. L. Ford, "Water Pollution Control - Experimental Procedures for Process Design," Pemberton Press, New York NY, 1970, pp 201-205.

5. Fair, G. M., J. C. Geyer, and D. A. Okum, "Water and Wastewater Engineering," Volume 2, John Wiley and Sons, Inc., New York NY, 1968, p. 26-21.

6. EPA, "Process Design Manual for Carbon Adsorption," Ch 4, Swindell-Dressler Co., Pittsburgh PA, Oct 1971.

APPENDIX F

WATER QUALITY CRITERIA

Page

Tables

I. APPLICABLE WATER QUALITY CRITERIA AND EFFLUENT QUALITY REQUIREMENTS

Included in this appendix are copies of pertinent federal, State of New Jersey (NJDEP), and Delaware River Basin Commission (DRBC) criteria concerning water quality and treatment plant effluent quality. Executive Order (EO) 11507, Department of Defense (DoD) Directive 5100.50, Air Force Regulation 19-1, and applicable Army directives require Ft Dix and MAFB to insure that their sewage treatment facilities are designed, operated and maintained so as to conform with all applicable federal, state and local agency water quality standards adopted pursuant to the Federal Water Pollution Control Act of 1965, as amended. These directives further require that "performance specifications" be proposed for each treatment facility to meet the applicable requirements. Performance specifications are specific limits of discharges that will as a minimum provide for conformance with water quality standards.

II. INTERIM PERFORMANCE SPECIFICATIONS

A. BACKGROUND

Discussions with representatives of the Federal EPA and the NJDEP have resulted in the development of proposed interim performance specifications for the two sewage plants. These proposed specifications should apply for the interim period until a final decision is reached concerning the investigations of a regional wastewater management program involving both Ft Dix and MAFB. Long range performance specifications are not proposed at this time primarily because of the current emphasis on regionalization, the probable changes in state and federal criteria, and the possible future changes in mission requirements of Ft Dix or MAFB. If regionalization of wastewater management efforts in this basin does not materialize, then more stringent, long-range performance specifications for each of the sewage plants would have to be negotiated with the NJDEP and the DRBC through the EPA. Sufficient data and operating characteristics on the two sewage treatment facilities and the receiving waters are contained in this report to aid in any such future negotiations.

B. PROPOSED SPECIFICATIONS

Table F-1 contains the proposed interim performance specifications which are based on existing DRBC and NJDEP criteria (see attached documents, Section IV, this appendix).

Table F-1. Proposed Interim Performance Specifications for Ft Dix and MAFB Sewage Treatment Facilities

Parameter	DRBC/NJDEP	EHL/K
BOD_5	25	-
BOD_5	90 percent removal	-
SS	100	-
SS	90 percent removal	-
COD	-	80
TDS	-	400
MBAS (as LAS)	-	3.0
Phenol	-	0.015
Oil & Grease	10	-
Hg	0.01	-
Cr_{total}	0.10	-
Cr^{+6}	0.10	-
Pb	0.10	-
Zn	0.60	-
Cu	0.20	-
Ag	-	0.01
Ni	-	0.05
As	0.10	-
CN^-	-	0.01
Ba	2.0	-
Al	-	1.00
Cd	0.02	-
pH	6.5-8.5	-
Fecal Coliforms (Geom. Mean, per 100 ml)	-	300
Debris, Scum, Float. Materials	none	-
Toxicity (1:1 Dilution)	<96-hr TL_{50}	-
Odor (Thresh. Odor Nr)	250	-

III. COMPLIANCE WITH PROPOSED PERFORMANCE SPECIFICATIONS

Tables F-2 and F-3 are, respectively the summaries of the 24-hour and 12-hour composite sampling data collected during the field survey. The underlined entries in these tables represent lack of compliance with the proposed performance specifications. Some difficulties were encountered with the oils and grease analyses and the validity of these data are highly questionable.

Table F-2. Ft.Dix and MAFB Field Survey Data Summaries (24-Hour Flow - Composite Samples) Sewage Plant Effluents and Proposed Performance Specification Compliance (Underlined Entries Indicate Non-compliance)

Parameter	Perf. Spec.[1]	MAFB		Ft. Dix	
		Range	Mean	Range	Mean
BOD_5	25	<20.0-26.4	<23.7	<12.0-<24.0	<20.9
BOD_5	90% Rem	>70.4->87.7	>80.8	>88.6-92.7	>89.7
SS	100	22.0-53.0	39.3	33.0-46.0	38.3
SS	90% Rem	63.2-81.0	76.5	76.0-86.5	79.7
COD	80	45-133	94.1	45-128	80.0
TDS	400	170-246	206	266-312	284
MBAS (as LAS)	3.0	4.2-6.0	5.3	1.6-3.8	2.38
Phenol	0.015	0.005-0.025	0.010	<0.001-0.030	<0.012
Oil & Grease	10	89-231	152	19-271	115.7
Hg	0.01	-<0.005	<0.005	-<0.005	<0.005
Cr^{total}	0.10	-<0.05	<0.05	-<0.05	<0.05
Cr^{+6}	0.10	-<0.001	<0.001	-<0.001	<0.001
Pb	0.10	-<0.05	<0.05	-<0.05	<0.05
Zn	0.60	0.01-0.03	0.02	0.01-0.09	0.043
Cu	0.20	0.03-0.08	0.056	<0.02-0.04	0.024
Ag	0.01	-<0.01	<0.01	-<0.01	<0.01
Ni	0.05	-<0.04	<0.04	-<0.04	<0.04
As	0.10	-<0.01	0.01	0.01-0.02	0.015
CN	0.01	-<0.01	<0.01	-<0.01	<0.01
Ba	2.00	-<1.0	<1.0	<1.0-1.20	<1.03
Al	1.00	0.12-0.52	0.22	0.30-6.30	1.397
Cd	0.02	<0.10	<0.10	-<0.01	<0.01
pH	6.5-8.5	6.9-7.5	-	7.2-7.5	-
Fecal Coliforms (Geo. Mean/ 100 ml)	300	-	160	-	233
Debris, Scum, Float, Material	None	See Note 2		See Note 2	
Toxicity	<96 hr TL_{50}	See Note 3		See Note 3	
Odor	250	See Note 4		See Note 4	

NOTES: 1. All data tabulated in mg/l except for percent removals (%), pH (pH units) and fecal coliforms.
2. Resuspended solids present in plant effluents (see text).
3. No toxicity in unchlorinated effluents (see text)
4. Odor tests not conducted.

Table F-3. Ft Dix and MAFB Field Survey Data Summaries (12-hour, Flow - Composite Samples) Sewage Plant Effluents and Proposed Performance Specification Compliance (Underlined Entries Indicate Non-compliance).

Parameter	Perf. Spec.*	MAFB		Ft. Dix	
		Range	Mean	Range	Mean
BOD_5	25	<12.0-35.0	<24.4	<12.0-28.8	<20.1
BOD_5	90% Rem	71.1->89.7	79.9	79.7->95.1	91.2
SS	100	26.0-48.0	35.0	24.0-40.0	32.5
SS	90% Rem	74.8-80.6	77.0	81.8-85.0	82.5
COD	80	98.0-116.0	108.0	77.0-109.0	94.4
TDS	400	208-352	279	214-284	260
MBAS (as LAS)	3.0	5.8-10.5	6.86	1.4-2.4	1.94
Phenol	0.015	0.015-0.025	0.019	0.005-0.035	0.019
Oil & Grease	10	83.0-103.0	93.0	52-87	69.5
Hg	0.01	-	-	-	-
Cr_{total}	0.10	-<0.05	<0.05	-<0.05	<0.05
Cr^{+6}	0.10	<0.001-0.10	<0.026	<0.001-0.010	<0.003
Pb	0.10	-<0.05	<0.05	-<0.05	<0.05
Zn	0.60	0.04-0.05	0.044	0.05-0.08	0.066
Cu	0.20	-<0.02	<0.02	-<0.02	<0.02
Ag	0.01	-<0.01	<0.01	<0.01-0.02	0.012
Ni	0.05	-<0.04	<0.04	-<0.04	<0.04
As	0.10	-	-	-	-
CN	0.01	-<0.01	<0.01	-<0.01	<0.01
Ba	2.00	-<1.00	<1.00	-<1.00	<1.00
Al	1.00	0.18-0.26	0.212	0.48-0.66	0.55
Cd	0.02	<0.01	<0.01	-<0.01	<0.01
pH	6.5-8.5	6.7-6.8	-	7.0-7.4	-

NOTE: All data tabulated in mg/l except for percent removals (%) and pH (pH units).

IV. PERTINENT FEDERAL, STATE AND DRBC CRITERIA

This section contains the following documents.

RULES AND REGULATIONS
ESTABLISHING SURFACE WATER QUALITY CRITERIA

June 30, 1971

New Jersey Department of Environmental Protection

Richard J. Sullivan, *Commissioner*

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL
PROTECTION

Office of the Commissioner

FOREWORD

On the following pages surface water quality criteria are set forth which have been adopted by the New Jersey Department of Environmental Protection.

These criteria are definitions of acceptable water quality for the various categories of surface waters in our state. They are not intended to be enforcement standards in their own right. They represent water quality objectives hopefully to be met through a rigorous enforcement program.

The entry of wastes into a stream cannot be permitted if it will cause the quality of the stream to fail to meet the criteria. For waterways that are already polluted all waste treatment effluents and other sources of pollution must be upgraded or eliminated to permit the restoration of quality as defined by the criteria. In all such cases standards are imposed upon the effluent in the form of existing treatment regulations, administrative orders, or where necessary, orders of the court.

Similar control over effluent quality will be imposed as a condition of obtaining the required State permit for the construction of any new industrial or community waste treatment facilities. Such facilities should have incorporated in them pollution control in keeping with the currently accepted state of the art. Only by stringent regulation of effluent quality will we have any chance whatever of causing our waterways to meet these quality criteria.

Richard J. Sullivan
Commissioner

Approved: 30 June 1971

Filed With Secretary of State: 30 June 1971

INTRODUCTION

The water resources management concept is vital to an effective water pollution control program. The waters of this State are priceless natural resources which must be properly managed if they are to be retained useable for their best purposes.

The basis for such an effort includes establishing a system of defining the best uses for all surface waters including not only the present but also possible future uses and recognizing the possibility of a variety of compatible uses. This then permits the development of quality values or parameters for such best uses. These two measures are incorporated in the regulations.

The general ranking of uses to be protected for all of New Jersey's fresh, tidal and coastal waters include but are not necessarily limited to the following:

(1) Fresh Surface Waters

- (a) Those set aside for posterity to represent the natural aquatic environment and its associated biota.
- (b) Public water supply.
- (c) Recreation.
- (d) Maintenance, migration and propagation of natural and established biota.
- (e) Industrial water supply.
- (f) Agricultural water supply.
- (g) Navigation.

(2) Tidal Waters

- (a) Shellfish harvesting.
- (b) Public water supply.
- (c) Recreation.
- (d) Maintenance, migration and propagation of the natural and established biota.
- (e) Fish passage and survival.
- (f) Industrial water supply.
- (g) Agricultural water supply.
- (h) Navigation.

(3) Coastal Waters

- (a) Recreation.
- (b) Maintenance, migration and propagation of the natural and established biota.

In the Water Quality Act of 1965, the U. S. Congress authorized the establishment of water quality standards for interstate (including coastal) waters. The purpose of these standards is the protection and enhancement of the quality and productivity of the nation's interstate waters to serve a variety of beneficial uses. This Act, which amended the Federal Water Pollution Control Act, requires that the States establish standards for their interstate waters subject to review and approval by the Secretary of the Interior. The responsibility for this and other water pollution control functions has since been transferred from the Secretary of the Interior to the Administrator of the U. S. Environmental Protection Agency.

The standards serve as both State and Federal standards which are enforceable under the State water pollution control statutes and the Federal Water Pollution Control Act, as amended (Section 10).

These water quality standards actually consist of the following three major components:

(a) A statement of policy on the protection and enhancement of water resources including numerical values and narrative descriptions of water quality parameters for specific water uses.
(b) Classification of surface waters designating specific best uses.
(c) A plan of implementation and enforcement including treatment and control requirements for all wastewaters discharged into or affecting surface waters.

The State Department of Health, the agency previously responsible for water pollution control, adopted regulations effective September 1, 1964 establishing numerical values and narrative descriptions of water quality parameters for specific water uses. It is these September 1, 1964 regulations that are to be amended and updated and will hereinafter be referred to in this document as "Surface Water Quality Criteria." The other two components of New Jersey's water quality standards (b and c above) will, if necessary, be amended in the future and submitted to the Administrator of the U. S. Environmental Protection Agency for approval.

In addition to the adoption of Surface Water Quality Criteria, the Department has classified New Jersey's waters, interstate and intrastate, as to their best intended uses. The water quality standards were submitted to the Department of Interior on June 27, 1967 for Federal approval in accordance with the statutory timetable. Subsequently, certain revisions were made in the original submission. The Secretary of the Interior on March 13, 1968 approved the standards with certain exceptions.

The exceptions contained in the Secretary's approval have been accommodated in these criteria. The criteria also reflect considerable reliance upon the findings and recommendations in the "Report of the Committee on Water Quality Criteria" published April 1, 1968 by the Federal Water Pollution Control Administration.

The Surface Water Quality Criteria also reflect the efforts and opinions of members of the State Interdepartmental Committee on Surface Water Pollution Abatement. Representation on this Committee includes the Division of Water Resources, Division of Fish, Game and Shellfisheries, Division of Parks and Forests, all within the Department of Environmental Protection, the Division of Rural Resources of the Department of Agriculture, the Division of State and Regional Planning of the Department of Community Affairs, and the Division of Economic Development of the Department of Labor and Industry.

The amended Surface Water Quality Criteria consists of the following:

(a) Statement of policy on the protection and enhancement of water resources.

(b) Glossary of terms.
(c) Parameters of quality consisting of numerical values and narrative descriptions for defined water uses.

These criteria do not describe existing quality conditions of New Jersey's waterways. They do represent objectives of cleanliness which hopefully can be achieved through the administrative and enforcement mechanisms available to the State Department of Environmental Protection.

We believe that these criteria are achievable through rather severe wastewater treatment requirements that are already in effect in addition to the contemplated construction of regional water pollution control projects or the reconstruction and improvement of existing facilities. Additional measures may be required to deal with nonspecific pollution sources.

These criteria will provide the basis for protecting and enhancing the quality of both interstate and intrastate waters; they are compatible with those adopted by our neighboring states.

Considerable water quality data will be gathered and studies made to permit a continuing evaluation of the proposed criteria and effluent regulations. Scientific analyses of such data will, in turn, enable the Department to expand specific wastewater effluent quality standards including equitable load allocation for each approved discharge source. This approach has already been taken in the Delaware River Estuary area.

These criteria may also be utilized to assist in determining the influence of man's activities beyond those involving the discharge of used community or industrial waters. These indirect sources of water pollution include land development, water impoundments, dredging, landfills and agricultural operations.

It should be pointed out that the criteria are not intended to be applicable in instances where water quality does not conform to specified values solely as a result of natural causes.

With the exception of a relatively few toxic substances, tolerable levels of many toxic substances in waters have not been fully established. In addition, toxicity may vary depending upon the presence or interaction of different constituents and the nature or characteristics of the stream or waterway involved. Therefore, maximum permissible limits for toxic substances will be determined by appropriate bioassays in addition to available technical guidance.

Because of the complex interrelationships between the physical, chemical, biological and hydrological factors affecting the aquatic environment, utilization of these criteria, particularly where specific numerical values are involved, must be carried out with great care. Sufficient valid data must be obtained and assessed to determine with reasonable accuracy levels of quality for a particular waterway. This cannot be overemphasized since these criteria will be utilized not only by the State Department of Environmental Protection but by other water pollution control and water resource agencies, local boards of health, private citizens, civic and other groups.

These criteria and other information will guide the Department in determining the required degree of treatment, and therefore the quality of effluent for all waste treatment facilities.

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

RULES AND REGULATIONS

SURFACE WATER QUALITY CRITERIA

SECTION 1

A STATEMENT OF POLICY

1.1 Chapter 12 of Title 58 of the Revised Statutes of New Jersey (N.J.S.A.) 58:12-3 provides that no plant for the treatment of domestic or industrial wastes or other polluting substance from which the effluent is to flow into any of the waters of this State, shall be constructed except under such conditions as shall be established by the State Department of Environmental Protection.

1.2 The protection and enhancement of the quality and function of the waters of this State into which effluents from sewerage facilities are discharged is a principal objective of the State Department of Environmental Protection when considering the approval of designs for proposed sewerage facilities.

1.3 Waters which are designated to be retained in their natural state and therefore not subject to any man-made wastewater discharges shall be protected.

1.4 The protection and enhancement of the State's waterways shall take precedence over such allowable minimal water quality levels as may be established.

1.5 In all situations where there may be an impingement of a lesser quality water upon that of a higher quality of water, the lesser quality of water shall be upgraded in order to protect or improve adjacent higher quality waters.

1.6 Existing approved shellfish harvesting areas shall be protected. Tidal waters that now are at levels of quality below acceptable limits for shellfish harvesting shall be restored.

1.7 Any industry or community does not have the privilege of utilizing the theoretical capacity of surface waters to receive waste discharges.

1.8 Water is vital to life and comprises an invaluable natural resource which is not to be abused by any segment of the State's population or its economy.

1.9 Where existing water quality is better than the established criteria, the Department of Environmental Protection in the administration of its regulations shall maintain the quality of such waters unless it can be demonstrated that change is justifiable as a result of necessary economic or social development.

1.10 The water quality criteria for the main stem of the Delaware River (fresh and tidal) to and including the Delaware Bay are established in the current Water Quality Standards for the Delaware River Basin adopted by the Delaware River Basin Commission as part of its Comprehensive Plan.

1.11 The water quality criteria for the Raritan Bay shall be those established for TW-1 waters, as a minimum, but that the management of the quality of the water system comprising the Raritan Bay shall be such as to assure that regulations of the Interstate Sanitation Commission with respect to dissolved oxygen will be met.

1.12 The levels of quality specified for various water uses, where applicable, are expected to be maintained under conditions comprising minimum consecutive seven day fresh water flows with ten year recurrence intervals.

1.13 The minimum degree of wastewater treatment permitted shall consist of the reduction of biochemical oxygen demand by at least 80 percent at all times. Higher treatment requirements will be established where necessary.

1.14 Effective year-round disinfection shall be required for all treated wastewater discharges containing pathogenic organisms.

SECTION 2

GLOSSARY OF TERMS

2.1 Agricultural Water Supply - Water used for livestock or irrigation.

2.2 Anadromous Fish - Fish that spend a part of their lives in the sea or lakes, but ascend rivers to spawn.

2.3 Aquatic Substrata - Soil material and attached biota underlying the water.

2.4 Biota - The animal and plant life of the region; flora and fauna collectively.

2.5 Department - New Jersey State Department of Environmental Protection.

2.6 Eutrophic Lake - Lakes with a good supply of nutrients; they may support rich organic production, such as algae blooms and are commonly deficient in dissolved oxygen below the thermocline when stratified.

2.7 Industrial Water Supply - Water used for processing and cooling.

2.8 Mixing Zones - Localized areas of surface waters, as may be designated by the Department, into which wastewater effluents, including heat, may be discharged for the purpose of mixing, dispersing or dissipating such wastewater without creating nuisances or hazardous conditions.

2.9 Natural Temperature - Temperature that would exist in a waterway without the addition of heat of artificial origin.

2.10 Nontrout Waters - Waters, that because of their physical and/or chemical and/or biotic characteristics, are not suitable for trout but which, in general, are suitable for a wide variety of other fish species.

2.11 Primary Contact Recreation - Recreational activities that involve significant ingestion risks and including but not limited to the following: (1) wading, (2) swimming, (3) diving, (4) surfing, and (5) water skiing.

2.12 Secondary Contact Recreation - Recreational activities where the probability of significant contact or water ingestion is minimal and including but not limited to: (1) boating, (2) fishing, (3) and those other activities involving limited contact with surface waters incident to shoreline recreation.

2.13 Surface Water Classifications - Surface waters of this State identified as (1) Fresh (FW), (2) Tidal (TW) and (3) Coastal (CW). This includes both interstate and intrastate waters.

2.14 Thermocline - The layer in a body of water in which the drop in temperature equals or exceeds 1° C. per meter of depth.

2.15 Thermal Alterations - The increase or decrease in temperature of surface waters above or below the natural that may be caused by the activities of man.

2.16 Trout Maintenance Waters - Waters that support trout throughout the year or which have high potential for such use pending the correction of short term environmental alterations. Waters in which the biotic community is manipulated for the purpose of trout maintenance and which are otherwise not naturally suited for such purposes are not included.

2.17 Trout Production Waters - Waters that are used by trout for spawning and/or nursery purposes during their first summer; or which are considered to have high potential for such use pending the correction of short term environmental alterations.

2.18 Wildlife - All undomesticated animals and fowl.

SECTION 3

SURFACE WATER USE DESIGNATIONS AND CRITERIA OF QUALITY TO BE MAINTAINED IN WATERS SO DESIGNATED

* * *

SECTION 3.1 - SURFACE WATER QUALITY CRITERIA FOR FW-1 WATERS

CLASS FW-1 - Fresh waters, including rivers, streams, lakes, or other bodies of water, that because of their clarity, color, scenic setting, or other characteristic of aesthetic value or unique special interest, have been designated by authorized State agencies in conformance with laws pertaining to the use of private lands, are set aside for posterity to represent the natural aquatic environment and its associated biota.

3.1.1 These waters shall be maintained as to quality in their natural state and shall not be subject to any man-made wastewater discharges.

SECTION 3.2 - SURFACE WATER QUALITY CRITERIA FOR FW-2 WATERS

CLASS FW-2 - Fresh surface waters approved as sources of public water supply. These waters shall be suitable for public potable water supply after such treatment as shall be required by the Department.

These waters shall also be suitable for the maintenance, migration and propagation of the natural and established biota; and for primary contact recreation; industrial and agricultural water supply and any other reasonable uses.

3.2.1 FLOATING SOLIDS, SETTLEABLE SOLIDS, OIL, GREASE, COLOR AND TURBIDITY

None noticeable in the water or deposited along the shore or on the aquatic substrata in quantities detrimental to the natural biota. None which would render the waters unsuitable for the designated uses.

3.2.2 TOXIC OR DELETERIOUS SUBSTANCES INCLUDING BUT NOT LIMITED TO MINERAL ACIDS, CAUSTIC ALKALI, CYANIDES, HEAVY METALS, CARBON DIOXIDE, AMMONIA OR AMMONIUM COMPOUNDS, CHLORINE, PHENOLS, PESTICIDES, ETC.

None, either alone or in combination with other substances, in such concentrations as to affect humans or be detrimental to the natural aquatic biota or which would render the waters unsuitable for the designated uses. None which would cause the Potable Water Standards of the Department for drinking water to be exceeded after appropriate treatment.

3.2.3 TASTE AND ODOR PRODUCING SUBSTANCES

None offensive to humans or which would produce offensive tastes and/or odors in water supplies and fauna used for human consumption. None which would render the waters unsuitable for the designated uses.

3.2.4 pH

Between 6.5 and 8.5.

3.2.5 DISSOLVED OXYGEN

(a) Trout Production Waters - Not less than 7.0 mg/l at any time.

(b) Trout Maintenance Streams - Daily average not less than 6.0 mg/l. Not less than 5.0 mg/l at any time.

(c) Trout Maintenance Lakes - Daily average not less than 6.0 mg/l. Not less than 5.0 mg/l at any time.

In eutrophic lakes when stratification is present, not less than 4.0 mg/l in or above the thermocline where water temperatures are below 72° F. At depths where the water is 72° F. or above, daily average not less than 6.0 mg/1 and not less than 5.0 mg/1 at any time.

(d) Nontrout Waters - Daily average not less than 5.0 mg/1. Not less than 4.0 mg/1 at any time.

3.2.6 TEMPERATURE

(a) Trout Production Waters - Natural temperatures shall prevail except where properly treated wastewater effluents may be discharged. Where such discharges occur, stream temperatures shall not be raised more than 1° F.

(b) Trout Maintenance Streams - No heat may be added which would cause temperatures to exceed 2° F. over the natural temperatures at any time or which would cause temperatures in excess of 68° F.

Reductions in temperatures may be permitted where it can be shown that trout will benefit without detriment to other designated water uses. The rate of temperature change in designated mixing zones shall not cause mortality of the biota.

(c) Trout Maintenance Lakes - No thermal alterations except where it can be shown to benefit the designated uses.

(d) Nontrout Waters - No thermal alterations, except in designated mixing zones, which would cause temperatures to deviate more than 5° F. at any time from natural stream temperatures or more than 3° F. in the epilimnion of lakes and other standing waters.

No heat may be added, except in designated mixing zones, which would cause temperatures to exceed 82° F. for small mouth bass or yellow perch waters or 86° F. for other nontrout waters.

The rate of temperature change in designated mixing zones shall not cause mortality of the biota.

3.2.7 RADIOACTIVITY

Current U. S. Public Health Service Drinking Water Standards shall apply.

3.2.8 BACTERIAL QUALITY

Fecal coliform levels shall not exceed a geometric mean of 200/100 ml. Samples shall be obtained at sufficient frequencies and at locations and during periods which will permit valid interpretation of laboratory analyses.

Appropriate sanitary surveys shall also be carried out as a supplement to such sampling and laboratory analyses.

SECTION 3.3 - SURFACE WATER QUALITY CRITERIA FOR FW-3 WATERS

CLASS FW-3 - Fresh surface waters suitable for the maintenance, migration and propagation of the natural and established biota; and for primary contact recreation; industrial and agricultural water supply and any other reasonable uses.

3.3.1 FLOATING SOLIDS, SETTLEABLE SOLIDS, OIL, GREASE, COLOR AND TURBIDITY

None noticeable in the water or deposited along the shore or on the aquatic substrata in quantities detrimental to the natural biota. None which would render the waters unsuitable for the designated uses.

3.3.2 TOXIC OR DELETERIOUS SUBSTANCES INCLUDING BUT NOT LIMITED TO MINERAL ACIDS, CAUSTIC ALKALI, CYANIDES, HEAVY METALS, CARBON DIOXIDE, AMMONIA OR AMMONIUM COMPOUNDS, CHLORINE, PHENOLS, PESTICIDES, ETC.

None, either alone or in combination with other substances, in such concentrations as to affect humans or be detrimental to the natural aquatic biota or which would render the waters unsuitable for the designated uses.

3.3.3 TASTE AND ODOR PRODUCING SUBSTANCES

None offensive to humans or which would produce offensive tastes and/or odors in fauna used for human consumption. None which would render the waters unsuitable for the designated uses.

3.3.4 pH

Between 6.5 and 8.5.

3.3.5 DISSOLVED OXYGEN

(a) Trout Production Waters - Not less than 7.0 mg/1 at any time.

(b) Trout Maintenance Streams - Daily average not less than 6.0 mg/1. Not less than 5.0 mg/1 at any time.

(c) Trout Maintenance Lakes - Daily average not less than 6.0 mg/1. Not less than 5.0 mg/1 at any time.

In eutrophic lakes when stratification is present, not less than 4.0 mg/1 in or above the thermocline where water temperatures are below 72° F. At depths where the water is 72° F. or above, daily average not less than 6.0 mg/1 and not less than 5.0 mg/1 at any time.

(d) Nontrout Waters - Daily average not less than 5.0 mg/1. Not less than 4.0 mg/1 at any time.

3.3.6 TEMPERATURE

(a) Trout Production Waters - Natural temperatures shall prevail except where properly treated wastewater effluents may be discharged. Where such discharges occur, stream temperatures shall not be raised more than 1° F.

(b) Trout Maintenance Streams - No heat may be added which would cause temperatures to exceed 2° F. over the natural temperatures at any time or which would cause temperatures in excess of 68° F.

Reductions in temperatures may be permitted where it can be shown that trout will benefit without detriment to other designated water uses. The rate of temperature change in designated mixing zones shall not cause mortality of the biota.

(c) Trout Maintenance Lakes - No thermal alterations except where it can be shown to benefit the designated uses.

(d) Nontrout Waters - No thermal alterations, except in designated mixing zones which would cause temperatures to deviate more than 5° F. at any time from natural stream temperatures or more than 3° F. in the epilimnion of lakes and other standing waters.

No heat may be added, except in designated mixing zones, which would cause temperatures to exceed 82° F. for small mouth bass or yellow perch waters or 86° F. for other nontrout waters.

The rate of temperature change in designated mixing zones shall not cause mortality of the biota.

3.3.7 RADIOACTIVITY

Current U. S. Public Health Service Drinking Water Standards shall apply.

3.3.8 BACTERIAL QUALITY

Fecal coliform levels shall not exceed a geometric mean of 200/100 ml. Samples shall be obtained at sufficient frequencies and at locations and during periods which will permit valid interpretation of laboratory analyses.

Appropriate sanitary surveys shall also be carried out as a supplement to such sampling and laboratory analyses.

Required Changes in New Jersey Water Quality Standards.

Items*	State/Federal Classification	Required Changes**
3.1	Class FW-1/A	Satisfactory as written. Federal Criteria contained in 1, 2.1, 2.2, 5 and 6 must apply.
3.2	Class FW-2/A	
3.2.1 Floating solids; etc.		Federal Criteria 1.1, 1.2 & 1.3 must apply
3.2.2 Toxic or Deleterious Subs.		Federal Criteria 1.4 & 2.1.2 must apply.
3.2.4 pH		Federal Criteria 2.2.2 must apply.
3.2.5 D.O.		Federal Criteria 2.1.1.1 must apply, specifically:
b.		≥6.0 mg/l
c.		≥6.0 mg/l; Eutrophic Lakes: ≥5.0 mg/l and 6.0 mg/l
d.		≥5.0 mg/l (2.1.1.1c)
		Appropriate Federal Criteria contained in 1, 2.1, 2.2, 3, 4, 5, 6 and 7 not cited above must also apply.
3.3	Class FW-3/A	
3.3.1 Floating Solids, etc.		Federal Criteria 1.1, 1.2 and 1.3 must apply.
3.3.2 Toxic or Deleterious Subs.		Federal Criteria 1.4 & 2.1.2 must apply.
3.3.4 pH		Federal Criteria 2.2.2 must apply.
3.3.5 D.O.		Federal Criteria 2.1.1.1 must apply, specifically:
b.		≥6.0 mg/l
c.		≥6.0 mg/l; Eutrophic Lakes: ≥5.0 mg/l and ≥6.0 mg/l
d.		≥5.0 mg/l (2.1.1.1c)
		Appropriate Federal Criteria contained in 1, 2.1, 2.2, 3, 4, 5, 6 and 7 not cited above must also apply.

*Items refer to section of "Rules and Regulations Establishing Surface Water Quality Criteria."

**Except as otherwise noted, changes refer to sections of Attachment III.

Minimum Federal Water Quality Criteria

1. General Water Quality Criteria*

All surface waters shall meet generally accepted aesthetic qualifications and shall be capable of supporting diversified aquatic life. These waters shall be free of substances attributable to discharges or waste as follows:

1.1 Materials that will settle to form objectionable deposits.

1.2 Floating debris, oil, scum, and other matter.

1.3 Substances producing objectionable color, odor, taste, or turbidity.

1.4 Materials, including radionuclides, in concentrations or combinations which are toxic or which produce undesirable physiological responses in human, fish and other animal life, and plants.

1.5 Substances and conditions or combinations thereof in concentrations which produce undesirable aquatic life.

2. Specific Water Quality

2.1 For All Waters

2.1.1 Key Parameters

2.1.1.1 Dissolved Oxygen (DO)

a) Cold Fresh Waters (Trout Spawning)
Not less than 7.0 mg/l from other than natural conditions.

*Note: An example of how this statement may be expanded is shown in the Example Water Quality Standards, Attachment III, Part E.

b) Cold Fresh Waters (Trout)
Not less than 6.0 mg/l except that the DO may be between 5.0 and 6.0 for not more than 4 hours within any 24 hour period provided the water quality is favorable in all other respects and normal daily and seasonal fluctuations occur. In large streams that have some stratification or that serve principally as migratory routes DO levels may range between 4.0 and 5.0 mg/l for periods up to 6 hours, but in no case shall the DO be below 4.0 mg/l.

c) Fresh Waters (Streams, Unstratified Lakes and Epilimnion of Stratified Lakes)
Not less than 5.0 mg/l except that the DO may be between 4.0 and 5.0 mg/l for not more than 4 hours within any 24 hour period provided the water quality is favorable in all other respects, but in no case shall the DO be less than 4.0 mg/l.

d) Fresh Waters (Hypolimnion of Stratified Lakes)
Not less than 6.0 mg/l from other than natural conditions.

e) Marine Waters (Coastal)
Not less than 5.0 mg/l from other than natural conditions.

f) Estuarine Waters (Estuaries and Tidal Tributaries)
Not less than 5.0 mg/l from other than natural conditions. A DO of between 4.0 and 5.0 mg/l will be permitted for infrequent intervals and for limited periods of time where salinity is reduced (near the salt line), but at no time shall the DO be less than 4.0 mg/l.

2.1.1.2 Temperature

a) Cold Fresh Waters (Trout Spawning)

Natural temperatures shall prevail except where properly treated wastewater effluents may be discharged. Where such discharges occur, stream temperatures shall not be raised more than 1°F.

b) Cold Fresh Waters (Trout)

No heat may be added which would cause temperatures to exceed 2°F over the natural temperatures at any time or which would cause temperatures in excess of 68°F.

Reductions in temperatures may be permitted where it can be shown that trout will benefit without detriment to other designated water uses. The rate of temperature change in designated mixing zones shall not cause mortality of the biota.

c) Trout Maintenance Lakes

No thermal alterations except where it can be shown to benefit the designated uses.

d) Fresh Waters (Streams Unstratified Lakes, Epilimnion of Stratified Lakes)

No thermal alterations, except in designated mixing zones which would cause temperature to deviate more than 5°F. at any time from natural stream temperature or more than 3°F. in the epilimnion of lakes and other standing waters.

No heat may be added, except in designated mixing zones, which would cause temperatures to exceed 82°F. for small mouth bass or yellow perch waters or 86°F. for other non-trout waters.

The rate of temperature change in designated mixing zones shall not cause mortality of the biota.

e) Hypolimnion of Stratified Lakes

Unless a special study shows that a discharge of a heated effluent into the hypolimnion or pumping water from the hypolimnion (for discharging back into the same water body) will be desirable, such practice shall not be permitted.

f) Estuarine Waters

No heat may be added, except in designated mixing zones, which would cause temperatures to exceed 85°F., or which would cause the monthly mean of the maximum daily temperature at any site, prior to the addition of any heat, to be exceeded by more than 4°F. during September through May, or more than 1.5°F. during June through August. The rate of temperature change in disignated mixing zones shall not cause mortality of the biota.

g) Marine Waters

No heat may be added, except in designated mixing zones, which would cause the temperature to exceed 80°F. or which would cause the monthly mean of the maximum daily temperature at any site, prior to the addition of any heat, to be exceeded by more than 4°F. during September through May; or more than 1.5°F. during June through August. The rate of temperature change in designated mixing zones shall not cause

2.1.1.3 Dissolved Solids

a) Fresh Waters
Maximum dissolved solids of 500 mg/l or one third above (133%) natural characteristic levels, whichever is less.

b) Marine Waters
Not applicable.

2.1.1.4 Dissolved Gas

a) Cold Waters (Fresh & Marine)
Total dissolved gas pressure not to exceed 110 percent of existing atmospheric pressure.

2.1.1.5 Phosphorus as total P shall not exceed 100 μg/l in any stream nor exceed 50 μg/l in any reservoir, lake, estuary or offshore water, or at any point where it enters these receiving waters.

2.1.1.6 Suspended, Colloidal or Settleable Solids: None from waste water sources which will cause deposition or be deleterious for the designated uses.

2.1.1.7 Oil and Floating Substances: No residue attributable to waste water nor visible oil film nor globules of grease.

2.1.2 Radioactivity (USPHS - Drinking Water Standards shall apply)

2.1.2.1 Gross Beta	1,000 picocuries per liter in the absence of Sr^{90} and alpha emitters.
2.1.2.2 Radium-226	3 picocuries per liter
2.1.2.3 Strontium-90	10 picocuries per liter

2.2 Class A Waters

2.2.1 Microbiological - shall not exceed a geometric mean of 200 fecal coliforms (MPN) per 100 ml.

2.2.1 a) Shellfish - National Shellfish Sanitation Program (NSSP) microbiological standards shall apply, i.e. shall not exceed a median of 70 total coliforms (MPN) per 100 ml.

2.2.2 pH - shall be maintained between 6.5 and 8.3

pH - Marine - Normal range of pH must not be extended at any location by more than ± 0.1 pH unit. At no time shall the pH be less than 6.7 or greater than 8.3.

2.2.3 Taste and Odor Producing Substances - None in amounts that will interfere with use for primary contact recreation, potable water supply or will render any undesirable taste or odor to edible aquatic life.

2.2.4 Color and Turbidity - a Secchi disc shall be visible at a minimum depth of 1 meter.

2.3 Class B Waters

2.3.1 Microbiological - shall not exceed a geometric mean of 10,000 total coliforms or of 2,000 fecal coliforms (MPN) per 100 ml (Fecal coliform counts are preferred).

2.3.1 a) Shellfish - National Shellfish Sanitation Program (NSSP) standards shall apply, i.e. shall not exceed a median of 70 total coliforms (MPN) per 100 ml.

2.3.2 pH - shall be maintained between 6.0 and 9.0

pH - Marine - Normal range of pH must not be extended at any location by more than ± 0.1 pH unit. At no time shall the pH be less than 6.7 or greater than 8.5.

2.3.3 Taste and Odor Producing Substances - None in amounts that will interfere with the use for potable water supply or will render any undesirable taste or odor to edible aquatic life.

2.3.4 Color and Turbidity

a) Cold Waters - 10 Jackson Turbidity units (JTU)

b) Warm Waters - 50 Jackson Turbidity units (JTU)

c) Marine Waters - a Secchi disc shall be visible at a minimum depth of 1 meter.

3. Mixing Zones

The total area and/or volume of a receiving stream assigned to mixing zones shall be limited to that which will: (1) not interfere with biological communities or populations of important species to a degree which is damaging to the ecosystem; (2) not diminish other beneficial uses disproportionately.

4. Zones of Passage

In river systems, reservoirs, lakes, estuaries and coastal waters, zones of passage are continuous water routes of the volume, area and quality necessary to allow passage of free-swimming and drifting organisms with no significant effects produced on their populations. These zones must be provided wherever mixing zones are allowed.

Because of varying local physical and chemical conditions and biological phenomena, no single value can be given on the percentage of river width necessary to allow passage of critical free-swimming and drifting organisms so that negligible or no effects are produced on their populations. As a guideline, mixing zones should be limited to no more than 1/4 of cross-sectional area and/or volume of flow of stream or estuary, leaving at least 3/4 free as a zone of passage.

5. Analytical Testing

All methods of sample collection, preservation, and analysis used in applying any of the rules and regulations in these standards shall be in accord with those prescribed in "Standard Methods for the Examination of Water and Waste Water," Thirteenth Edition, or any subsequent edition with other generally accepted procedures.

6. Stream Flow

The water quality standards shall apply at all times except during periods when flows are less than the average minimum seven-day low flow which occurs once in ten years.

7. Minimum Treatment Requirements

The minimum treatment required for any wastewater must be such that discharges shall meet effluent limits as established under section 402 of the 1972 Amendments and shall not cause the Federal Criteria for instream water quality contained herein to be contravened.

NO. 72-

A RESOLUTION to interpret and quantify certain aspects of the Commission's Water Quality Standards.

WHEREAS, certain sections of the Commission's Water Quality Standards express stream quality objectives and effluent requirements in general non-quantitative terms; and

WHEREAS, the Commission held a public hearing on July 28, 1971, on a proposed Interpretive Guideline No. I to be used in administering certain sections of its Water Quality Standards, and numerous witnesses appeared to testify and their comments and views have been considered by the Commission; now therefore

BE IT RESOLVED by the Delaware River Basin Commission:

1. The following numerical definitions shall be used as guidelines by the Commission staff in administering sections 2-1.2(1), 2-1.3(1), 2-1.3(3), and 2-1.3(4) of the Water Quality Standards:

A. Stream Quality Objectives

(1) Limits.

a. Toxic substances.

i) The concentration of a toxic substance in Basin waters shall not exceed one-twentieth of the TL_{50} value at 96 hours, as determined by appropriate bioassays, except in mixing areas that may be designated by the Commission. Criteria for combinations of toxic substances will be based upon the same principle.

ii) The substances listed below shall not exceed the specified limits or one-twentieth of the TL_{50} value at 96 hours, whichever is lower.

	limit mg/l
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium (hexavalent)	0.05
Lead	0.05
Mercury	0.005
Selenium	0.01
Silver	0.05

iii) The concentration of a persistent pesticide 1/ in Basin waters shall not exceed one one-hundredth

1/ [Pers]istent pesticides are defined as natural and synthetic materials having a half-life of greater than 96 hours, which are used to ...

of the TL_{50} value at 96 hours, as determined by appropriate bioassay.

b. Oil. No readily visible oil.

B. Effluent Quality Requirements

(1) Suspended solids. For municipal and industrial waste treatment facilities, at least 90 percent removal as determined by an average of samples taken over each period of 30 consecutive days of the year and not to exceed 100 mg/l, whichever is less.

(2) Public safety.

a. Temperature. Maximum 110° F where readily accessible to human contact.

(3) Limits.

a. Oil. Not to exceed 10 mg/l; no readily visible oil.

b. Debris, scum, or other floating materials. None.

c. Toxicity.

i) Not more than 50 percent mortality in 96 hours in an appropriate bioassay test with a 1:1 dilution. Wastes containing chlorine may be dechlorinated prior to the bioassay test.

ii) Notwithstanding the results of the tests prescribed in paragraph (i) above, the substances listed below being accumulative or conservative, shall not exceed the following specified limits in an effluent:

	limit mg/l
Arsenic	0.1
Barium	2.0
Cadmium	0.02
Chromium (hexavalent)	0.10
Copper	0.20
Lead	0.10
Mercury	0.01
Selenium	0.02
Zinc	0.60

iii) Persistent pesticides - not to exceed one one-hundredth of the TL_{50} value at 96 hours as determined by appropriate bioassay.

d. Odor. Not to exceed a threshold number of 250.

e. BOD.

i) The former INCODEL Standards which were saved from repeal by Resolution 67-7 remain applicable; that is, no discharge shall exceed a daily average of 50 mg/l in Zone 1 and 100 mg/l in Zone 2. A slight deviation may be permitted by the Commission when it results from reduced secondary treatment plant efficiency caused by wastewater temperatures below 59° F (15° C).

ii) In Zones 2, 3, 4 and 5 a waste shall receive not less than zone percent reduction in addition to meeting allocation requirements.

2. These guidelines will be administered in accordance with the procedures contained in the Commission's Basin Regulations - Water Quality adopted March 7, 1968.

Chairman

Secretary

ADOPTED: January 26, 1972

Temp — DEL

NEW JERSEY STATE DEPARTMENT OF HEALTH
DIVISION OF CLEAN AIR AND WATER
WATER POLLUTION CONTROL PROGRAM

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL, SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE DELAWARE RIVER BASIN

WHEREAS, the State Department of Health is charged with the responsibility for the Water Pollution Control Program, including the approval of the designs of wastewater treatment facilities, in the State of New Jersey, and

WHEREAS, the State Department of Health did promulgate the rules and regulations entitled "Regulations Establishing Certain Classifications to be Assigned to the Waters of this State and Standards of Quality to be Maintained in Waters so Classified," effective September 1, 1964, and amended said rules and regulations on January 5, 1966 and March 6, 1967, and

WHEREAS, the State Department of Health did promulgate regulations entitled "Regulations Concerning Classification of the Surface Waters of the Delaware River Basin, Being Waters of the State of New Jersey," effective July 28, 1967, and

WHEREAS, the State Department of Health is of the opinion that the attainment and maintenance of water quality in the Delaware River Basin as specified by the aforesaid regulations of the Department is necessary in order to abate a present threat to the public health, comfort or property of citizens of this State.

NOW, THEREFORE, the State Department of Health promulgates the following regulations entitled "Regulations Concerning Treatment of Wastewaters, Domestic and Industrial, Separately or in Combination, Discharged into the Waters of the Delaware River Basin."

NEW JERSEY STATE DEPARTMENT OF HEALTH

Roscoe P. Kandle

Roscoe P. Kandle, M.D.
State Commissioner of Health

Filed with Secretary of State: October 17, 1967

Effective Date: November 17, 1967

NEW JERSEY STATE DEPARTMENT OF HEALTH
DIVISION OF CLEAN AIR AND WATER
WATER POLLUTION CONTROL PROGRAM

REGULATIONS CONCERNING TREATMENT OF WASTEWATERS, DOMESTIC AND INDUSTRIAL, SEPARATELY OR IN COMBINATION, DISCHARGED INTO THE WATERS OF THE DELAWARE RIVER BASIN, BEING WATERS OF THE STATE OF NEW JERSEY

Pursuant to the authority vested in it under the provisions of Chapter 12, Title 58 of the Revised Statutes, the State Department of Health hereby promulgates the following regulations concerning treatment of wastewaters, domestic and industrial, separately or in combination, discharged into the waters of the Delaware River Basin.

I. Henceforth, domestic wastes, separately or in combination with industrial wastes, prior to discharge into waters of the Delaware River Basin classified as FW-2, FW-3, TW-1 and TW-2, shall be treated to a degree providing, as a minimum, ninety percent (90%) of reduction of biochemical oxygen demand at all times including any four-hour period of a day when the strength of the wastes to be treated might be expected to exceed average conditions; it is an objective of this regulation that the biochemical oxygen demand of effluents discharged shall not exceed twenty-five (25) parts per million.

II. Henceforth, industrial wastes, prior to discharge into waters of the Delaware River Basin, classified as FW-2, FW-3, TW-1 and TW-2, shall be treated to a degree providing, as a minimum, ninety percent (90%) of reduction of biochemical oxygen demand at all times and such further reduction of biochemical oxygen demand as may be necessary to maintain the receiving waters, after reasonable effluent dispersion, as specified in the regulations entitled "Regulations Concerning Classification of the Surface Waters of the Delaware River Basin, Being Waters of the State of New Jersey," effective July 28, 1967; it is an objective of this regulation that the biochemical oxygen demand of effluents discharged shall not exceed twenty-five (25) parts per million.

III. Henceforth, domestic wastes, separately or in combination with industrial wastes, prior to discharge into the waters of the "main stem" of the Delaware River shall be treated to a degree providing for conformity with "Water Quality Standards for the Delaware River Basin" as adopted by the Delaware River Basin Commission on April 26, 1967 by its Resolution No. 67-7; it is an objective of this regulation that the biochemical oxygen demand of effluents discharged shall conform to all regulations of the Delaware River Basin Commission especially in relation to allocations of biochemical oxygen demand loadings.

IV. Henceforth, industrial wastes prior to discharge into waters of the "main stem" of the Delaware River Basin shall be treated to a degree providing for conformity with "Water Quality Standards for the Delaware River Basin" as adopted by the Delaware River Basin Commission on April 26, 1967 by its

Resolution No. 67-7; it is an objective of this regulation that the biochemical oxygen demand of effluents discharged shall conform to all regulations of the Delaware River Basin Commission especially in relation to allocation of biochemical oxygen demand loading.

V. It is recognized, especially in connection with some industrial wastes, that the pollution load imposed upon the waters of the Basin cannot be evaluated fully exclusively by the biochemical oxygen demand test; therefore, each industrial waste problem shall be considered individually and treatment shall be required as needed to effect compliance with the Water Quality Standards established for the various classifications of waters in the Basin.

VI. Treatment standards set by these regulations are the minimum acceptable for the Delaware River Basin. Treatment more intensive than that specified hereinabove shall be provided whenever it is determined by the State Department of Health that such treatment is necessary.

Filed with Secretary of State: October 17, 1967

Effective Date: November 17, 1967

APPENDIX G

Physical Chemical and Biological Evaluation of the Receiving Waters

Figures

APPENDIX G (contd)

APPENDIX G (contd)

APPENDIX G (contd)

I. INTRODUCTION

South Run is the receiving stream for the effluents of both Ft Dix and McGuire AFB sewage treatment plants. South Run originates on the Ft Dix reservation and flows about 5.5 miles to a confluence with Crosswicks Creek. North Run, South Run and Jumping Brook are the tributaries which form the headwaters of Crosswicks Creek. These tributaries originate in Burlington and Ocean Counties and flow north through Monmouth County and then west to the Delaware River at Trenton forming the northern boundry for Burlington County. Crosswicks Creek flows about 24 miles, mostly through Collington-Freehold type soils, which are acid, well-drained, sandy-loam soils with overlaying hardwood vegetation. Jumping Brook drains an area of bogs and pitch pine and the waters are strongly acid, red-brown in color (humic acids), and zero alkalinity. The topography of the area is flat to undulating and ranges from 50 to 150 feet above sea level.

II. GENERAL

The stream survey was limited to that part of Crosswicks Creek from the headwaters to a point ten miles downstream. Data were collected on a preliminary survey in April 1972 and during the main field survey period between 10 and 26 September 1972. Preliminary data summaries were provided in November 1972 to all interested parties. The stream survey was initiated to gather basic physical, chemical and biological data on the stream to: evaluate the effects of Fort Dix and McGuire AFB wastewater discharges on the stream; compile standards for future Fort Dix and McGuire AFB wastewater discharges; establish base line data for comparison with any future surveys; and, to evaluate the impact on the stream if wastewater discharges should cease.

III. SAMPLING STATION LOCATIONS

Eight primary sampling stations were selected. Station 1 on Jumping Brook was a control for the brown, acid waters. Stations 2, 3 and 4 were located on South Run; Station 7 was on North Run; Stations 5, 6 and 8 were on Crosswicks Creek. The stations were located from above the Ft Dix sewage treatment plant outfall to 0.5 miles below New Egypt. The location of each station is shown in Figure G-1. The tributaries to Crosswicks Creek are narrow, shallow and fast flowing. The reach from Station 5 to Station 8 includes a stretch of sluggish, deeper stream and a broad, shallow area called Oakford Lake. Figure G-2 contains cross-sections of the streams at the eight sampling stations.

IV. PHYSICAL AND CHEMICAL CHARACTERISTICS

Automatic composite daily samples were collected at each station for seven days (12-18 September) and grab samples were collected for four days (19-22 September). Exceptions were due to equipment malfunctioning at which time grab samples were substituted for composites. After reviewing

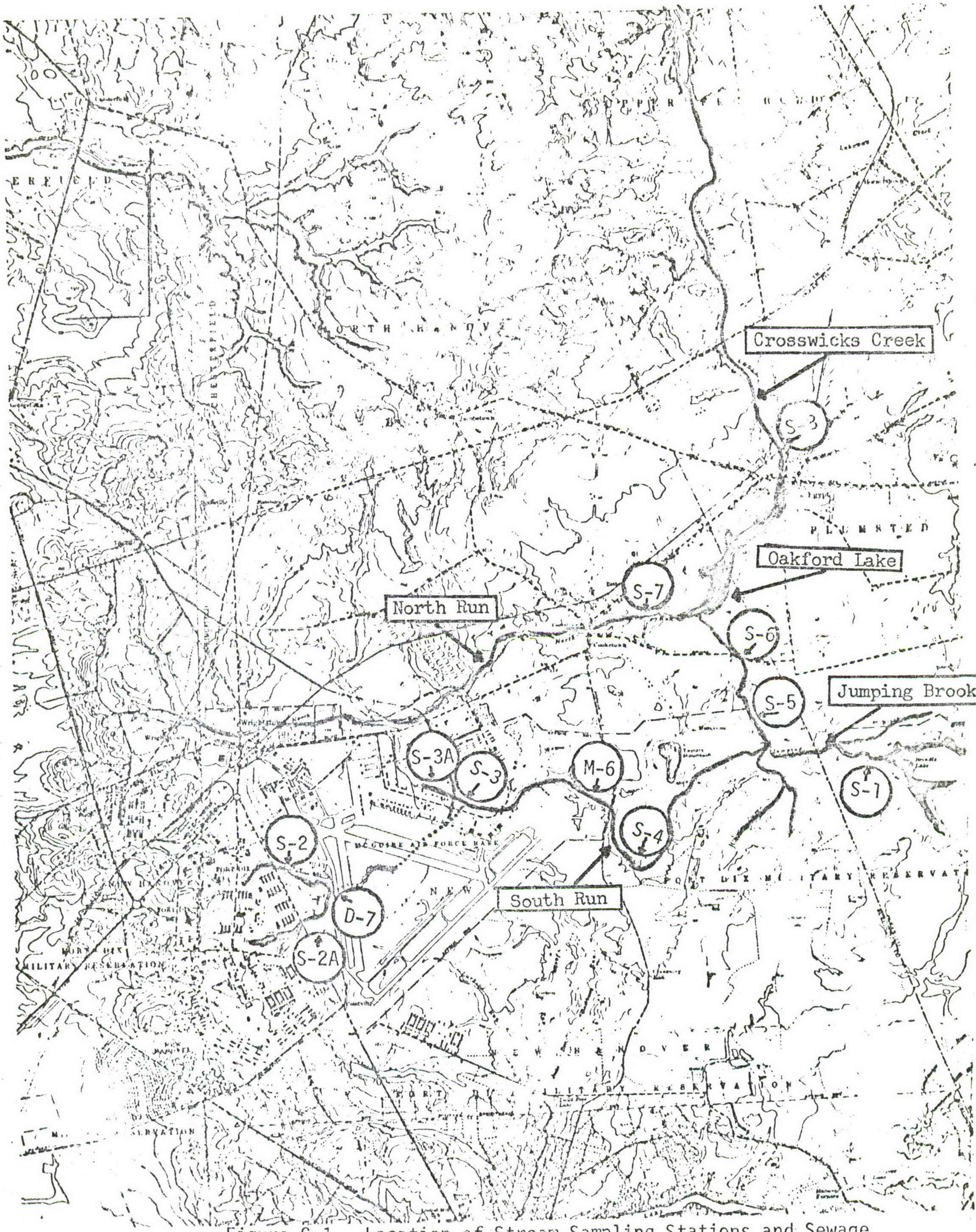


Figure G-1. Location of Stream Sampling Stations and Sewage Plant Outfalls, Ft Dix and McGuire AFB NJ, Sep 1972

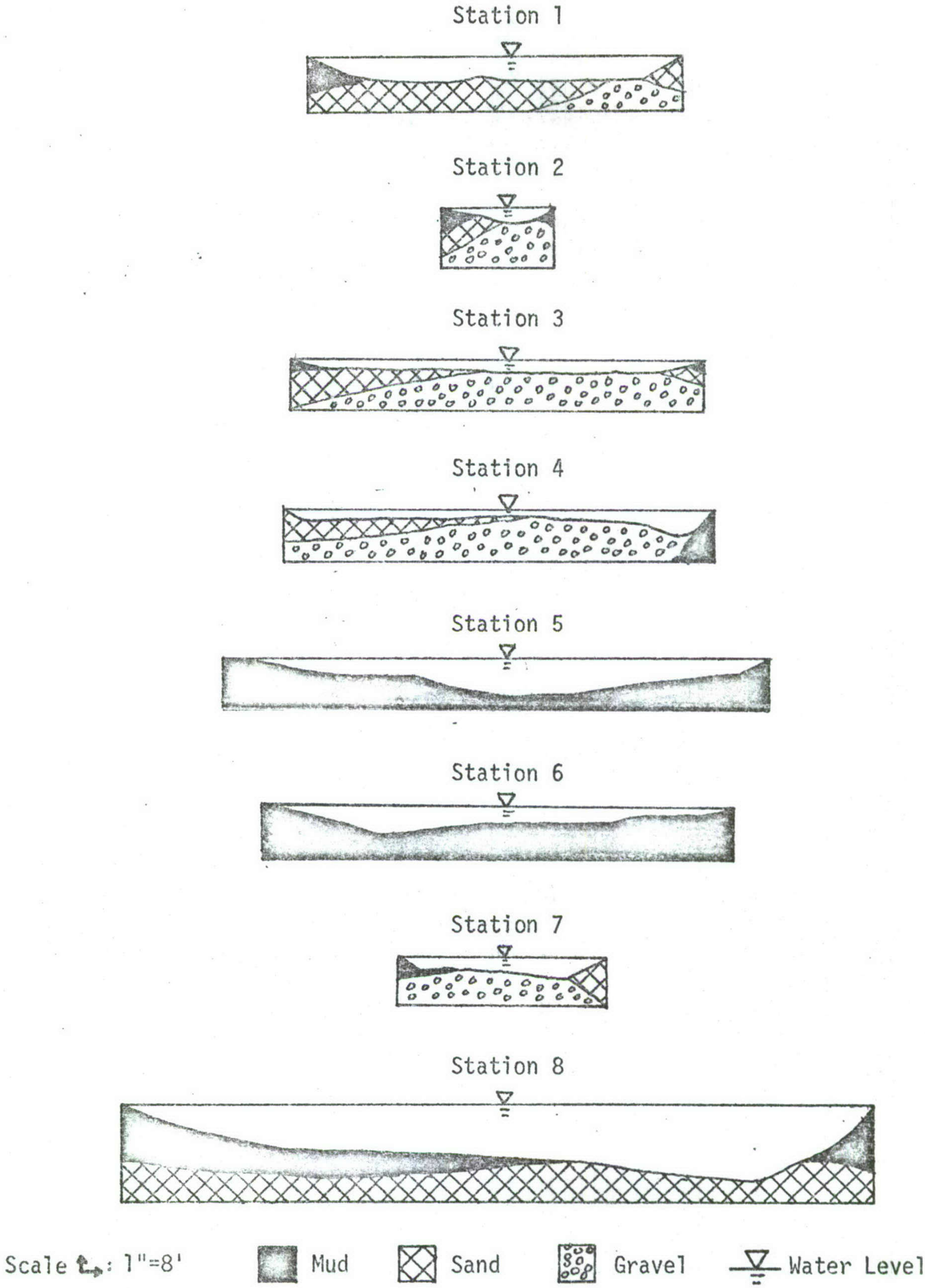


Figure G-2. Cross-Sections of Stream Sampling Stations, Fort Dix and McGuire AFB NJ, September 1972 the results, the grab sample results were noted to be similar to the composite sample results and consequently all results were treated as composites for data summaries. All analytical results for day 9 (September 19) were discarded from data summaries because heavy rainfall and flooding corrupted all samples. Appendix C contains stream water sampling data and statistical evaluations. Table G-1 is a summary of chemical analyses Data.

A. FLOW MEASUREMENTS

A U.S. Geological Survey (USGS) gauging station is located on Crosswicks Creek at Extonville NJ (Lt. 40° 08' 15", Long. 74° 36' 02", just upstream from highway bridge on Extonville Road). The drainage area for this station is 83.6 square miles. The drainage area for South Run in the vicinity of the Ft Dix/MAFB main cantonement areas is estimated to be 5.3 square miles. The ratio of these two drainage areas is 0.0634.

1. Historical Data. The natural flow in South Run in the Ft Dix/MAFB vicinity may be estimated by multiplying the ratio of the South Run drainage area (5.3 sq mi) to the total Crosswicks Creek drainage area (83.6 sq mi) by the gauged flow measurements at Extonville.(1) Using this method with USGS flow data, two frequency curves for the natural flow in South Run were generated. Figure G-3 is an average daily flow duration curve, and Figure G-4 is a consecutive day low flow frequency curve. Table G-2 contains a summary of 7-consecutive-day low flows at Extonville for various recurrence intervals. Worthy of note is the 10-year, 7-day low flow estimate for South Run, 0.915 MGD.

2. Field Survey Stream Flow Measurements. During the September field survey stream flow measurements were made using a velocity - area method. Figure G-5 is a graph of the mean daily flow measurements obtained during the course of the field survey for each stream station. The increased flows noted beginning on the afternoon of 18 September resulted from intense rainfall (1.32 inches in 30-hour period 18 and 19 Sep). Table G-3 contains the mean daily flow for each stream station for the dry (no precipitation) period of the field survey. Included in this tabulation are the estimated volumes of stream flow unaccounted for by actual stream measurements. The total of unaccounted for discharges to the receiving waters was approximtely 3.75 MGD. In general, these unmeasured discharges may be attributed to natural surface drainage from low-lying areas and from ground water flow to the surface water courses.

B. TEMPERATURE

The shallow waters of the receiving streams are directly affected by changes in atmospheric temperatures. Table G-4 lists selected temperature measurements of the receiving waters for the field survey. Very little change in stream water temperature due to STP effluents was measured during the survey, however, some temperature differences may

Table G-1. Mean Daily Chemical Analyses Data For the Stream Survey Stations, Ft Dix and McGuire AFB NJ, September 1972

Parameter	Stream Station							
	S-1	S-7	S-2	S-3	S-4	S-5	S-6	S-8
PH	4.325	6.737	6.225	6.850	6.987	6.775	6.762	6.762
ALKALINITY	.000	34.556	36.375	83.889	77.333	57.000	61.889	50.444
COLOR	700.000	36.250	40.000	47.500	43.750	145.000	155.000	111.429
TURBIDITY	8.625	7.250	10.375	12.500	11.875	11.750	14.500	18.250
TOTAL SOLIDS	124.571	156.250	203.500	232.000	216.571	176.571	168.250	241.571
SUSPENDED SOLIDS	74.000	17.000	25.667	32.000	28.444	26.556	48.667	41.556
DISSOLVED SOLIDS	49.143	140.250	175.625	201.500	189.429	148.857	118.500	200.143
TOTAL ORGANIC CARBON	43.625	8.000	7.875	17.125	16.125	17.625	20.000	16.125
TOTAL OXYGEN DEMAND	129.143	.000	6.571	94.714	81.143	75.429	83.714	56.429
TOTAL COD	90.000	19.000	37.111	51.300	42.600	42.400	49.200	40.600
BOD	17.000	3.244	4.437	14.244	12.267	11.267	11.256	10.344
BOD SOLUBLE	19.667	5.433	4.400	13.100	12.900	12.433	12.067	11.400
KJELDAHL NITROGEN	.625	.688	.563	12.437	10.562	6.875	8.438	4.937
AMMONIA NITROGEN	.100	.100	.175	6.900	6.175	5.267	5.100	3.012
NITRITES	.100	.100	.100	.267	.237	.300	.187	.162
NITRATES	.112	.737	.725	1.067	.662	.475	.437	.675
TOTAL PHOSPHATE	2.700	2.962	1.725	7.600	6.425	6.150	6.187	4.425
ORTHO PHOSPHATE	2.167	1.162	.575	5.237	5.062	4.862	5.125	2.687
OIL & GREASE	50.500	215.714	138.250	71.833	122.143	126.500	178.714	170.714
PHENOLS	.012	.063	.006	.008	.026	.006	.004	.004
MBAS	.164	.180	.917	1.542	1.978	1.546	1.270	.522
MERCURY	.005	.005	.005	.005	.005	.005	.005	.005
CHROMIUM	.050	.050	.050	.050	.050	.050	.050	.050
HEXAVALENT CHROMIUM	.001	.001	.001	.001	.001	.001	.001	.001
LEAD	.050	.050	.050	.050	.050	.050	.050	.050
ZINC	.016	.017	.016	.026	.014	.012	.014	.010
IRON	10.037	.613	.832	1.250	1.708	3.318	4.825	2.675
COPPER	.020	.020	.020	.021	.022	.020	.020	.020
SILVER	.010	.010	.010	.010	.010	.010	.010	.010
NICKEL	.040	.040	.040	.040	.040	.040	.040	.040
ARSENIC	.010	.010	.010	.010	.010	.010	.010	.010
CYANIDE	.010	.010	.010	.010	.010	.010	.010	.010
MANGANESE	.047	.045	.148	.157	.152	.050	.062	.023
BARIUM	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
ALUMINUM	.526	.269	.20[illegible]	.507	.367	.353	.631	.960
CADMIUM	.010	.010	.010	.010	.010	.010	.010	.010

NOTES: UNITS ARE AS FOLLOWS; TEMPERATURE IN DEGREES C, COLOR IN COLOR UNITS, PH IN PH UNITS, TURBIDITY IN JACKSON TURBIDITY UNITS. ALL OTHER DATA IN MG/L.

Table G-2. USGS Flow Measurements at Extonville NJ and South Run

Recurrence Interval (years)	7-Consecutive Day Low Flow (MGD)	
	At Extonville	In South Run
20	12.8	0.819
10	14.3	0.915
5	16.4	1.049
2	21.2	1.356
1.01	42.9	2.745

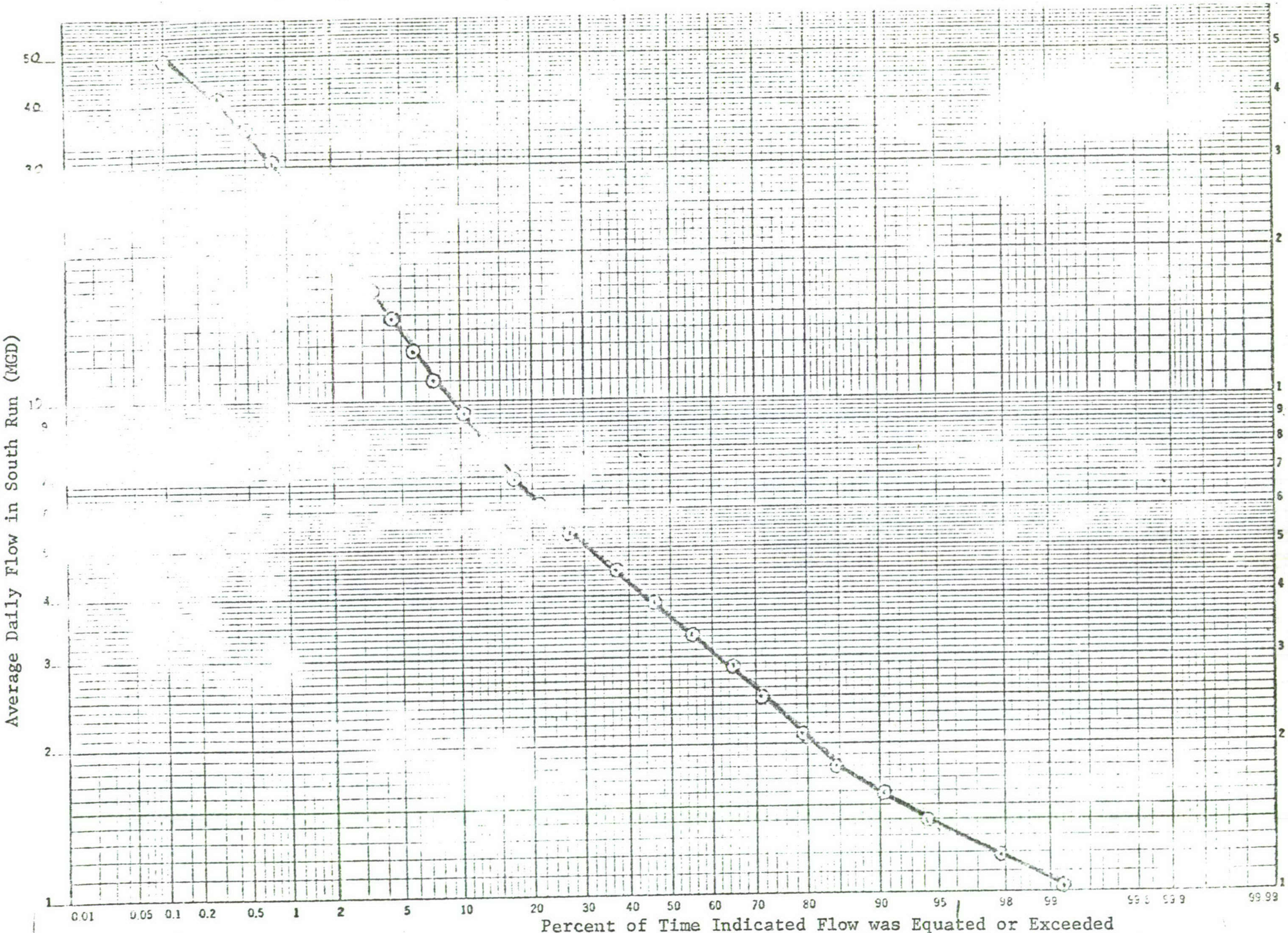


Figure G-3. Duration Curve of Daily Flow, South Run, Based on USGS Data on Crosswicks Creek at Extonville NJ, 1924-1967 (N = 9,487)

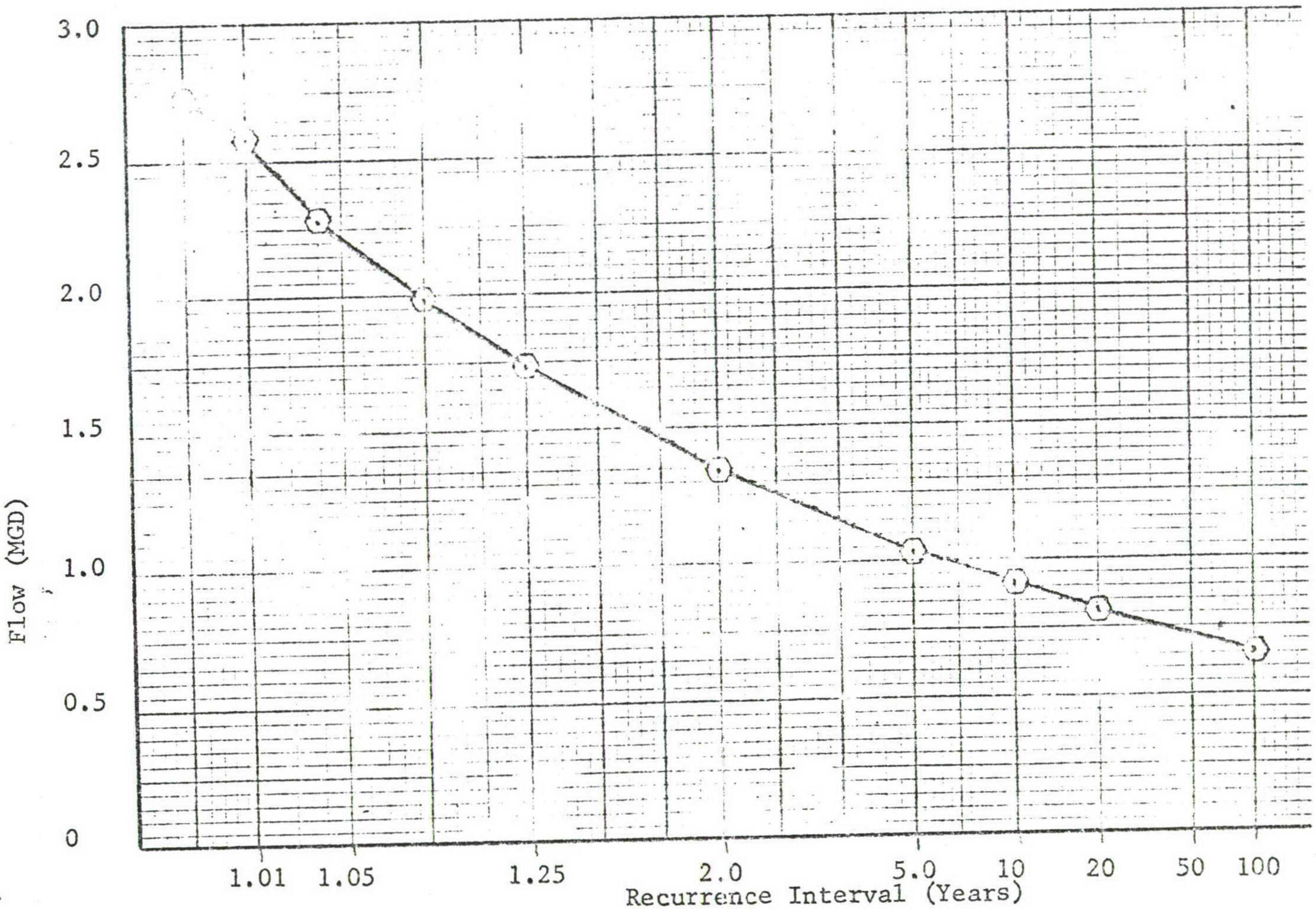


Figure G-4. Log-Pearson Type III 7-Consecutive Day Low Flow Frequency Curve, Crosswicks Creek and South Run NJ

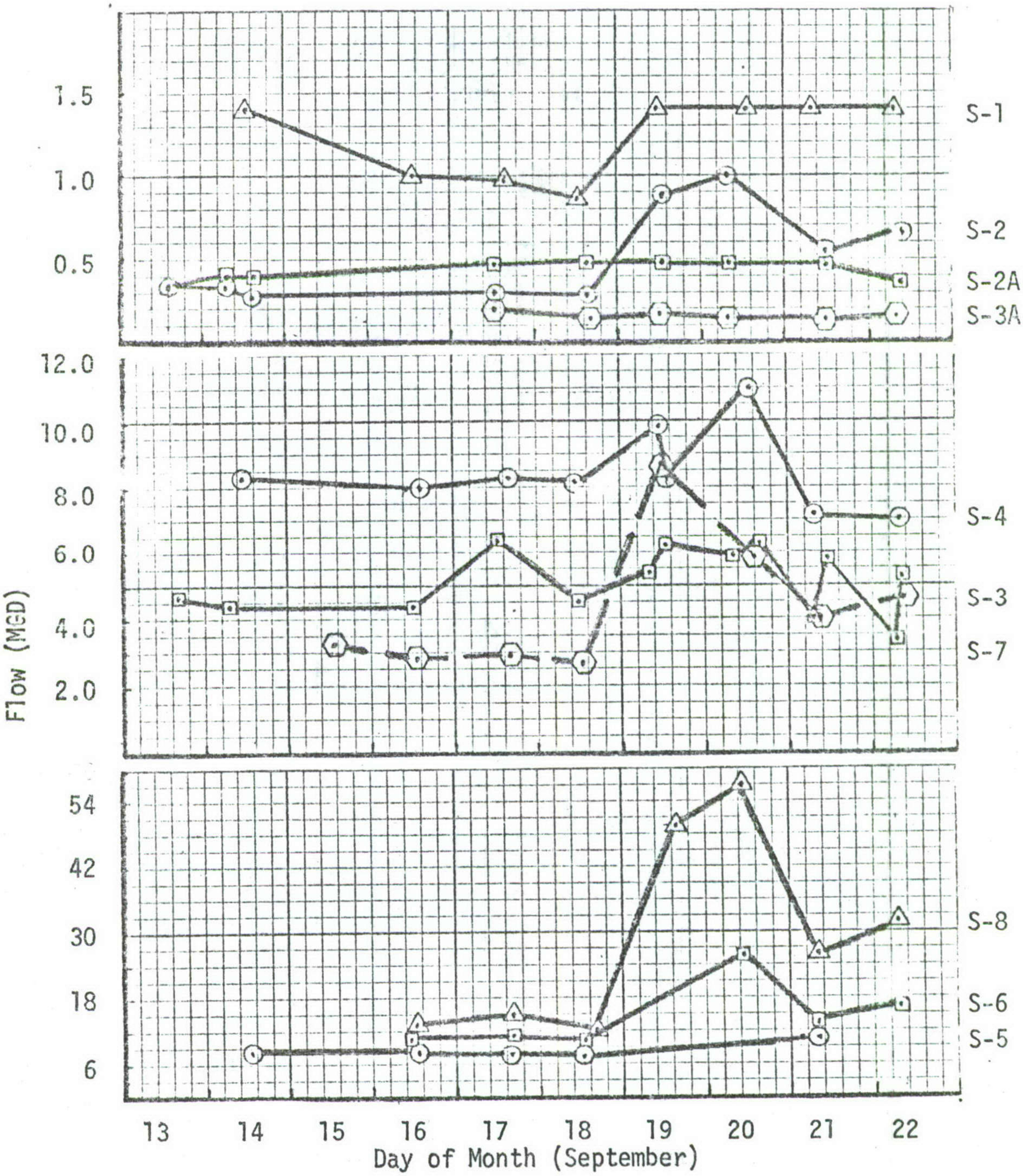


Figure G-5. Mean Daily Flow Measurements at Sampling Stations on South Run, North Run and Crosswicks Creek - Ft Dix/ McGuire AFB Field Survey, September 1972

Table G-3. Mean Daily Flow - South Run, North Run, Crosswicks Creek - Ft Dix/McGuire AFB Field Survey, September 1972

Stream Station	Measured Stream Flow (MGD)	Measured Discharge Point	Measured Discharge Flow (MGD)	Unmeasured Discharge Between	Unmeasured Discharge Flow (MGD)
S-2	0.3				
S-2A	0.5				
		D-7	3.0		
S-3	4.9			S-2 - S-3	1.1
		S-3A	0.15		
		M-6	1.30		
S-4	7.8			S-3 - S-4	1.45
		S-1	1.10		
S-5	8.4			S-4 - S-5	-0.5
S-6	10.0			S-5 - S-6	1.6
		S-7	2.9		
S-8	13.0			S-6 - S-8	0.1

Table G-4. Selected Water Temperature Measurements, Crosswicks Creek, Ft Dix and McGuire AFB NJ, September 1972

	Day (September)											
	12	13	14	15	16	17	18	19	20	21	22	23
Mean Daily Air Temperature	19.5	23	24.7	20.5	21.7	26.5	24.5	21.4	15.7	16.4	18.9	13.5
Station	Water Temperature, °C											
1			21	20.5	20.5	21.5	23	22.5	-	19		
2		18.5	20.5	18	18	20.5	21	21	-	17		
3		21	-	17.5	17	21	22	22	-	17	-	15
4			21.5	21	19	21	21.5	-	-	19	-	15
5			21.5	19.5	18	21	22	22	-	18	-	15
6			21.5	-	18	21	18	22	-	13.5	-	15
7			18.5	-	16.5	19.5	17	21	-	16	-	14
8		17	20	-	18	20.5	18	22	-	-	-	14

*All water temperatures measured at 0800.

result in winter months when STP effluents may be warmer than the receiving waters. The temperatures in Jumping Brook were generally a few degrees warmer than other waters. This phenomena probably resulted from warmer waters in Brindle Lake being the source of flow for Jumping Brook.

C. pH

The pH measurements at the stream stations are summarized in Table G-5. The selected control on Jumping Brook (S-1) was atypical with a mean pH of 4.1. The pH of South Run and North Run was usually within the 6.7 to 7.0 range. Crosswicks Creek waters had a pH of 6.8 to 7.1 and reflected the influence of the North Run and South Run discharges more than the low pH input of Jumping Brook.

D. DISSOLVED OXYGEN AND OXYGEN DEMANDS

1. Field Survey Analysis

New Jersey Water Quality Standards for the Crosswicks Creek watershed state the Dissolved Oxygen (DO) will not be less than 5.0 mg/l on a daily average and never less than 4.0 mg/l at any time. Dissolved oxygen was monitored with continuous-recording DO equipment and with portable DO meters for the ten-day field survey period in South Run, North Run, Jumping Brook and Crosswicks Creek. The DO measurements for the survey period are listed in Tables G-6 to G-13 by station. The DO's were rather constant and high for the survey period in North Run and Jumping Brook. State DO requirements were met in South Run except for two days when the mean daily DO was below 5 mg/l and hourly measurements revealed DO at less than 4.0 mg/l. Low dissolved oxygen conditions existed at Stations 6 and 8 in Crosswicks Creek much of the time in violation of state law. The State DO criteria were violated all of the time at Station S-6. An insopleth of dissolved oxygen concentrations is presented in Figure G-6. Mean hourly DO data was utilized for this isopleth. The critical DO problems at Station S-6 are obvious in this plot of data.

a. Daily DO Fluctuations

Figure G-7 presents typical 24-hour DO fluctuations at all stream sampling stations (17 Sep was the day chosen for comparison; S-8 was 22 Sep). No diurnal/nocturnal DO fluctuations were observed at Stations 1, 7, 6 and 8. Diurnal increases/noctural decreases in DO were observed at Stations 2, 3, 4 and 5 with the peak DO shifting to later in the afternoon with distance downstream. The diurnal dissolved oxygen increases are a result of photosynthesis by algal cells in the stream. These algal cells probably originate in the golf course ponds on the upper reaches of South Run and from sloughing-off the trickling filters of both sewage plants. The algae populations found in the plankton

Table G-5. Summary of pH Measurements at Stream Stations, Crosswicks Creek, Ft Dix and McGuire AFB NJ, September 1972*

Station		Day (September)							
		12	13	14	15	16	17	18	19
	$\bar{X}$				4.2	4.1	4.0	4.1	4.3
1	Max				4.5	4.2	4.2	4.2	4.8
	Min				3.7	3.7	3.5	4.1	4.2
	$\bar{X}$	6.4	6.6	6.6	6.6	6.6	6.7	6.6	
2	Max	6.6	6.6	6.7	6.7	6.7	6.8	6.8	
	Min	6.4	6.5	6.5	6.5	6.6	6.6	6.4	
	$\bar{X}$			7.0	7.1	7.1	6.9	6.9	
3	Max			7.1	7.4	7.4	7.2	7.0	
	Min			7.0	7.0	7.0	6.8	6.8	
	$\bar{X}$	7.1	6.8	6.7	6.8	6.8	6.7	6.7	
4	Max	7.2	6.8	6.8	6.9	7.0	7.0	6.9	
	Min	6.9	6.7	6.6	6.7	6.7	6.5	6.5	
	$\bar{X}$	7.1	7.2	7.1	7.3	7.1	7.1	7.0	6.9
5	Max	7.1	7.2	7.4	7.5	7.4	7.3	7.1	7.0
	Min	7.0	7.1	6.9	7.3	7.2	7.0	6.9	6.8
	$\bar{X}$								
6	Max		no	pH	measurements				
	Min								
	$\bar{X}$	7.1	7.1	7.0	6.9	7.0	7.0	6.9	
7	Max	7.2	7.1	7.0	7.0	7.0	7.0	7.1	
	Min	7.0	7.0	6.9	6.9	6.9	6.9	6.6	
	$\bar{X}$		6.9	6.9	6.9	6.8	6.8	6.8	
8	Max		7.0	7.0	7.0	6.8	6.9	6.8	
	Min		6.8	6.8	6.8	6.8	6.8	6.8	

*Each mean ($\bar{X}$) represents 12 readings (every 2 hours) for each 24 hour period.

Table G-6. Dissolved Oxygen Data (mg/l) by Two-Hour Interval for Sample Station S-1, Jumping Brook, Ft Dix/MAFB NJ September 1972

Date (Sep)	Dissolved Oxygen (mg/l)										Mean DO by hour
	12	13	14	15	16	17	18	19	20	21	
Time											
0200			7.6	6.2	6.8		7.1	6.9	6.5		6.8
0400			7.6	6.2	7.0		6.9	7.7	6.5		7.0
0600			7.8	6.3	7.0		6.8	7.5	6.6		6.9
0800			7.8	6.1	7.0	6.6	6.8	6.4	6.4	6.5	6.7
1000			7.9	6.3	7.2		6.8	6.6	6.5		6.9
1200			7.9	6.4	7.4		6.9	6.6	6.4		6.9
1400			7.4	7.0			6.9	6.4	6.4		6.8
1600		7.3	6.9	7.1		6.6	7.2	6.9	6.4		6.9
1800		7.0	6.0	7.2		6.8	7.3	5.5			6.6
2000		7.3	5.8	6.9		7.1	7.1	5.6			6.6
2200		7.5	6.5	6.9		7.2	7.0	6.4			6.9
2400		7.5	6.3	6.9		7.2	6.9	6.6			6.9
24-hr mean		7.3	7.1	6.6	7.1	7.0	7.0	6.6	6.5		

Table G-7. Dissolved Oxygen Data (mg/l) by Two-Hour Interval for Sample Station S-2, South Run, Ft Dix/MAFB NJ, Sep 1972

Date (Sep)	Dissolved Oxygen (mg/l)										Mean DO by Hour
	12	13	14	15	16	17	18	19	20	21	
Time											
0200			5.3	4.7	4.6	6.2	5.2				5.2
0400			5.4	5.0	4.3	5.0	5.8				5.1
0600			5.4	4.8	4.5	4.9	5.3				5.0
0800				5.0	5.4	5.0	5.3				5.2
1000			6.7	6.7	6.9	6.1	6.1				6.5
1200	4.8		8.3	7.9	8.5	7.6	5.8				7.2
1400			8.6	7.5	8.9	8.6	5.9				7.9
1600			8.3	7.7	8.7	7.3					8.0
1800		7.6	7.5	6.7	7.8	5.9					7.1
2000		5.9	5.4	5.4	7.1	5.1					5.8
2200		5.0	5.1	4.4	6.6	4.9					5.2
2400		5.3	5.0	4.6	6.5	5.0					5.3
24-hr mean		6.0	6.5	5.9	6.7	6.0	5.6				

Table G-8. Dissolved Oxygen Data (mg/l) by Two-Hour Interval for Sample Station S-3, South Run, Ft Dix/MAFB NJ, Sep 1972

Date	Dissolved Oxygen (mg/l)											Mean DO by hour
(Sep)	12	13	14	15	16	17	18	19	20	21	22	
Time												
0200		3.6	4.6	3.2	5.6	4.2	5.0	6.6		5.4	6.6	4.8
0400		3.6	4.4	2.7	5.6	4.8	5.2			5.2	5.8	4.5
0600		4.6	4.2	2.7	5.1	4.7	5.3			5.3	5.6	4.5
0800			11.	5.2	6.1	6.0	5.8	6.0	6.8	6.6	6.0	6.6
1000			13.	7.2	15.	9.4	5.8			6.6	6.2	9.0
1200	5.1		8.9		13.	7.6	6.0			6.6	6.3	7.1
1400	5.1		8.2	13.	14.	7.6	6.2		6.9		6.2	8.4
1600	5.1		5.4	20.	12.	6.1	5.9		6.9	7.0	5.8	8.2
1800	4.1	7.8	4.7	8.1	6.7	5.9	5.6		6.5	6.6	5.2	6.1
2000	4.4	6.3	4.2	6.1	3.8	4.8	5.4		5.9	6.2	4.5	5.2
2200	3.9	6.1	4.0	5.6	4.1	4.7	5.3		6.1	6.3	4.0	5.0
2400	3.6	5.4	4.0	5.6	4.0	5.0	6.9		5.8	6.2	3.6	5.0
24-hr mean	4.5	5.3	6.4	6.9	8.0	5.9	5.7		6.5	6.3	5.5	

Table G-9. Dissolved Oxygen Data (mg/l) by Two-Hour Interval for Sample Station S-4, South Run, Ft Dix/MAFB NJ, Sep 1972

Date	Dissolved Oxygen (mg/l)												Mean DO by hour
(Sep)	12	13	14	15	16	17	18	19	20	21	22	23	
Time													
0200		1.7	5.0	4.9	4.8	5.7				7.2		6.8	5.2
0400		1.4	4.8	5.1	4.8	5.7				7.1		6.5	5.1
0600		1.2	4.8	4.8	5.2					7.0		6.4	5.0
0800		5.2	5.9	5.2	5.7	5.6	5.2			7.2	5.9	6.5	5.8
1000		6.9	7.2	6.5	8.3	9.1	5.2			7.3	6.0		7.1
1200		6.4	7.9	6.5	10.	11.	5.2			6.8	7.5		7.7
1400	5.2	7.5	7.7		11.	11.	5.7		7.2	7.1	7.5		7.8
1600	3.1	7.5	7.6	7.5	11.	9.1	5.2		7.8	6.7	7.0		7.2
1800	2.6	6.4	7.6	6.9	9.2	6.8	4.4		7.7	6.0	6.9		6.4
2000	2.1	5.9	6.9	5.2	6.8	5.5	3.4		7.7	6.0	7.0		5.6
2200	1.9	5.6	6.5	4.7	5.7		3.2		7.6	5.8	6.9		5.3
2400	1.9	5.3	6.0	4.8	5.4		3.0		7.4		6.8		5.1
24-hr mean	3.1	5.1	6.5	5.9	7.3	7.5	4.5		7.6	6.7	6.8	6.6	

Table G-10. Dissolved Oxygen Data (mg/l) by Two-Hour Interval for Sample Station S-5, Crosswicks Creek, Ft Dix/MAFB NJ, September 1972

Date	Dissolved Oxygen (mg/l)											Mean DO by hour
(Sep) Time	12	13	14	15	16	17	18	19	20	21	22	
0200				6.0	5.4	4.5	4.5					5.1
0400				6.0	5.3	4.4	4.6	3.1				4.7
0600				5.9	4.0	4.4	4.0	2.9				4.2
0800			5.8	4.4	4.6	4.4	4.2	3.4				4.5
1000			6.5	4.9	5.1	4.0	5.6	3.4				4.9
1200			8.8	5.9	6.0	5.3	6.4	3.7				6.0
1400			8.2	7.8	8.8	6.9	6.8	4.3				7.1
1600	5.6		8.2	5.8	8.8		6.7	4.3				6.6
1800			6.9	8.7	7.7	5.3	5.7	5.0				6.6
2000			7.3	6.7	6.3	4.8	4.5	5.2				5.8
2200			6.5	6.2	5.6	4.3	3.7					5.3
2400			6.2	5.6	4.9	4.4	3.2					4.9
24-hr mean			7.2	6.2	6.1	5.0	5.0	4.0				

Table G-11. Dissolved Oxygen Data (mg/l) by Two-Hour Interval for Sample Station S-6, Crosswicks Creek, Ft Dix/MAFB NJ, September 1972

Date	Dissolved Oxygen (mg/l)											Mean DO by hour
(Sep) Time	12	13	14	15	16	17	18	19	20	21	22	
0200					2.7	3.0	2.4	2.6				2.7
0400					2.8	2.9	2.5	2.6				2.7
0600					2.8	2.9	2.5	1.9				2.5
0800				2.6	2.8	2.9	2.6	2.7				2.7
1000				2.7	2.7	2.8	2.6	2.4				2.6
1200				2.9	2.9	2.6	2.6	2.1				2.6
1400				3.4	3.2	2.6	3.0	2.2				2.9
1600				3.6	3.4	2.8	3.2	2.5				3.1
1800				4.1	3.6	2.8	3.4	2.8				3.3
2000				3.5	3.4	2.9	3.2					3.2
2200				3.4	3.3	2.5	2.9					3.0
2400				3.2	3.1	2.4	2.9					2.9
24-hr mean				3.3	3.1	2.8	2.8	2.4				

Table G-12. Dissolved Oxygen Data (mg/l) by Two-Hour Interval for Sample Station S-7, North Run, Ft Dix/MAFB NJ, Sep 1972

Date (Sep)	Dissolved Oxygen (mg/l)										Mean DO by hour
Time	12	13	14	15	16	17	18	19	20	21	
0200			7.1	7.2		6.6	7.2	6.9			7.0
0400			7.1	7.2		6.6	7.1	6.8			7.0
0600			7.1	7.2		6.6	7.3	7.0			7.0
0800				6.9	8.2	7.3	7.2	7.1			7.3
1000			7.5			7.5	7.4	6.6			7.2
1200	8.2	8.6	7.7		7.3	7.5	7.5				7.6
1400		8.4	8.3	7.4	7.0	7.7	7.5				7.7
1600		8.6	8.1		6.9	6.9	7.5				7.6
1800		7.1	7.8		6.9	7.0	7.4				7.2
2000		7.1	7.7		6.9	6.8	7.4				7.2
2200		7.1	7.5		6.7	6.9	6.7				7.0
2400		7.1	7.4		6.6	7.1	6.7				7.0
24-hr mean		7.7	7.6	7.2	7.1	7.1	7.2	6.9			

Table G-13. Dissolved Oxygen Data (mg/l) by Two-Hour Interval for Sample Station S-8, Crosswicks Cr., Ft Dix/MAFB NJ, Sep 72

Date (Sep)	Dissolved Oxygen (mg/l)												Mean DO by hour
Time	12	13	14	15	16	17	18	19	20	21	22	23	
0200		4.5	4.0						4.7		4.3	3.9	4.3
0400		4.2	3.9						4.4		4.0	3.7	4.0
0600		4.5	4.0						4.5		4.5	3.7	4.2
0800		4.7		3.2	3.6	3.7	3.4	3.2	4.2	6.8	4.6	4.2	4.2
1000		4.7							4.2	6.3	4.9		5.0
1200	4.8	4.6								5.9	4.8		5.0
1400	4.8	4.6								5.4	3.9		4.7
1600	5.0	4.5								5.2	3.9		4.6
1800	5.2	4.4						6.1		5.4	3.4		4.9
2000	4.9	4.4						5.6		4.8			4.9
2200	4.6	4.4						5.4		4.5	4.2		4.6
2400	4.6	4.2						4.9		4.2	4.0		4.4
24-hr mean	4.8	4.5	4.0					5.6	4.4	5.4	4.2	3.9	

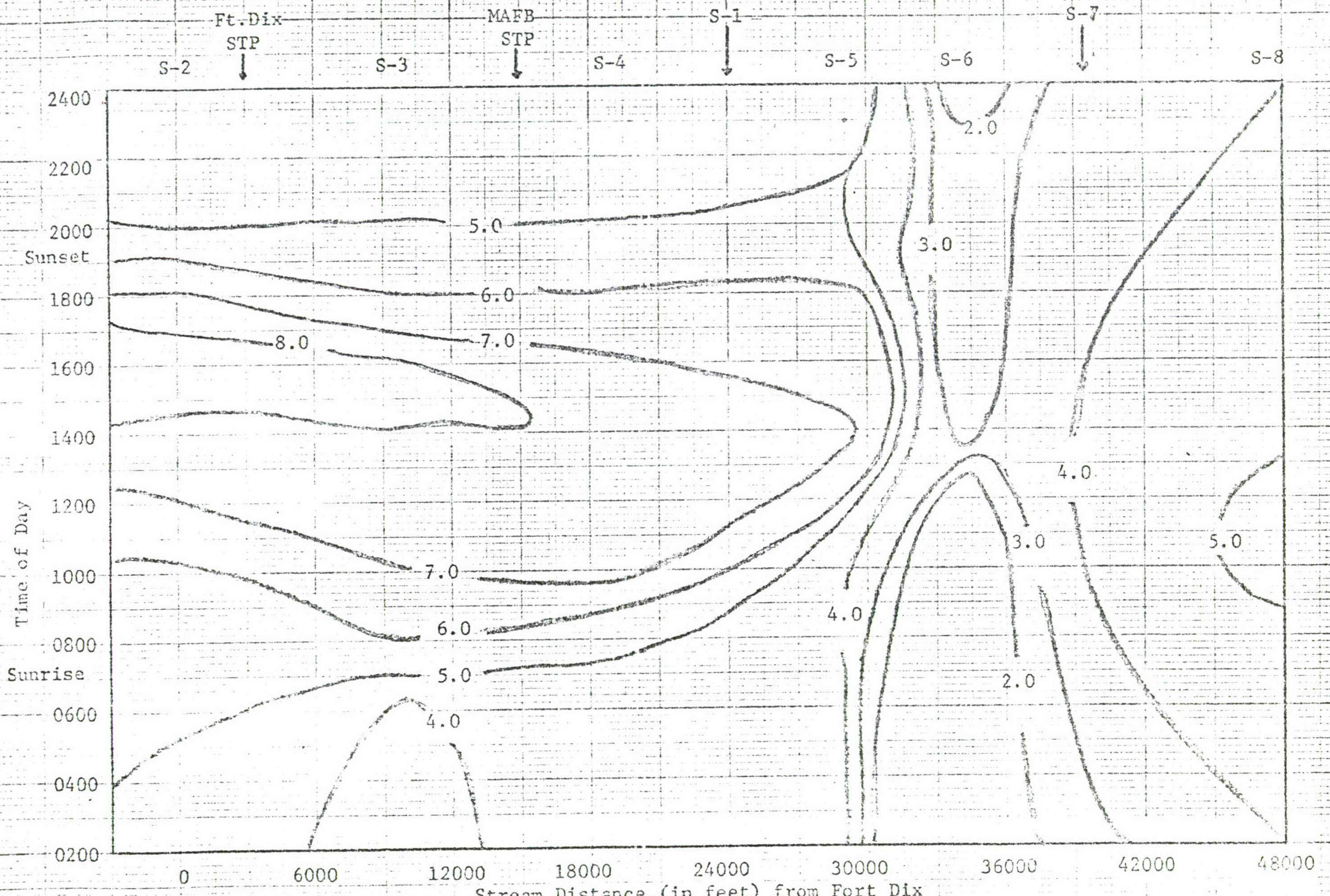


FIGURE G-6. Isopleth of Dissolved Oxygen Concentrations (mg/1) in South Run and Crosswicks Creek, Ft. Dix and McGuire,AFB, September 1972.

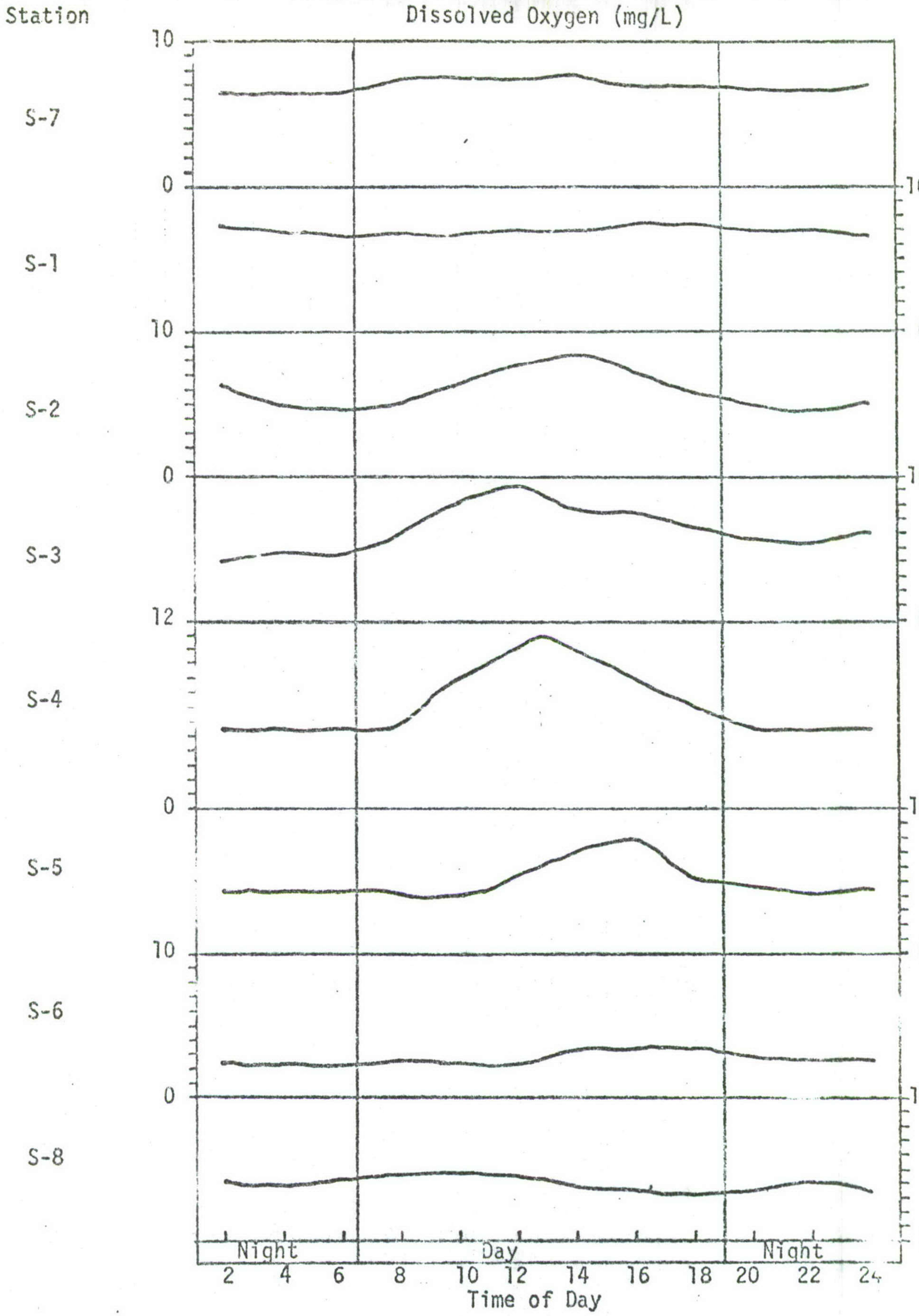


Figure G-7. Typical 24-Hour Dissolved Oxygen Fluctuations at the Stream Survey Stations, Ft Dix/McGuire AFB NJ, Sep 1972 determinations do not fully explain the phenomenon. Stream Stations S-7, S-2, S-4 and S-5 were found to have higher algae concentrations. The reaeration of North Run was likely great enough to overshadow algal influence on dissolved oxygen. The algal populations on the trickling filters at Ft Dix and McGuire STP's likely increased the diurnal dissolved oxygen concentrations in the effluents and in the stream.

b. Oxygen Demand in the Receiving Waters

Figure G-8 presents the mean daily dissolved oxygen, BOD_5, and COD by stream station and the UOD of one grab sample. The BOD_5, UOD and COD concentrations are all elevated in the stream as a result of the sewage plant effluents. The BOD_5 loading on the stream increased from 11 pounds per day in South Run (S-2) to 580 pounds below Ft Dix (S-3) and 800 pounds per day below McGuire (S-4). Known BOD_5 loadings in addition to the STP's include North Run (S-7), 77 pounds per day, and Jumping Brook (S-1) at 150 pounds per day. The oxygen demand in Crosswicks Creek would be expected to decrease downstream as normal biological activity satisfied this demand. However, additional unidentified flows increased the volume of Crosswicks Creek and these flows add more BOD_5 to the stream resulting in a measured 1,116 pounds of BOD_5 per day at Station S-8 in Crosswicks Creek. This data is consistent with the decreasing dissolved oxygen in the stream. Figure G-9 presents the ultimate oxygen demand analyses of morning grab samples from the receiving waters on 21 Sep. The control stations (S-1 and S-2) and North Run (S-7) had low oxygen demanding properties. The two sewage plants add a heavy oxygen demand to the stream which impacts on the dissolved oxygen. The UOD had been mostly satisfied after 2½ days of water travel (S-8), but the DO of the stream was still depressed at this point.

2. Theoretical Modeling of Dissolved Oxygen

a. Background: In the past, pollution of surface waters was thought of only in terms of the dissolved oxygen (DO) in the waters. The assimilative capacity of a stream was, and to some extent still is, considered to be its ability to absorb certain concentrations of oxygen demanding materials without the DO being depleted below a specified level. A much broader concept of stream pollution has been evolving in recent years, with serious considerations to its effects and causes. Despite these broader concepts, the DO in a stream still holds much fascination, perhaps rightfully so, to the ecologist concerned with the evaluation of surface waterways.

b. Formulation of Oxygen Sag Curve: Most sanitary engineering texts[2,3,4,5] present basic formulations of the classical oxygen sag curve equation. The development of this equation and its application dates back to 1925 and has been credited to Streeter and Phelps.[6,7,8] Following

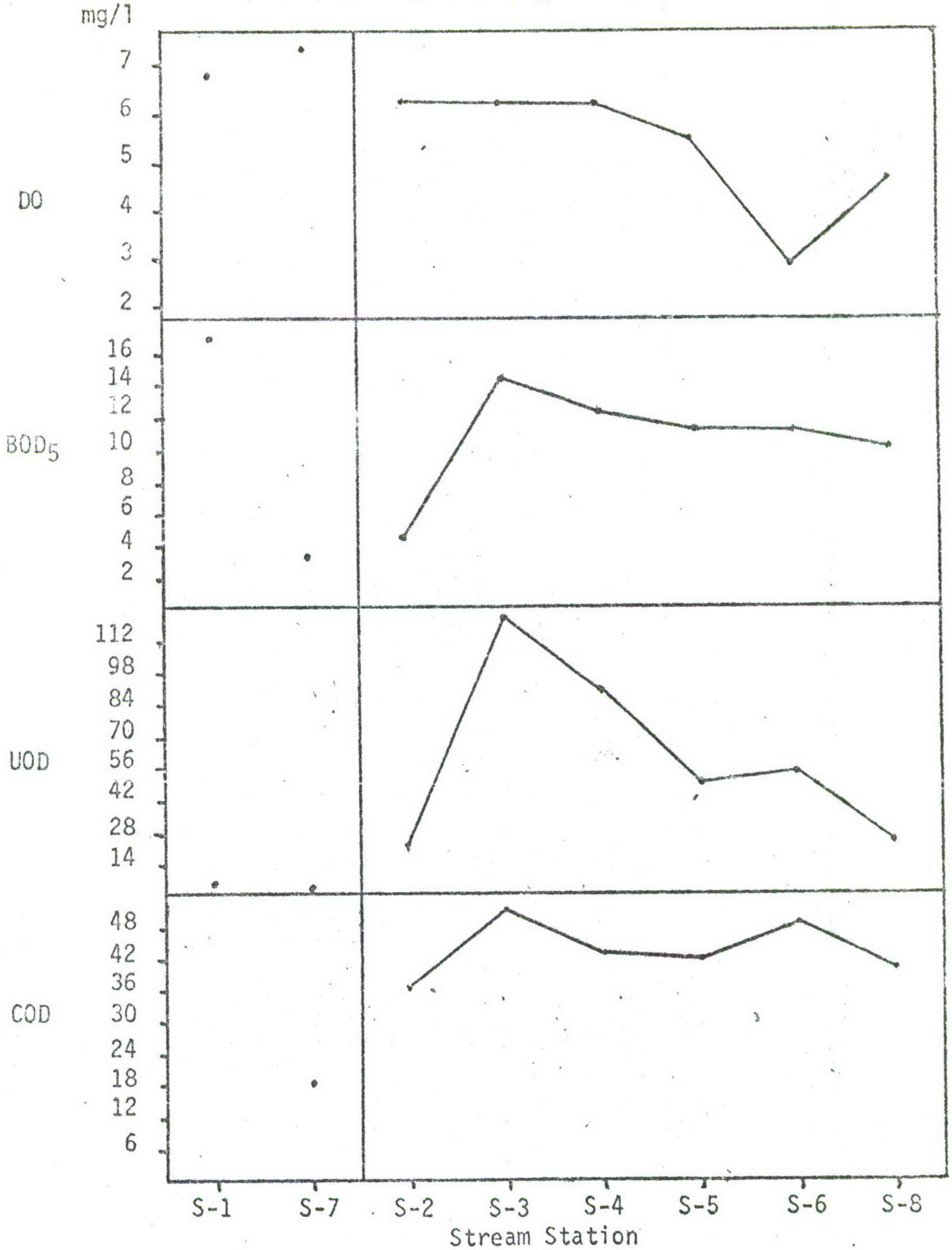


Figure G-8. Mean Daily Dissolved Oxygen (DO), BOD_5, and COD Concentrations, and UOD Concentration From One Grab Sample at Stream Sampling Stations, Ft Dix/MAFB NJ Field Survey, September 1972

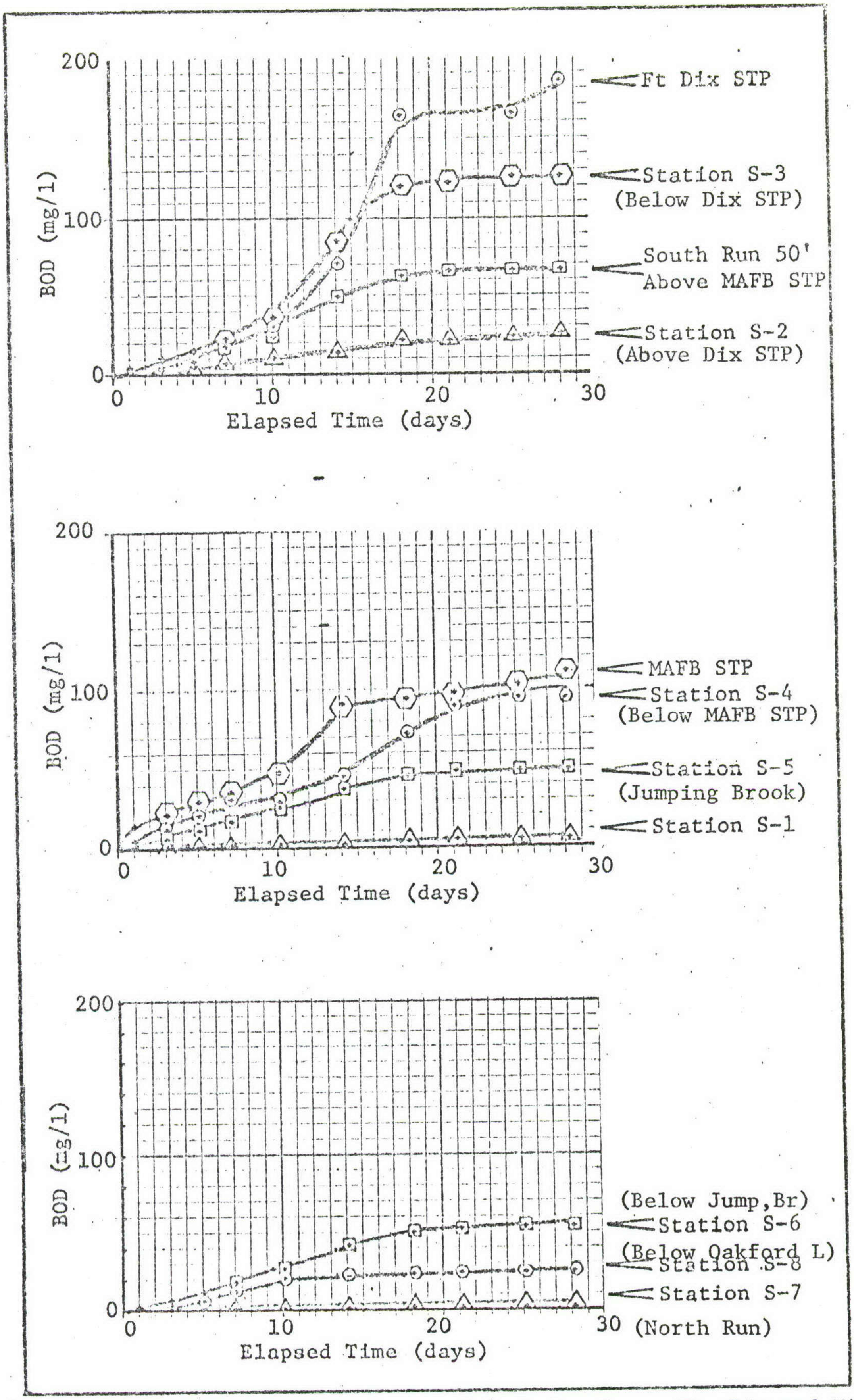


FIGURE G-9. Ultimate Oxygen Demand Analyses of Grab Samples - Ft. Dix and MAFB STP's South Run (S-2,S-3,S-4), Jumping Brook (S-1), Crosswicks Creek (S-5,S-6, S-8) and North Run (S-7), September 21, 1972.

is the "Streeter-Phelps" equation (Limitations on the use of this formulation are presented by Fair, et al)[5]

$$D = \frac{K_1 L_o}{K_2 - K_1} \left(e^{-K_1 t} - e^{-K_2 t}\right) + D_o e^{-K_2 t}$$

Where

D = Oxygen deficit in time t, mg/l
D_o = Initial oxygen deficit at point of discharge, mg/l
L_o = Initial concentration of the organic matter in the stream (ultimate 20 day BOD in mg/l)
K_1 = Coefficient of deoxygenation (per day)
K_2 = Coefficient of stream reaeration (per day)
t = Time of water travel, days

The interplay of the deoxygenation of polluted waters and their reaeration from the atmosphere creates a spoon-shaped profile of the DO deficit along the path of the water movement. Figure G-10 presents the classical DO sag curve and its components.

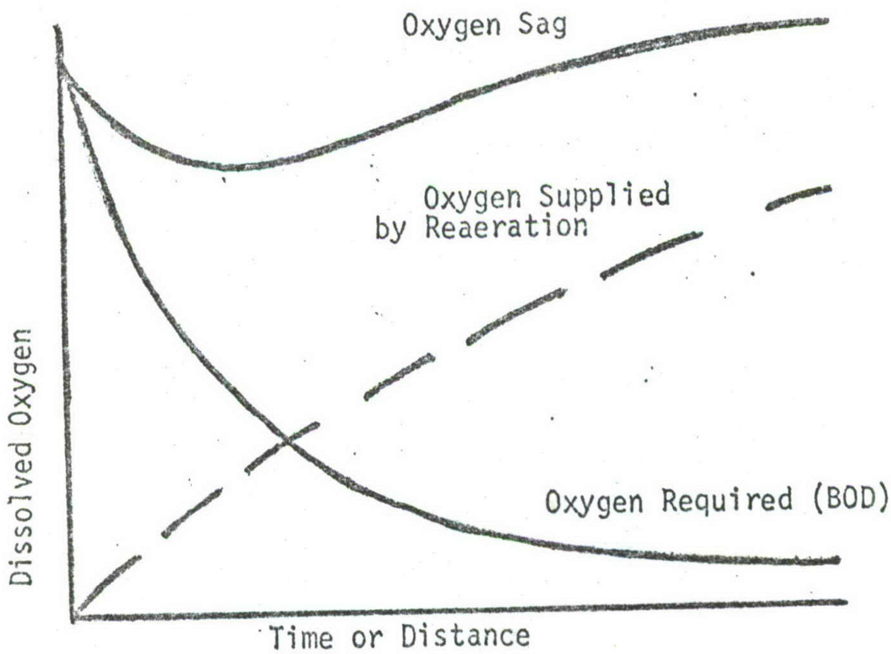


Figure G-10. Dissolved Oxygen Sag-Curve and Its Components

(1) Deoxygenation Coefficient: The deoxygenation coefficient is not a constant value but varies with the particular waste under study. Typical values for K_1 are presented below:

	K_1 (per day)
Secondary Effluent	0.05 - 0.23
Strong Wastewater	0.39
Weak Wastewater	0.35

The values of K_1 may be estimated by a time series of BOD determinations. A number of methods have been developed to determine the value of K_1 from experimental field data. Two such methods reported in the literature are: the "method of moments" by Moore[9] et al, and the "graphical method" by Thomas.[10] The variation of K_1 with temperature can be formulated in accordance with the van't Hoff-Arrhenius equation. (theta = 1.047)[5]

(2) Coefficient of Stream Reaeration: The value of K_2 varies with the water surface exposure, the volume of water, the rate of vertical and horizontal mixing and temperature. Two literature references provide independent methods of estimating the value of K_2. O'Connor and Dobbins[11] proposed the approximate formula:

$$K_2 = \frac{(D_L U)^{1/2}}{(H)^{3/2}}$$

Where,

D_L = Diffusivity of oxygen in water

= 8.1×10^{-5} ft/hr at 20°C

U = Stream velocity, ft/hr

H = Dept of flow, ft

Churchill, et al,[12] have proposed the following relationship:

$$K_2 = (5.026)(\bar{V})^{.969}/\bar{R}^{\,1.673}$$

Where,

$\bar{V}$ = Mean velocity, ft/sec

$\bar{R}$ = Mean hydraulic radius, ft

There is appreciable variation in literature values for K_2. Typical values for K_2 range from 0.20 to 10.0 per day, the lower values representing deep, slow-moving waters and the higher values, shallow swift-flowing streams.[4] The Churchill, et al, formulation gives generally lower values for K_2 than does the O'Connor and Dobbins formula. Inherent in these empirical formulas is the weakness of applying them to situations beyond the limits of the original experimental observations. As with the deoxygenation coefficient, the variation of K_2 with temperature can be formulated in accordance with the van't Hoff-Arrhenius equation (Theta = 1.031).[5] Streeter's original approach to determination of K_2 was to determine all other factors in the sag curve formula - K_1, Lo, Do, D, and t - and calculate the reaeration coefficient by insertion of trial values of K_2 in the sag formula to obtain a calculated check on the noted deficit, D. This procedure, however, has the unfortunate result of combining all measurement errors, but the procedure is still used.

(3) Limitations

Aside from the difficulties of estimating the values of deoxygenation and reaeration coefficients, the Streeter-Phelps equation falls short of precise description of the DO profile in a given stream when other oxygen consuming factors come into play. Three such factors include nitrification, oxygen demand from bottom deposits, and oxygen variations caused by algal photosynthesis and respiration by aquatic organisms.

(a) Nitrification: In 1935 Streeter[7] and many others since have concluded that the nitrogenous stage of the BOD curve exhibits a lag in streams similar to that in laboratory bottles, where it usually starts only after five to ten days. The second stage of the BOD reaction was considered to be of little or no consequence in stream reaches close downstream from waste discharges where the greatest oxygen depletion occurs. Investigators since, however, have found that nitrification can have a significant impact on the stream oxygen demand. Courchaine[13] found that the nitrification of organic and ammonia nitrogen immediately below a secondary treatment plant accounted for 75 percent of the downstream oxygen demand. O'Connell, et al, also found similar situations.[14] The quantitation of the nitrification process in streams is complicated by departures from the orderly progression of the nitrogen cycle from organic nitrogen decomposition to ammonia and the successive oxidation of ammonia to nitrite and then to nitrate. Quantifying the relative changes of nitrogen forms can, however, be a useful indication of whether nitrification, or second stage BOD, is in progress in a given stream.

(b) Bottom Deposits: Sludge deposits in a stream can result in concentrated oxygen demand in limited reaches of streams and can impose heavy drafts on DO of the water passing over them. Detailed stream bed observations may reveal significant sludge deposits that may contribute to a corruption of the application of the Streeter-Phelps equation.

(c) Photosynthesis: Diurnal variations in stream DO caused by algal photosynthesis and respiration can completely obscure the effect of reaeration of a stream from the atmosphere. Wide diurnal/nocturnal variations in DO clearly implicate the effects of photosynthesis.

c. Field Determination of Deoxygenation Coefficients and Carbonaceous BOD_L

A series of successive day BOD determinations were made for all stream stations and the sewage plant effluents. Both the "method of moments" by Moore, et al,[9] and the "graphical method" by Thomas[10] were employed to estimate the coefficient of deoxygenation, K_1, for each station. Table G-14 presents the calculated values for K_1 for each station. Also included are tabulated values for the ultimate oxygen demand (BOD_L) based on the estimated values of K_1 and also from the ultimate oxygen demand (UOD) analyses of grab samples from each station (Fig G-9)

(1) Deoxygenation Coefficient. With the exception of the estimated values for K_1 for the MAFB effluent (Station M-6) and for Jumping Brook (Station S-1), the two methods used to estimate the deoxygenation coefficient yielded similar values for each sampling station. In general, the estimated K_1 values characterize the stream as containing relatively stable, weak wastewaters. Estimating the coefficients for the Jumping Brook waters (S-1) and for the MAFB effluent (M-6) was difficult based on the collected data. No explanation is clearly apparent for the difficulties with the MAFB effluent, while the highly acid/zero alkalinity conditions of the Jumping Brook waters may have interfered with the field measurements.

(2) Carbonaceous BOD_L. Calculated values of BOD_L also characterize the stream waters as stable, weak wastewaters. The disparity between calculated and measured BOD_L values for the stream stations can be accounted for by recognizing that the measured values are based on grab sample UOD analyses. An analysis of Figure G-9 reveals that the second stage of the BOD curve, the nitrification stage, took place beginning at about 10 days.

d. Field Determination of Stream Reoxygenation Coefficients

Estimates of the stream reoxygenation coefficients (K_2) for four reaches of the receiving stream were made using the two methods described earlier.[11,12] Table G-15 contains a description of each stream reach, the raw data used to estimate the values of K_2, the approximate times of water travel for each reach of the receiving streams, and the estimated reoxygenation coefficients based on the two methods. The lower values estimated by the Churchill, et al, method are more consistent with the range of values for K_2 found in the literature.

Table G-14. ESTIMATED VALUES FOR DEOXYGENATION COEFFICIENTS (K_1) - SUCCESSIVE-DAY BOD'S, ULTIMATE OXYGEN DEMAND - FORT DIX/MAFB NJ, SEP 1972.

Day/Station	D-7	M-6	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8
1	1.3	1.3	0.1	1.4	4.6	3.6	3.0	2.8	1.4	2.4
2	4.7	3.6	1.6	2.9	8.4	7.0	4.9	5.2	2.2	4.9
3	8.2	5.8	4.5	3.6	11.5	8.4	6.1	6.4	2.8	6.1
4	9.7	9.6	6.0	4.5	13.8	11.5	7.4	6.5	2.9	6.9
5	11.2	14.3	6.5	5.4	14.6	12.0	8.4	8.3	3.8	9.1
Coeffient (K_1, Base e)										
Thomas (1/Day)	0.053	-0.136	-0.261	0.167	0.25	0.22	0.33	0.35	0.38	0.20
Moore, et.al. (1/Day)	∿0.055	∿0.010	∿0.010	0.23	0.24	0.21	0.31	0.33	0.33	0.23
Calculated BOD_L (mg/1)	46	(39.0)[1]	(16.5)[1]	6.43	18.8	17.6	10.7	9.9	4.5	13.3
Measured BOD_L (mg/1)[2]	40	40	5.0	20	45	50	35	40	2.5	20

NOTES: [1] BOD_L for MAFB Sewage Plant effluent and Station S-1 based on K_1 = 0.10.

[2] Measured BOD_L For all Stations estimated from UOD analyses.

TABLE G-15. DESCRIPTION OF RECEIVING STREAM REACHES, DATA USED IN ESTIMATING STREAM REOXYGENATION COEFFICIENTS - FORT DIX/MAFB NJ, SEP 1972

Reach	Description	Length of Reach (L, ft)	Average Velocity ($\bar{v}$, fpm)	Average Cross Section ($\bar{A}$, ft)	Average Wetted Perimeter ($\bar{P}w$, ft)	Average Depth ($\bar{d}$, ft)	Time of Travel (T, min)[1]	Estimated Reaeration Coefficients @20°C (k_2 per day) Churchill[2]	O'Connor[3]
1	From Ft. Dix STP Effluent Discharge into South Run to Station S-3.	7,100	44	10.32	22.34	0.30	161	13.52	63.5
2	From Station S-3 to Confluence of South Run and Jumping Brook, Includes Station S-4 and MAFB STP Effluent Discharge to South Run.	17,700	49	12.06	23.6	0.53	400	12.71	30.4
3	From Confluence of South Run and Jumping Brook, Crosswicks Creek to Oakford Lake, Includes Stations S-5 and S-6	10,500	33.5	28.6	26.4	1.11	444	2.51	8.3
4	Crosswicks Creek through Oakford Lake to Station S-8.	9,900	12	104.6	41.9	3.00	619	0.23	0.11

Notes: [1] Time of travel estimated from average velocity measurements between stream stations.
[2] Reaeration rate constant calculated according to Churchill, et.al. (Ref 12)
[3] Reaeration rate constant calculated according to O'Connor, et. al. (Ref 11)

e. Fitting of Oxygen Sag Curve to Field Observations

An attempt was made to fit the classical DO sag curve(5) to the field observations in the four reaches of the receiving stream. The daylight (12-hour) mean and daily (24-hour) mean DO concentrations recorded at the various stream stations were used to compare with the predicted DO concentrations based on the sag curve analyses. The calculated values for K_2 were originally used in the preliminary sag curve fitting process, and the predicted DO concentrations did not fit the measured values well. Following a number of iterations of lower values for K_2, closer correlation was found between the predicted DO and the measured DO in the stream. Table G-16 contains the raw data input used in the DO sag curve analysis for the four reaches on the receiving stream. Worthy of special note are the estimated values for the reoxygenation coefficients (K_2) used in the final analysis. (See Table G-16) These K_2 values are consistent with the literature references cited earlier. Figure G-11 is a DO profile of the receiving waters, including the 24-hour, the 12-hour mean DO concentrations and the predicted DO profile based on the Streeter-Phelps equation. With the corrected values for K_2, the classical DO sag curve correlates closely with the measured values on the stream for the first two reaches in South Run below the Ft Dix plant discharge. The DO sag curve equation does not, however, adequately describe the DO profile in the final two reaches of the stream from the confluence of Jumping Brook (Station S-1) and Crosswicks Creek through Oakford Lake to Station S-8. Significant sediment deposits were noted in these two reaches and, along with photosynthesis and nitrification could account for the depressed DO in these two reaches of the stream. No attempt was made to mathematically account for these factors in the sag curve analyses. The sludge deposits in these two reaches are considered to be transient and result at least partially from the settleable solids discharged from the two upstream sewage plants. During periods of turbulence in these stream reaches, caused by dramatic increases in stream flow, these sediments would no doubt be scoured and translocated further downstream, to exert an oxygen demand at a later time. Reduction in settleable solids discharged from the two sewage plants should diminish the oxygen demand resulting from bottom sediments.

3. Theoretical Permissible BOD Loading

The critical reach in the receiving waters (where minimum DO occurs) falls within reaches 3 and 4. Although the Streeter-Phelps equation does not adequately describe the DO profile within these two reaches, some valuable information may be obtained from estimating the allowable BOD loading of the stream using the rate constants for deoxygenation (K_1) and reaeration (K_2) calculated in the above analyses. Permissible BOD_5 daily mass emission rates (PDMER) were estimated according to Fair(5) for the critical reach in Crosswicks Creek that would maintain the DO at or above 5.0 mg/l. The BOD_5 PDMER is determined by the magnitudes of the following parameters: (1) flow (2) temperature (3) stream

Table G-16

RAW DATA OXYGEN SAG CURVE ANALYSES
FT DIX/MAFB NJ, SEP 1972

	Description	Reach 1: Ft Dix STP Discharge to South Run	Reach 2: MAFB STP Discharge to South Run	Reach 3: South Run Discharge to Crosswicks Creek	Reach 4: Crosswicks Ck to Oakford L. & North Run
Discharge Parameters	Flow (MGD)	3.0	1.3	7.8	10.0
	BOD_5 (mg/l)	21.0	20.0	12.0	12.0
	DO (mg/l)	4.5	5.3	6.6	6.0
	Temp (°C)	22.0	24.5	22.1	20.1
	BOD_5 Rate Constant @ 20°C (per day)	0.055	0.10	0.31	0.30
Receiving Stream Parameters	Flow (MGD)	0.8	6.4	2.2	2.9
	BOD_5 (mg/l)	4.0	14.0	6.0	5.0
	DO	6.1	8.0	7.0	7.0
	Temp (°C)	21.5	23.0	21.6	17.6
	Velocity (fps)	0.733	0.817	0.559	0.200
	Depth (ft)	0.30	0.53	1.11	3.00
	Reaeration Rate Constant @ 20°C (per day)	13.52(10.0)[1]	12.71(2.0)[1]	2.51(0.1)[1]	0.23(0.1)[1]

NOTE: [1] Final values of K_2 used for curve fitting.

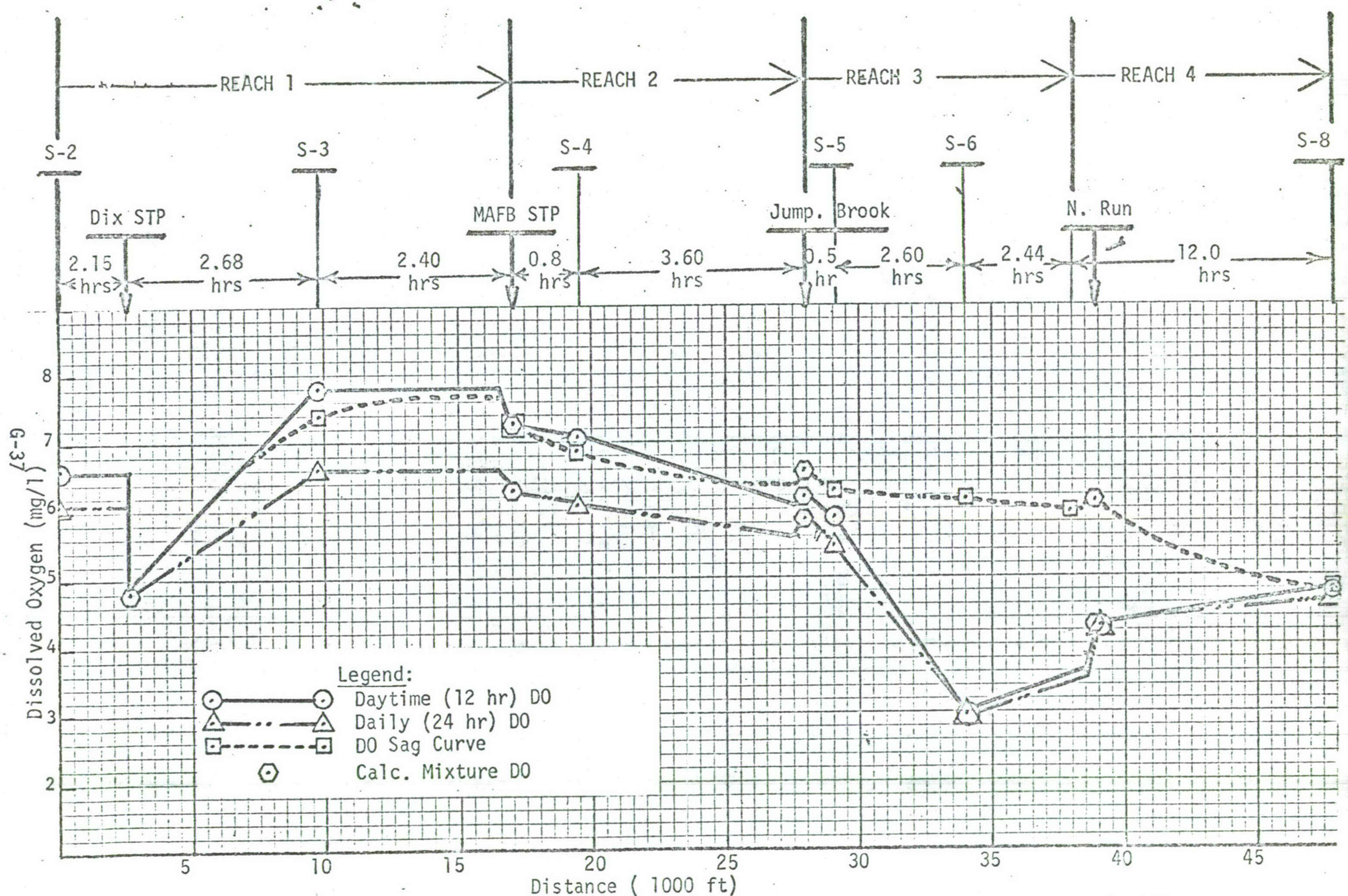


Figure G-11. Dissolved Oxygen Profile of the Receiving Waters, Ft Dix/MAFB NJ, September 1972 reaeration capacity (4) the deoxygenation rate constant (5) the initial stream DO and (6) the minimum allowable DO. Figures G-12 through G-15 are graphs of the calculated PDMER's in the critical reach of Crosswicks Creek for varying flows, temperature and initial stream DO. Table G-17 contains data used in generating these graphs. Figure G-16 is a graph of the BOD_5 PDMER probability based on probable flow (See Fig G-3) in the critical reach of Crosswicks Creek for temperatures varying from 12°C to 30°C and for the boundry conditions of initial DO ranging from 100 percent saturation to 5.0 mg/l. Table G-18 contains tabulated permissible BOD_5 concentrations and PDMER's for the critical reach in Crosswicks Creek to maintain a minimum DO of 5.0 mg/l at the critical, low-flow (7-day, 10-year) condition for stream temperatures of 12, 20 and 30 degrees C. The critical flow condition should occur in the fall when ambient and stream water temperatures approximate 16°C. Assuming the initial stream DO in the critical reach is approximately 80 percent saturation, the total permissible daily mass emission rate approximates 300 pounds of BOD_5 per day. The NJDEP may accept this estimate of the receiving stream's BOD_5 assimilative capacity or on the basis of these analyses the NJDEP may establish some other estimated BOD_5 stream assimilative capacity. Once such action is complete, then the NJDEP should allocate some fraction or all of the stream's BOD_5 assimilative capacity to the Ft Dix and MAFB discharges based on other known significant waste discharges.

E. NUTRIENTS AND ORGANIC CARBON

Figure G-17 illustrates the nutrient concentrations and total organic carbon (TOC) in the receiving waters. Table G-19 is a summary of the nutrient loading on the receiving waters in pounds per day of nitrogen forms and phosphates.

1. Eutrophication is the term used to describe enrichment of waters by nutrients. The fertilizing elements contributing most to eutrophication are nitrogen and phosphorus. The source of these nutrients that cause water pollution are primarily sewage plant effluents, and storm water runoff from agricultural lands.

a. The ammonia nitrogen introduced into the aquatic environment will be subjected to oxidation, assimilation and other losses. However, if oxygen is available and other environmental factors are favorable, a vigorous nitrifying flora will develop which will oxidize the ammonium ion to nitrite and nitrate. Through photosynthesis, the nitrates are utilized and converted into organic nitrogen in plant cells.[15]

b. The phosphates are a major element of municipal sewage due to detergents containing phosphates. Phosphates also enter the aquatic ecosystems through agricultural drainage and runoff from surface-applied fertilizers. Phosphates seldom exhibit toxic effects upon fish and other aquatic life and may be beneficial to fish culture by increasing algae and zooplankton; however, concentrations exceeding 0.03 mg/l may support undesirable plant growths.[16]

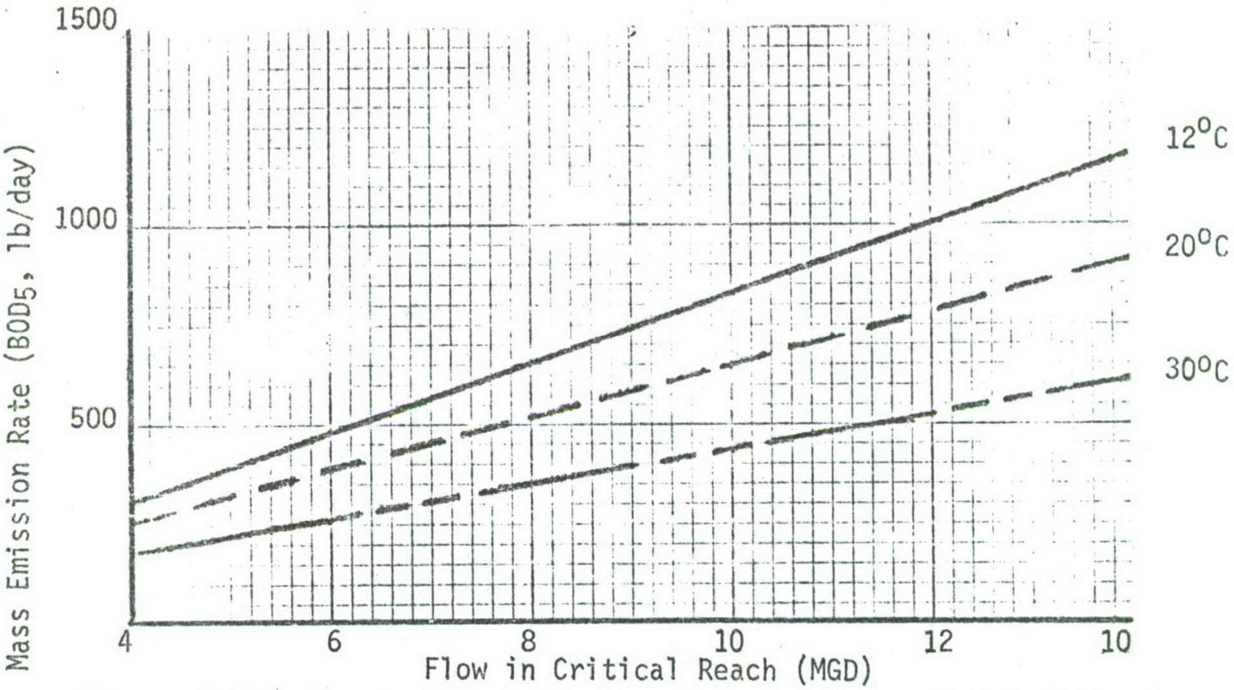


Figure G-12. Permissible Daily Mass Emission Rate - Critical Reach, Crosswicks Creek, Initial Stream DO Saturated

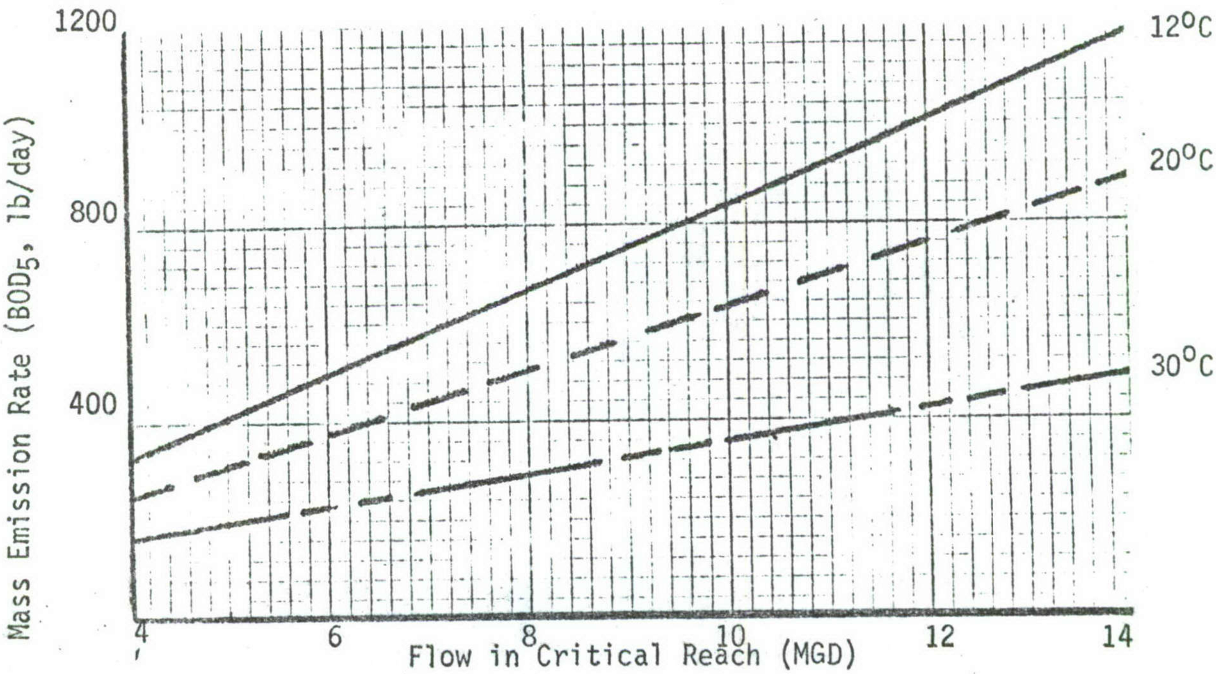


Figure G-13. Permissible Daily Mass Emission Rate - Critical Reach, Crosswicks Creek, Initial Stream DO 90 Percent Saturated

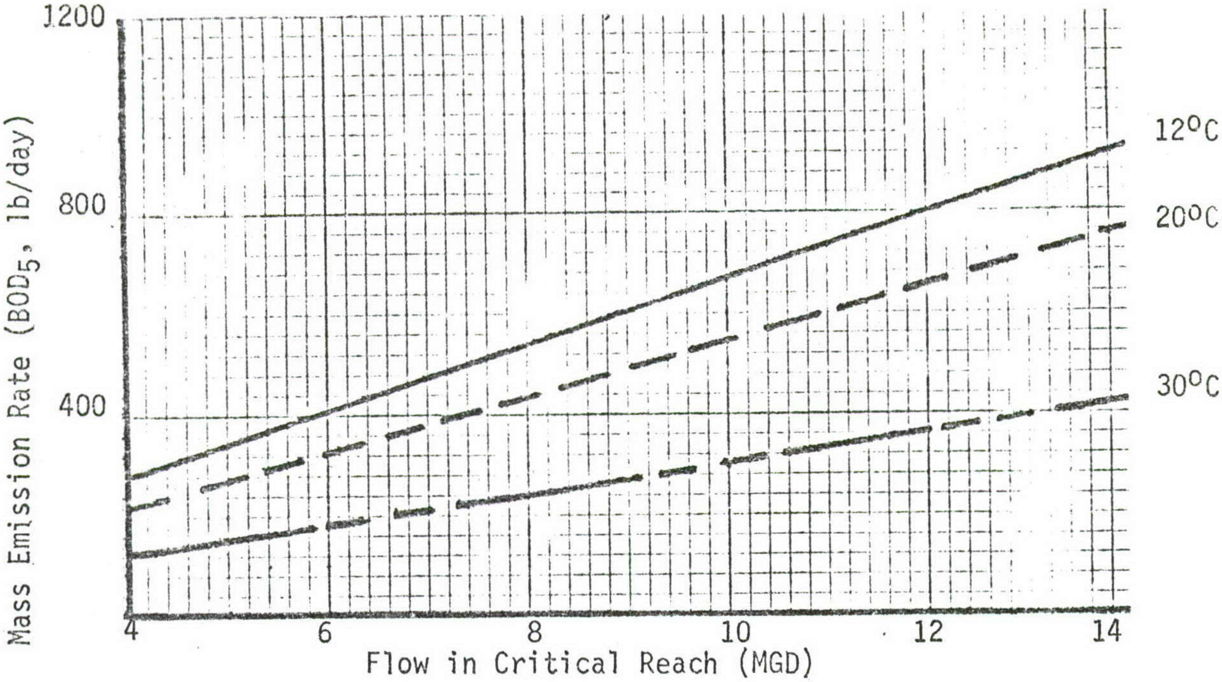


Figure G-14. Permissible Daily Mass Emission Rate - Critical Reach, Crosswicks Creek, Initial Stream DO 80-percent Saturated.

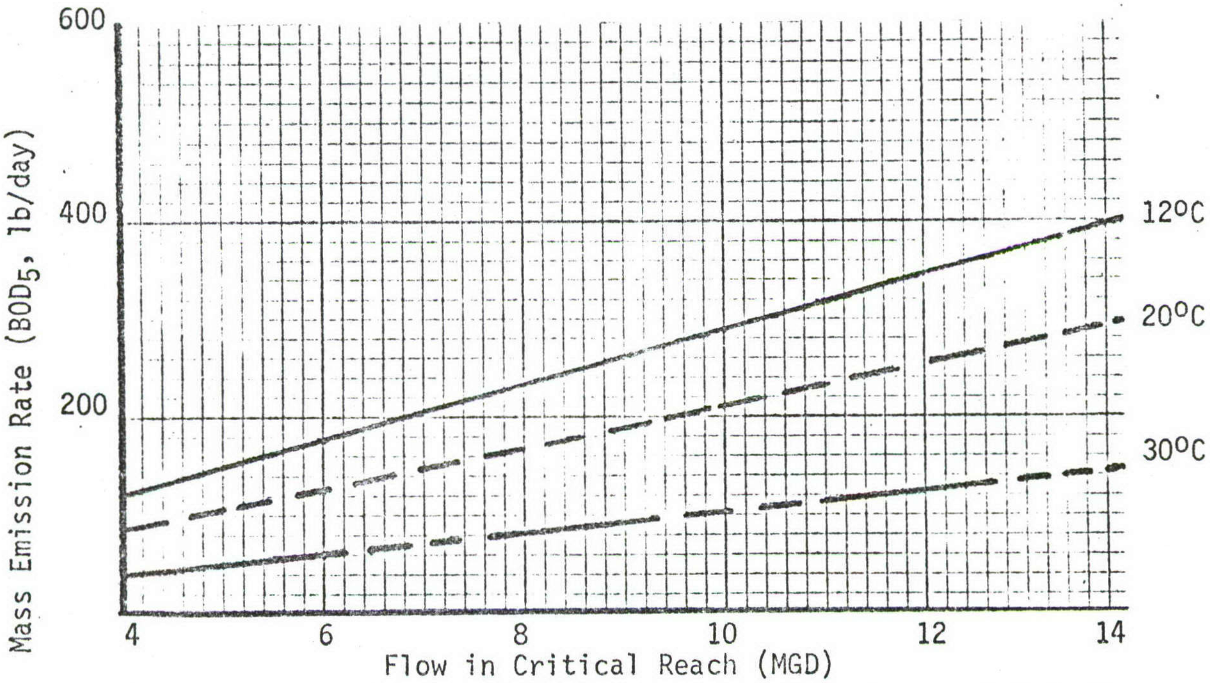


Figure G-15. Permissible Daily Mass Emission Rate - Critical Reach, Crosswicks Creek, Initial Stream DO - 5.0 mg/l.

Table G-17. Data Used to Estimate Permissible Daily BOD_5 Mass Emission Rates, Ft Dix/MAFB Survey, September 1972

Parameter	Temperature (°C)		
	12	20	30
Deoxygenation Rate Constant K_1 (per day)	0.207	0.30	0.475
Reoxygenation Rate Constant K_2 (per day)	0.19	0.23	.293
Saturation DO (mg/l	10.83	9.2	7.63

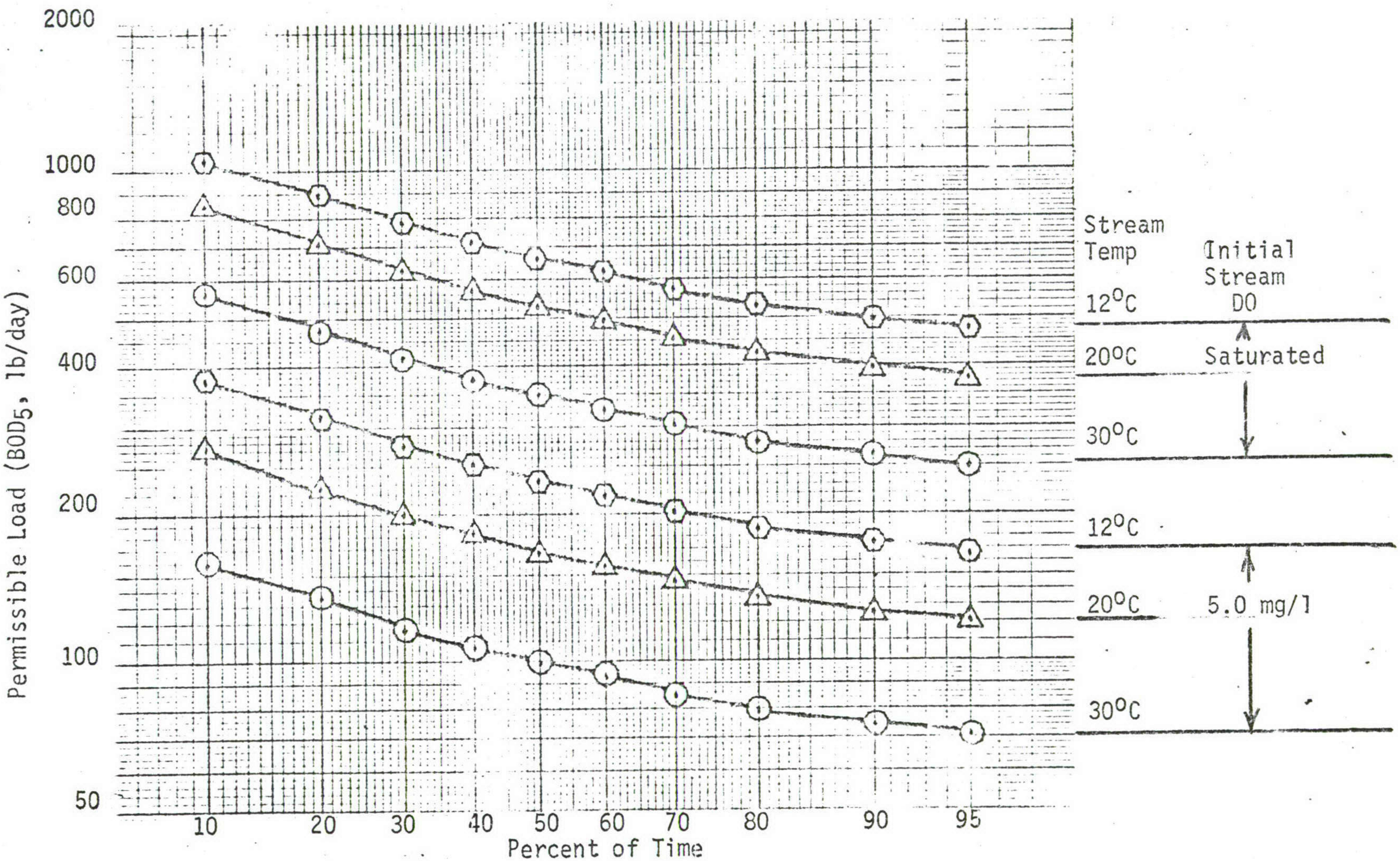


Figure G-16. Permissible Daily Mass Emission Rate Probability Based on Probable-Based on Probable Flow in Critical Reach 4, Crosswicks Creek Below Oakford Lake.

Table G-18. Estimated Permissible BOD_5 Concentrations and Daily Mass Emission Rates for the Critical Reach in Crosswicks Creek to Maintain a Minimum DO of 5.0 mg/l at the 7-Day, 10-Year Low Flow

Temp (°C)	Permissible BOD_5 (mg/l)				*Permissible (BOD5) Daily Mass Emission Rate (lb/day)			
	Initial Stream DO				Initial Stream DC			
	Saturated	0.9 Sat	0.8 Sat	5.0 mg/l	Saturated	0.9 Sat	0.8 Sat	5.0 mg/l
12	9.80	9.78	8.27	3.45	445	440	372	155
20	7.80	7.50	6.53	2.50	351	338	294	112
30	5.18	4.29	3.58	1.47	233	193	161	66

*Stream Flow assumed equal to 7-consecutive day, 10-year low flow of 0.9 MGD.

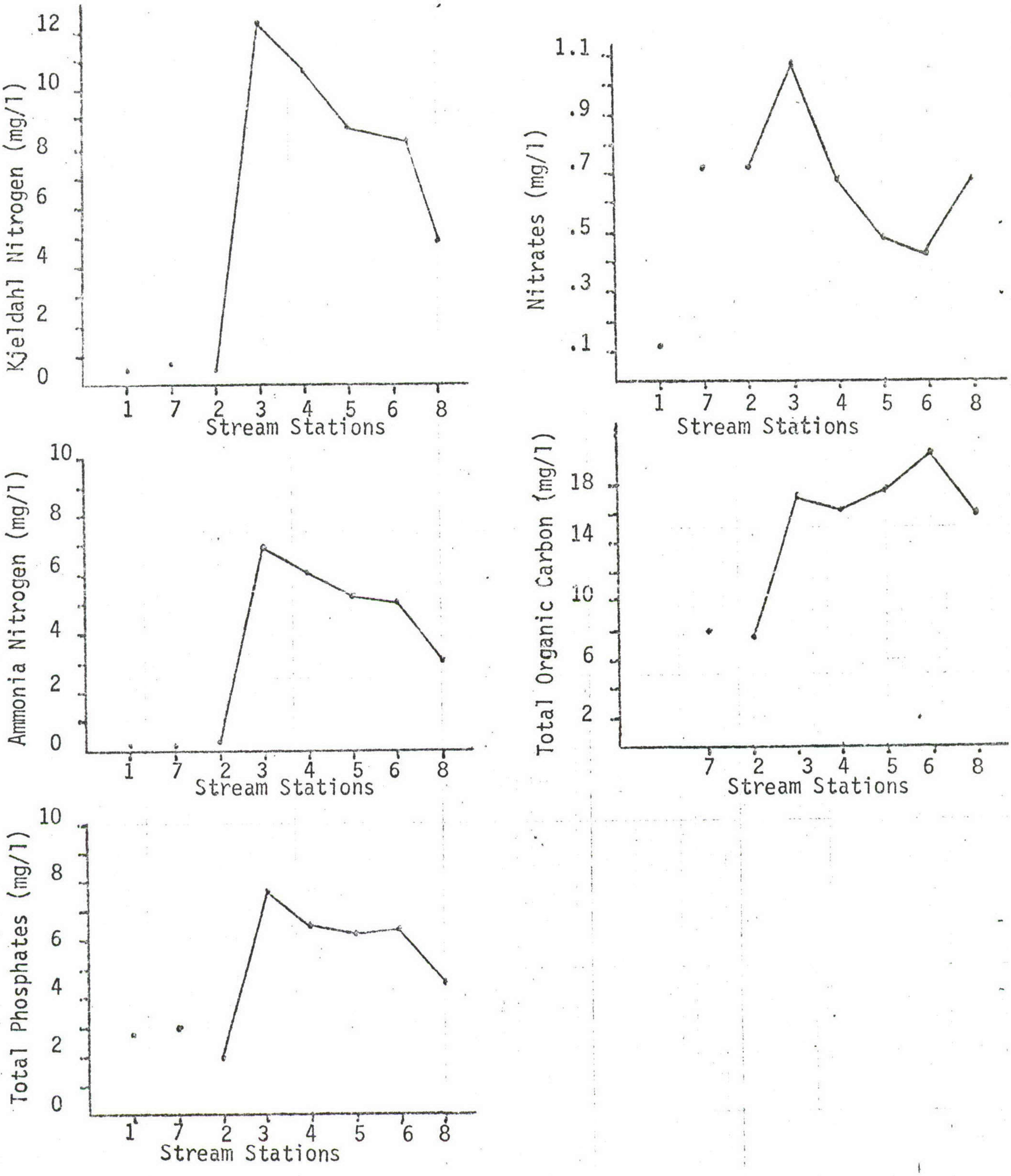


Figure G-17. Mean Daily Nitrogen (Kjeldahl, Ammonia and Nitrate), Total Phosphate and Total Organic Carbon Concentrations at Stream Sampling Stations, Ft Dix/MAFB NJ field survey, Sep 1972

Table G-19. Nutrient Loading in the Receiving Waters, Ft Dix/MAFB NJ
September 1972

Nutrient Input to Receiving Waters (lb/day)

Location	D-7	M-6	S-1	S-7
Flow (MGD)	3.1	1.4	1.1	2.9
Kjeldahl Nitrogen	564.5	168.3	5.6	8.0
Ammonia Nitrogen	323.2	88.9	0.9	1.2
Nitrates	27.6	6.8	1.0	8.6
Total Phosphates	193.0	119.7	24.8	34.6

Nutrient Concentrations in Receiving Waters

Location	S-2	S-3	S-4	S-5	S-6	S-8
Flow	0.8	4.9	7.8	8.4	10.0	13.0
Kjeldahl Nitrogen	3.8	508.2	687.1	621.8	703.7	535.3
Ammonia Nitrogen	1.2	282.	401.7	370.4	425.3	326.6
Nitrates	4.8	44.4	40.5	35.0	36.4	73.2
Total Phosphates	11.5	310.6	420.7	430.8	516.0	479.8

	Total Added to Stream	Sum in Stream	Change in Stream Loadings
Flow	8.5	9.3	+ +3.7
Kjeldahl Nitrogen	746.4	750.2	-214.9
Ammonia Nitrogen	414.2	415.4	-88.8
Nitrates	44.0	48.8	+24.4
Total Phosphates	372.1	383.6	+96.2

2. The two sewage plants add an average of 732 pounds of nitrogen and 312 pounds of phosphates per day to the receiving stream. This results in stream ammonia concentration of 5-7 mg/l where normally less than 0.1 mg/l ammonia is present and 6-7 mg/l phosphates where normally less than 2.7 mg/l phosphates are found. When speaking of the assimilative capacity of the stream for receiving wastewaters, the nutrient loading is a significant consideration. A mass balance of the reach studied in this survey revealed that after 30 hours of water travel the total nitrogen and ammonia concentrations in the stream were decreasing while the nitrate and phosphate concentrations were beginning to increase. Thus, the full effect of this loading would be expected to have further influence on the oxygen dynamics of Crosswicks Creek well downstream of New Egypt.

3. The total organic carbon was increasing at Stations S-5 and S-6, but decreased at Station S-8. Due to an EHL(K) modification of the standard analytical procedure for organic carbon,[17] the results do not accurately reflect the presence of biomass or plankton populations. The organic carbon concentration would be expected to increase at Station S-8 as nutrients are utilized to form more algae. As the numbers of algal cells increase, nuisance conditions occur such as surface scums and an algal-smothered benthos. The results may be foul smelling waters and unsightly streams.

F. HEAVY METALS

Analyses for 15 heavy metals were accomplished on the stream waters. Results are tabulated in Appendix C. No problems with metals pollution were detected by these analyses.

G. SURFACTANTS, PHENOLICS AND OILS AND GREASES

Specific in-stream limitations on surfactants, phenols and oils are not outlined in New Jersey water criteria. The data are summarized (Figure G-18) to show the impact of effluent discharges on these parameters.

1. Surfactants are solutes which have the property of lowering the surface tension of water. The surface-active agents include soap, detergents, emulsifiers, wetting agents and penetrants. The source of most surfactants result from the popularity of synthetic detergents. In mid-1965, the detergent industry completed its full-scale conversion from alkyl benzene sulfonate (ABS) to the more biodegradable linear alkayl sulfonate (LAS). Since this change-over, the number of detergent-caused foaming incidents has dropped sharply. Appreciable foaming has been observed at surfactant concentrations as low as 0.75 to 1.0 mg/l. Concentrations as low as 0.3 mg/l may be deleterious to game fish production.[16] No deleterious effects attributable to surfactants were detected, but concentrations were as high as 2.0 mg/l in South Run.

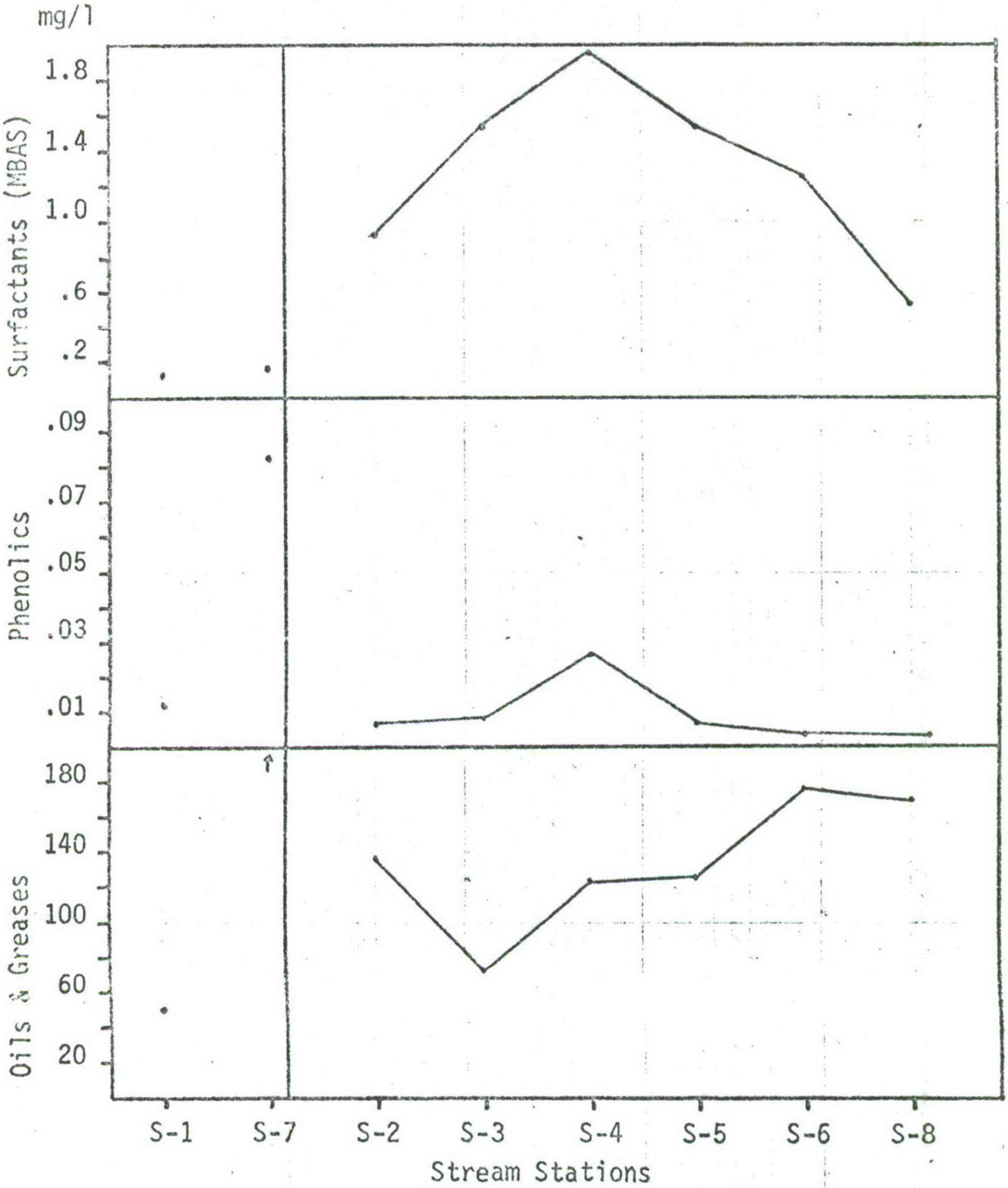


Figure G-18. Mean Daily Concentrations of Surfactants, Phenolics and Oils and Greases at Stream Sampling Stations, Ft Dix/MAFB Field Survey, September 1972

2. Phenolics are a group of organic compounds that are widely used as commercial disinfectants and as solvents on aircraft washracks. Phenolic compounds may affect fish in two ways; first, by a direct toxic action, and second, by imparting a taste to fish flesh. Concentrations less than 0.2 mg/l should not iterfere with fish and aquatic life. The daily mean concentrations in the receiving waters were less than 0.2 mg/l.(16)

3. Oils and other petroleum products may be harmful to fresh-water aquatic life in many respects including destruction of fish, benthic organisms, and algae; tainting of fish flesh, and interference with normal oxygen concentrations and reaeration.(16,18) High oils and greases concentrations were found in the stream, but irregularities in the data make these analyses questionable.

H. SEDIMENTS

1. Heavy Metals

a. Historical

Trace metals in natural surface waters are related to soil composition in a watershed, but wastewater discharges influence the heavy metal composition in polluted waters. Trace metal composition of soils and sediments will vary with the type of parent rocks, clay and organic composition and general water chemistry. Organic materials and clay particles bind metals while sand does not. The Crosswicks Creek watershead is primarily composed of fine sandy soils with mixtures of sandy loam. Many biological and physical processes lead to the deposition of metals in bottom sediments. Sediments act as a concentrated reservoir of metals from which they enter the food web of the aquatic community.

b. Preliminary Survey

Samples of sediment from five points in South Run were collected in April 1972 and analyzed for twelve metals. Table G-20 contains a summary of these heavy metals analyses. No heavy metals pollution was obvious from these samples, although an adequate control showing background levels was not available.

c. Field Survey

Sediment samples were collected at all stream stations and analyzed for seven heavy metals and organic content. The results are listed in Table G-21. The sediment was primarily sand with very low organic content. No evidence of metals pollution was obvious from

Table G-20. Heavy Metals Composition of Submerged Soils, South Run, Ft Dix and McGuire AFB, NJ, Preliminary Survey, April 1972.

Downstream Distance from Ft Dix Outfall (ft)	Parameter ($\mu g/g$ dry wt)											
	Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Zn
10 (L)[1]	0.86	2260	<.2	0.61	19.6	12.6	5699	0.050	4.4	2.63	19.8	51.3
10 (R)	0.56	3658	<.2	0.87	41.4	8.1	19195	0.018	7.5	11.67	3.7	14.4
7100 (L) [S-3]	0.20	1218	1.3	0.90	31.2	5.5	7316	0.027	7.2	8.30	5.8	36.7
7100 (R)	0.76	7065	1.2	0.76	58.8	10.3	16228	0.093	35.1	7.36	7.6	65.2
12,100 (L)	0.03	2142	<.2	0.36	20.8	4.9	2820	0.034	4.3	1.42	5.7	7.4
12,100 (R)	0.13	1500	6.9	1.62	54.1	8.8	14005	0.011	23.3	14.05	5.2	98.0
15,600-McGuire Outfall												
16,800 (L) [S-4]	--	--	--	--	--	Sample	Lost	--	--	--	--	--
16,800 (R)	0.25	1263	1.3	0.85	42.1	5.7	5798	0.039	6.5	4.30	4.1	75.9
25,600 (L)	2.79	2929	1.4	2.00	37.3	33.9	7462	0.189	33.9	4.41	31.4	208.9
25,600 (R)	1.61	3064	3.2	1.90	38.1	35.1	6876	0.151	23.2	3.45	29.7	159.2

[1] L and R indicate sample from left or right of stream center, facing downstream.

Table G-21. Heavy Metal Composition of Submerged Soils, Crosswicks Creek, Ft Dix and McGuire AFB, NJ, September 1972.

Stream Station[1]	Parameter ($\mu g/g$ dry wt)							
	Ag	Cd	Total Cr	Cu	Hg	Ni	Pb	% Organic Matter
7L	0.04	0.15	1.19	0.23	0.092	0.50	2.61	1.1
7R	0.03	0.16	1.39	0.37	0.085	0.43	2.22	6.0
1L	0.60	0.15	1.64	0.67	0.269	0.13	2.90	0.8
1R	0.12	0.15	0.59	1.48	0.075	0.06	2.97	1.0
2L	0.10	0.34	2.83	6.49	0.185	0.44	26.24	4.8
2R	0.04	0.28	3.22	2.65	0.025	0.30	53.27	3.6
3L	0.17	0.73	3.30	2.27	0.114	<.05	19.57	1.0
3R	0.22	0.31	6.65	1.93	0.013	0.16	10.13	8.5
4L	0.14	0.36	0.33	0.61	0.155	0.10	0.76	0.8
4R	0.16	0.34	3.30	1.37	0.012	0.35	12.19	0.8
5L	0.30	1.01	1.26	3.89	0.105	0.28	2.58	3.0
5R	0.95	0.91	3.01	4.17	0.054	0.37	20.02	3.0
6L	0.05	0.19	1.51	0.63	0.062	0.36	0.58	1.8
6R	0.24	0.26	1.66	2.34	0.025	0.24	3.78	1.4
8L	0.07	0.16	1.20	0.71	0.074	0.32	2.78	1.2
8R	0.06	0.16	1.48	0.73	0.106	0.31	3.75	0.8

[1] L and R indicate sample from left or right of stream center, facing downstream.

these samples. Some fluctuations in metals concentrations were noted, but many factors enter into these fluctuations. The chromium concentrations at all stations were ten times lower than the previous samples from the preliminary survey. EHL(K) analytical chemists could not find an analytical error and the difference is unexplainable.

2. Pesticides

a. Historical

Increased environmental awareness has prompted surveillance of aquatic ecosystems for pesticide residues. Pesticides may enter streams by aerial drift, application technique and storm water runoff. The following pesticides have recorded usage in recent years at Ft Dix and McGuire AFB: Abate carbaryl, chlordane, dalopon, DDT, diazinon, dieldrin, malathion, and silvex. Of the persistent chlorinated hydrocarbon insecticides, dieldrin and chlordane have been used extensively for Japanese Beetle (*Popillia japonica*) grub control.

b. Preliminary Survey

Sediment samples were collected from five locations on South Run in April 1972 for preliminary pesticide screening. Two samples from each cross-section were collected. Results of analyses are listed in Table G-22. DDT and metabolites were present in all samples at levels consistent with the background concentrations found by the National Soils Monitoring Program (Wiersma, et al, 1967). Only a trace of dieldrin was detected. Chlordane was found throughout South Run with increasing concentrations downstream. The impact of these chlordane concentrations cannot be fully evaluated, but additional samples during the actual field survey did not confirm these results. The results, therefore, are not fully explainable.

c. Field Survey

Sediment samples were collected (two per station) from ten selected stream stations in September 1972. The samples from Crosswicks Creek were analyzed by the U.S. Army Environmental Hygiene Agency and results are presented in Table G-23. DDT levels were much lower than the concentrations found in the preliminary sampling. No chlordance residues were detected, but lindane residues were found in two tributaries. The source of lindane is unknown, but presumably is local contamination. The difference between preliminary sampling results and field survey results is unexplainable, but flooding and subsequent scouring plus different analytical laboratories could be consequential.

V. BIOLOGICAL CHARACTERISTICS

A basic ecological tenet concerning pollution of any environment is that pollution depletes the diversity of animal and plant life.[19,20] Some pollutants increase the concentration of plants and animals (biomass) living in a given area, but decrease the variety of kinds. Other types of pollution simply decrease both the diversity and the biomass. Domestic sewage pollution generally has the former effect. The biological characteristics of Crosswicks Creek were determined by surveying the diversity and numbers of macroinvertebrates. Pumpkinseeds (Lepomis gibbosus) were used for in situ bioassays at each station.

A. AQUATIC MACROINVERTEBRATES

Aquatic macroinvertebrates are those animals without an internal skeletal structure that are retained on a U.S. standard sieve No. 30 and are found in an aquatic environment. These animals include the arthropods, annelids and mollusks. Two different types of sampling were accomplished: quantitative benthic sampling with a 9" x 9" Ponar dredge; and non-quantitative sampling with nets, seines and forceps.

1. Quantitative Benthic Sampling

Two samples were collected at each station (each side of middle) with a standard Ponar dredge. Samples were of a similar volume (a 9" x 9" by 2" deep). The identification and numbers of the macroinvertebrates are listed in Table G-24. The control station (S-1) supported the only pollution-sensitive benthic animals, otherwise the stream benthic fauna was quite uniform throughout, consisting of pollution-tolerant forms. Figure G-19 illustrates an analysis of the benthic macroinvertebrates by the number of groups, the number of animals and Margalef's Index of Diversity ($d = \frac{S-1}{\ln N}$).[21] At stream Stations 5 and 6 the benthic fauna consisted of large numbers of Tubicicid worms (sludge worms). These sludge worms are highly indicative of waters polluted with domestic wastes. The low number of animals collected at Station S-4 likely results from the chlorine residual in the McGuire effluent.

2. Diverse Macroinvertebrate Sampling

Macroinvertebrates were collected from a 10 yard reach of stream at each station. Sampling was nonquantitative, but was intended to qualitatively collect ecotypes. The specimens are listed by group and numbers for each station in Table G-25. As expected, a greater diversity of animals was collected. The analyses of these samples are illustrated in Figure G-20. The diversity was greatest at Stations 7, 1 and 5. South Run (Stations 2, 3 and 4) had the least number of groups. Station S-4 had the most groups indicative of pollution, while Station S-3 had the least number of clean-water forms. In Figure G-20 the adult animals that were not restricted to the water and those obtaining air from the surface were not considered in the analytical procedure. The result

Table G-22. Pesticide Residues in Submerged Soils, South Run, Ft Dix/MAFB NJ Preliminary Survey, April 1972

Downstream Distance from Ft Dix Outfall (ft)	Pesticide (μg/g dry wt)				
	DDE	DDD	DDT	Chlordane	Dieldrin
10 (L)[1]	.49	.40	.05	5.15	ND
10 (R)	.11	ND[2]	ND	1.00	ND
7100 (L) [S-3][3]	.12	.15	.02	1.36	ND
7100 (R)	.33	.11	.09	2.65	ND
12,100 (L)	.05	ND	ND	1.34	ND
12,100 (R)	.13	ND	ND	12.31	ND
15,600 McGuire Outfall					
16,800 (L) [S-4]	-	-	-	-	-
16,800 (R)	.11	.03	.30	9.94	.01
25,600 (L)	.48	.31	.18	35.71	ND
25,600 (R)	.30	.26	.04	22.27	ND

[1](L) and (R) denotes samples from left and right of stream, facing downstream
[2]ND = none detected
[3][S-3] = Same as Field Survey Stream Station 3

Table G-23. Pesticide Residues in the Submerged Soils, Crosswicks Creek, Ft Dix/MAFB NJ, September 1972[1]

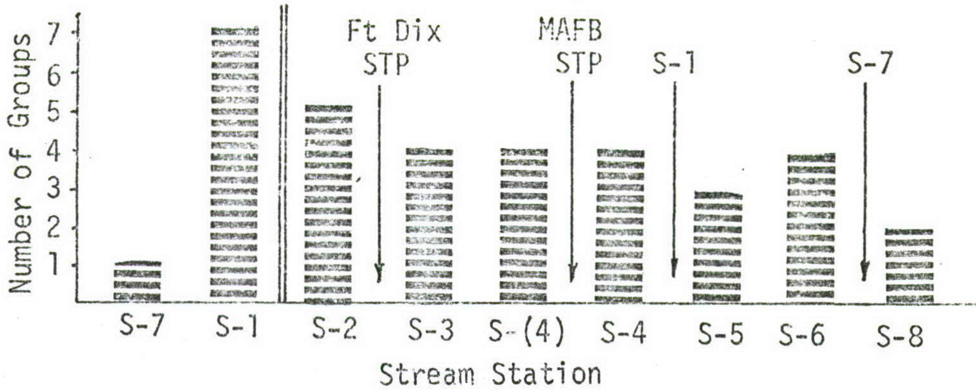
Stream Station	Pesticide (μg/g dry wt)				
	O,P-DDE	P,P-DDE	O,P-DDT	P,P-DDT	Lindane
7L	ND	ND	ND	ND	ND
7R	ND	ND	ND	ND	ND
1L	0.14	0.07	1.1	2.6	9.9
1R	0.15	Tr	Tr	T	ND
2L	ND	0.09	ND	0.19	ND
2R	ND	0.049	0.052	0.046	ND
Tributary 1					
3L	ND	ND	ND	ND	ND
3R	ND	ND	ND	ND	ND
Tributary 2					
4L	ND	ND	ND	ND	ND
4R	ND	0.02	0.51	0.41	ND
5L	ND	Tr	Tr	Tr	ND
5R	ND	0.06	ND	ND	ND
6L	ND	ND	ND	ND	ND
6R	ND	0.03	ND	ND	ND
8L	ND	ND	ND	ND	ND
8R	ND	ND	ND	ND	ND
Tributary 1 (L)	ND	0.05	0.053	0.13	0.06
(R)	ND	ND	ND	ND	ND
Tributary 2 (L)	ND	ND	ND	ND	ND
(R)	ND	ND	ND	ND	ND

[1]Analyses accomplished by U.S. Army Environmental Hygiene Agency (USAEHA/RE)

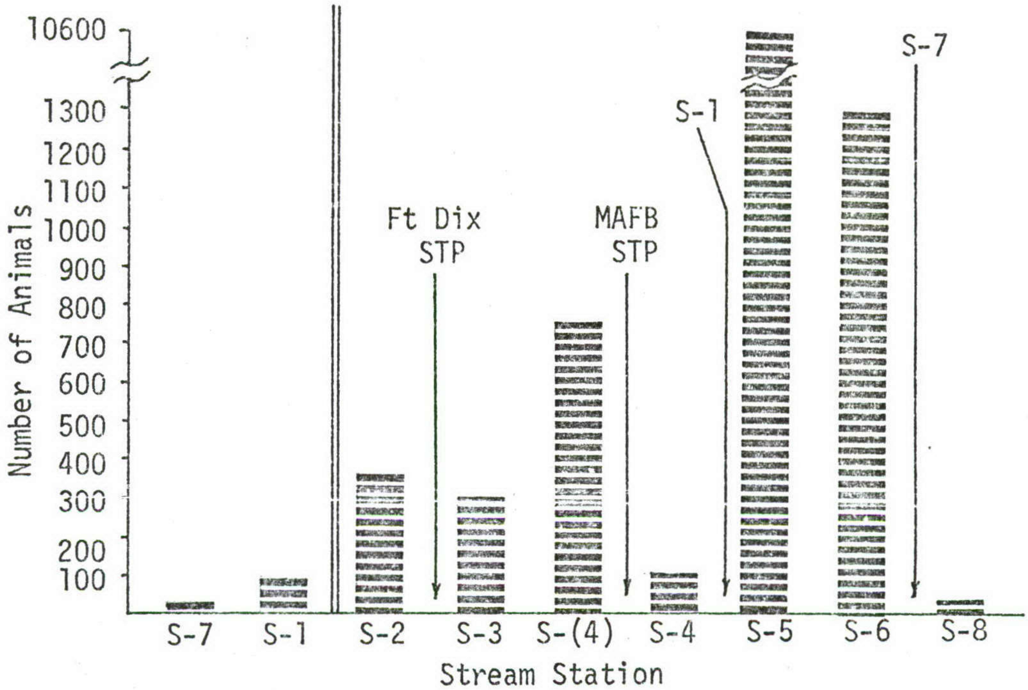
Table G-24. Macroinvertebrate Population as Collected by Quantitative Ponar Grab Sampling, Crosswicks Creek, Ft Dix and McGuire AFB, NJ, September 1972.

Identification	Station[1]																	
	1L	1R	2L	2R	3L	3R	(4)L	(4)R	4L	4R	5L	5R	6L	6R	7L	7R	8L	8R
Oligochaeta																		
Plesipora																		
Tubificidae																		
Limnodrilus hoffmeisteri	21	3	14	233	240	31	388	369	40	55	988	5763	1058	202	1	2	8	2
Tubifex tubifex		1	3	58								3825		51				
Arachnoidea																		
Hydracarina								1										
Insecta																		
Megaloptera																		
Sialidae		2																
Trichoptera																		
Limnephilidae	2	10																
Goeridae	3	20																
Diptera																		
Chironomidae	3	1	16	12	8	2	2	12		3	4	12		9				6
Psychodidae								1										
Coleoptera	3			1														
Gastropoda																		
Pulmonata																		
Lymdaeidae lymnaea			8	8	2		2	28	7	1			2					
Pelecypoda					2	1												
Total Numbers	69		353		286		752		107		10592		1322		3		16	
Total Groups	7		5		4		4		4		3		4		1		2	

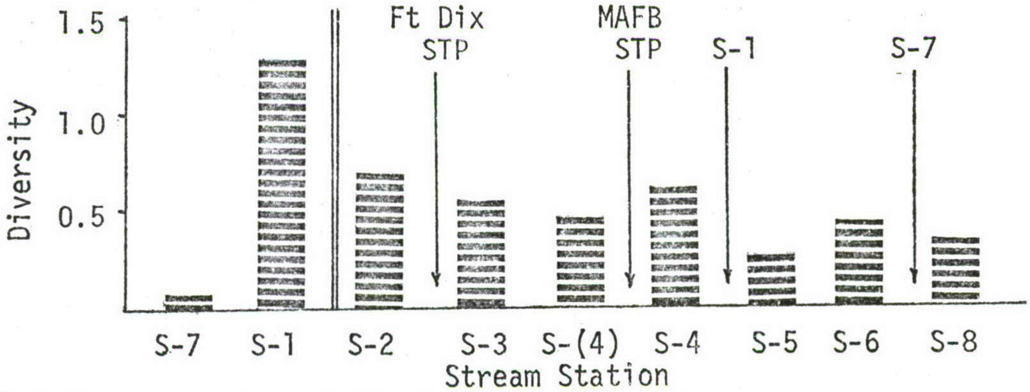
[1] L and R indicate sample from left or right of stream center, facing downstream



a. Distribution by number of species.



b. Distribution by total number of animals.

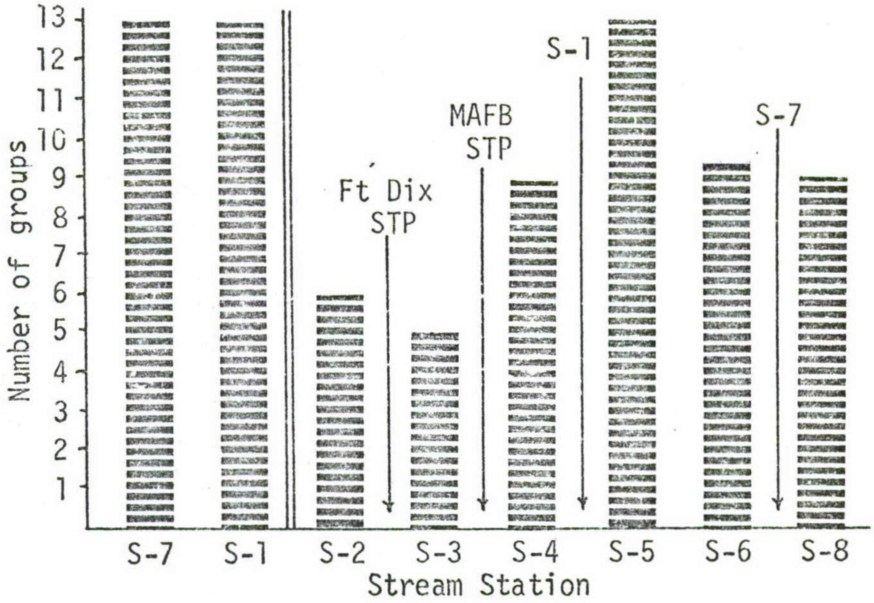


c. Distribution by Margalef's Index of Diversity

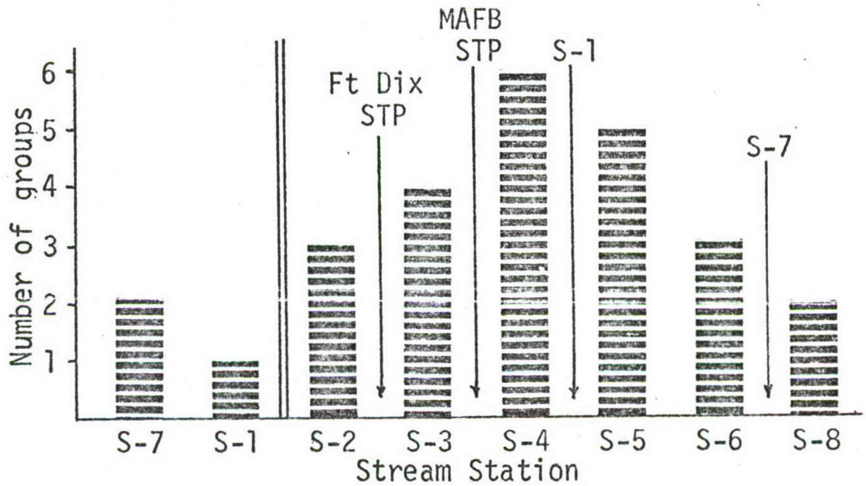
Figure G-19. Analysis of Quantitative Sampling of Benthic Macroinvertebrates, Crosswicks Creek, Ft Dix and McGuire AFB, NJ, September 1972.

Table G-25. Macroinvertebrate Population as Collected by Diverse Sampling, Ft Dix and McGuire AFB, NJ, September 1972.

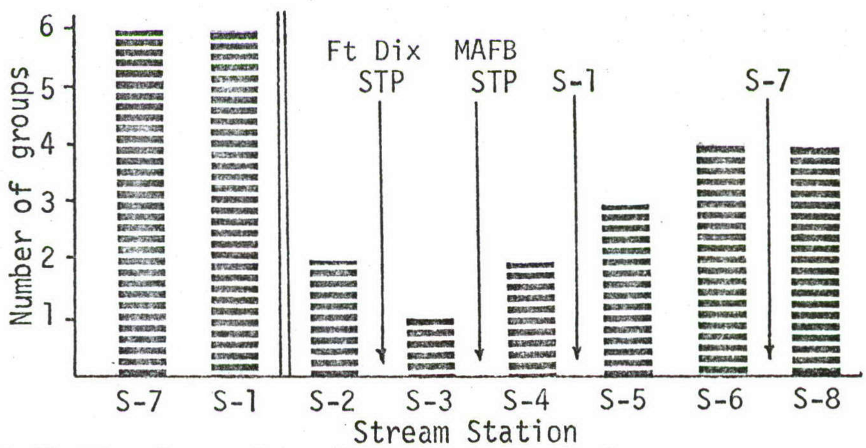
Class	Order	Family	Genus	Species	Station 1	2	3	4	5	6	7	8
Oligochaeta	Prosopora	Lumbricidae					6		2			
	Plesipora	Tubificidae	Limnodrilus	hoffmeisteri			2	3	2	8	3	
			Tubifex	tubifex				1				
Crustacea	Amphipoda	Gammaridae	Gammarus		1						1	
Insecta	Hemiptera	Belostomatidae	Belostoma						1			
		Gerridae	Gerris		1					4	2	1
			Trepobates		2					1		
		Notonectidae	Notonecta		5						1	
		Corixidae							1		1	
		Veliidae	Rhagovelia								4	
	Odonata	Coenagrionidae	Teleallagma				1	9				
			Coenagrion		1							
			Anomalagrion						4	2		4
			Ischnura		2	4			3	1		7
			Enallagma							2		
		Libellulidae	Tetragoneuria		4				4	1		1
		Aeschnidae	Boyeria								1	
		Agrionidae	Agrion								5	
	Diptera	Chironomidae			3	1	3	1	3	2	11	5
			Calopsectra								15	
		Psychodidae				1	1	6	1			
		Simuliidae	Simulium	vittatum							2	
			S.	venestrum							3	
		Ceratopogonidae	Palpomyia	tibrialis				4				
		Anthomyiidae						1				
		Culicidae	Culex		1							
		Tipulidae	Prionocera									1
		Tetanoceridae	Dictya			5						
	Coleoptera	Hydrophylidae	Helophorus		1							
			Hydrophilus					2	1			2
		Dytiscidae	Laccophilus		1	2			3		1	1
			Bidessus		1							
			Hydrocanthus		1							
		Haliplidae	Peltodytes						1			
Gastropoda	Pulmonata	Lymnaeidae	Lymnaea			8		8	6	6		1
			TOTAL GROUPS		13	6	5	9	13	9	13	9



a. Distribution by total number of groups.



b. Distribution by number of groups tolerant of pollution.



c. Distribution by number of non-tolerant, immature groups.

Figure G-20. Analysis of Diverse Sampling of Macroinvertebrates, Crosswicks Creek, Ft Dix and McGuire AFB, NJ, September 1972.

shows North Run and Jumping Brook with the greatest number of organisms indicative of clean water. South Run has a low number of pollution sensitive organisms. Some improvement of water quality based on the indicator organisms is evident at stream stations 6 and 8 on Crosswicks Creek.

B. PLANKTON

Plankton are minute plants and animals suspended in the water. Samples were collected and the algae, diatoms, zooplankton and fungi counted as described by "Standard Methods of Wastewater Analysis",[17] Sedgewick-Rafter Technique. The plankton as counted at each station are enumerated in Table G-26. Figure G-21 is a presentation of total plankton per liter of stream water by station. Figure G-22 gives a further breakdown by algal, fungal and zooplankton groups per station.

1. The saprophytic fungi derive energy from nonliving organic sources. Dense populations indicate organically enriched waters. High fungal populations were found at Stations 3 and 4 in South Run. The population decreased in Crosswicks Creek and none were found at Station 8.

2. Algae and diatoms are good indicators of nutrient-enriched waters. Dense algal and diatom populations were present at all stations indicating nutrient enriched waters throughout the watershed.

C. PERIPHYTON

Periphyton are the assemblage of minute organisms that grow on the surfaces of submerged substrates in aquatic habitats. Periphyton play an important role in the limnological processes of a stream because these organisms are the major primary producers in that environment. Periphyton appears as a constant feature in unmodified streams and is composed primarily of algae. As the level of organic pollution increases, the algal species change and the algae are replaced by filamentous bacteria and other nonchlorophyll bearing "consumer-type" organisms. The total biomass and total amount of chlorophyll increase with the organic enrichment, but also an increase in the biomass-to-chlorophyll ratio results. This ratio, termed the "Autotrophic Index" because it is a measure of the self-feeding or food-producing organisms (e.g., algae), provides a simple, yet highly significant index of water quality.[22,23] The Autotrophic Index (AI) was calculated from biomass (TOC) and chlorophyll-"a" measurements of the periphyton which grew on artificial substrates (glass slides) placed in the stream for ten days. Table G-27 contains data from periphyton sampling and the AI for each station. The data indicate:

1. Jumping Brook is a clean, unpolluted stream.

Table G-26. Plankton Population (organisms/liter of stream water), Crosswicks Creek, Ft Dix and McGuire AFB, NJ, September 1972.[1]

Station [2]	Filamentous Algae	Diatoms	Other Alagae	Fungi	Zooplankton
1-R	4.52×10^6	7.24×10^6	1.72×10^7	9.10×10^5	-
1-L	6.09×10^6	-	4.16×10^7	-	5.08×10^6
2-R	5.87×10^8	9.96×10^6	7.96×10^7	-	1.81×10^6
2-L	5.63×10^8	1.36×10^7	8.48×10^7	-	2.26×10^6
3-R	1.81×10^7	9.10×10^5	3.17×10^7	1.81×10^6	1.81×10^6
3-L	3.62×10^7	7.91×10^6	5.88×10^7	2.26×10^6	-
4-R	1.69×10^7	1.13×10^8	1.25×10^8	-	3.38×10^6
4-L	2.10×10^7	2.16×10^8	4.70×10^7	4.20×10^6	1.90×10^6
5-R	2.00×10^7	8.77×10^7	9.85×10^7	8.40×10^5	-
5-L	6.76×10^6	6.93×10^7	1.77×10^8	-	1.96×10^6
6-R	9.14×10^6	3.25×10^7	5.28×10^7	-	1.01×10^6
6-L	5.42×10^6	2.17×10^7	6.64×10^7	1.35×10^6	1.35×10^6
7-R	1.62×10^7	8.79×10^6	6.55×10^7	-	6.70×10^5
7-L	1.14×10^7	2.44×10^7	1.10×10^8	-	-
8-R	5.60×10^6	9.80×10^6	6.58×10^7	-	7.00×10^5
8-L	6.32×10^6	1.11×10^7	7.43×10^7	-	7.90×10^5

1 Plankton collected and counted as described by "Standard Methods of Waste Water Analysis", Sedgewick-Rafter Technique ( ).

2 L and R indicate sample from left or right of stream center, facing downstream.

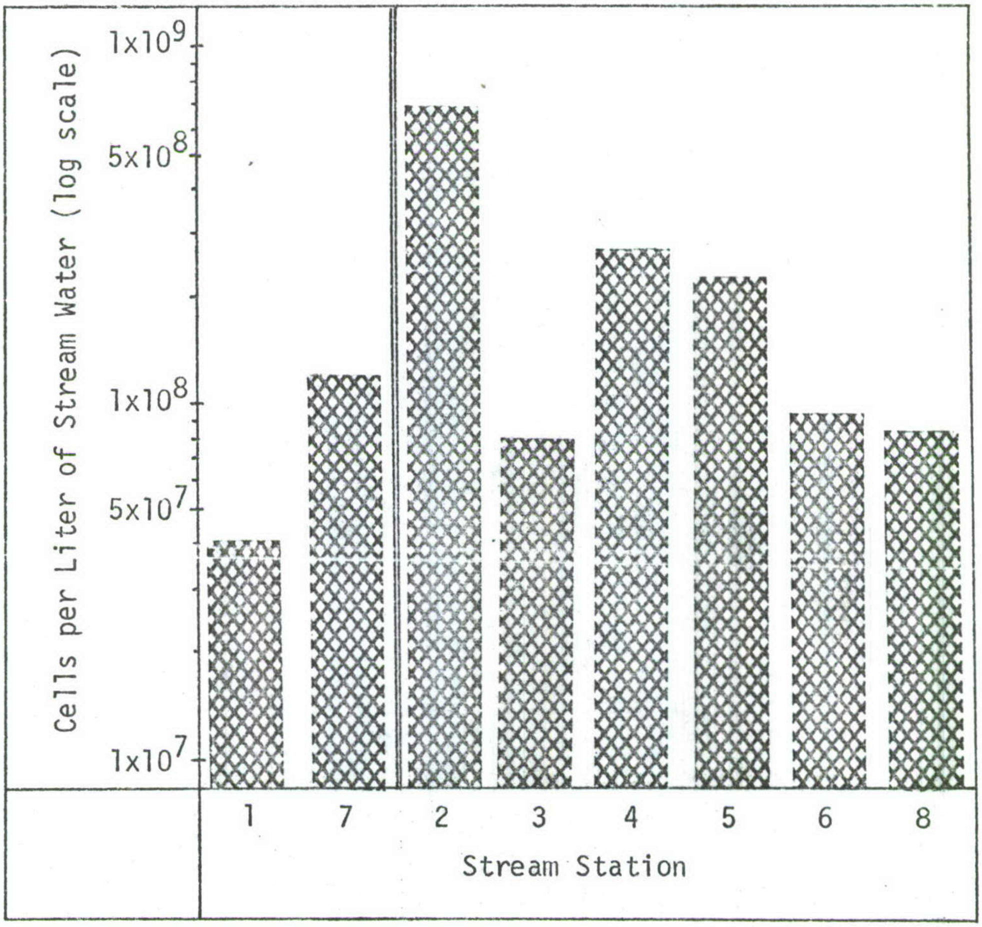


Figure G-21. Plankton Population by Station, Crosswicks Creek, Ft Dix and McGuire AFB, NJ, September 1972.

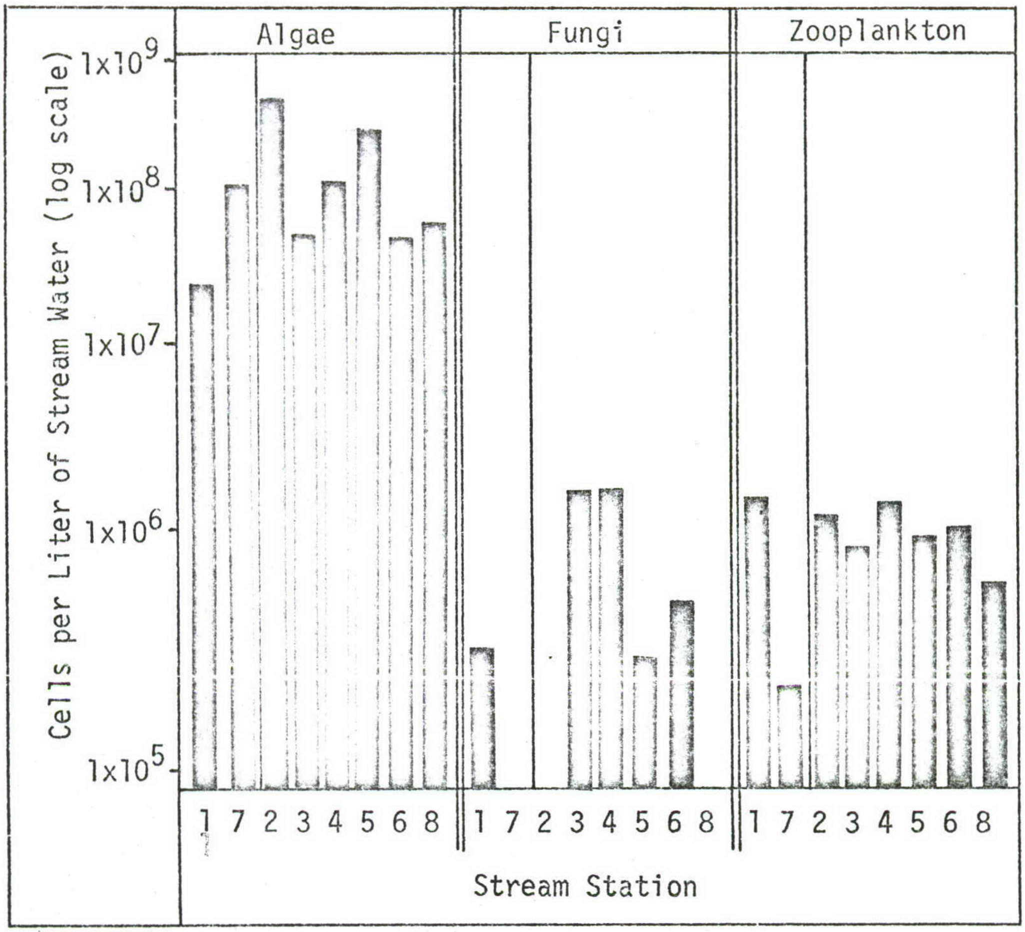


Figure G-22. Plankton Population by Group and Station, Crosswicks Creek, Ft Dix and McGuire AFB, NJ, September 1972.

Table G-27. Production of Chlorophyll "a" and Total Organic Carbon by Periphyton - Autotrophic Index, Crosswicks Creek, Ft Dix and McGuire AFB, NJ, 12-21 September 1972.[1,2,3]

Station[4]	Total Organic Carbon (g/m^2)	Chlorophyll "a" (g/m^2)	Autotrophic Index
1-L	0.061	$2.04x10^{-4}$	299
1-R	0.033	$3.56x10^{-4}$	93
			$\overline{X}$= 196
2-L	1.817	$2.55x10^{-3}$	712
2-R	2.422	$7.89x.0^{-3}$	307
			$\overline{X}$= 510
3-L	4.585	$8.32x10^{-3}$	551
3-R	6.315	$1.11x10^{-2}$	571
			$\overline{X}$= 561
4-L	0.123	$3.88x10^{-4}$	317
4-R	0.059	interference	-
			$\overline{X}$= 317
5-L	15.571	$4.63x10^{-3}$	3363
5-R	19.031	$5.08x10^{-3}$	3749
			$\overline{X}$= 3556
6-L	3.114	$2.87x10^{-3}$	1085
6-R	3.114	$2.59x10^{-3}$	1201
			$\overline{X}$= 1143
7-L	2.076	$6.51x10^{-3}$	319
7-R	3.633	$7.16x10^{-3}$	508
			$\overline{X}$= 414
8-L	6.401	$5.16x10^{-3}$	1241
8-R	2.372	interference	-
			$\overline{X}$= 1241

NOTES: [1] Periphyton samplers designed by EPA personnel
[2] Analytical method - unpublished technique of Keup
[3] Autotrophic Index - TOC/Chlorophyll "a"
[4] L and R indicate sample from left or right of stream center, facing downstream.

2. South Run is organically enriched, even upstream of the Ft Dix outfall. The AI increases downstream of Ft Dix, but decreases downstream of McGuire's outfall. This decrease is suspected to result from the toxic effect of the chlorine residual in the McGuire effluent.

3. The consumer type organisms (filamentous bacteria) are most prevalent at Station 5 in Crosswicks Creek, but the water quality improves downstream although it is still poor quality downstream of New Egypt.

4. The AI of North Run was low indicating good quality of water.

D. FISH POPULATIONS AND IN SITU FISH BIOASSAYS

Fish are dependent on the stream invertebrates for food and on the proper chemical and physical environment for survival. Fish populations are a reflection of the rest of the food web, but also fish have long life cycles and conditions directly or indirectly adverse to the fish have long term ramifications.(24) Sewage pollution reduces the variety of fish, but certain tolerant species increase in abundance. Generally, predatory fish are replaced by scavenger-type fish and regions of severe oxygen depletion may be devoid of fish entirely. The waters of Crosswicks Creek are to be "suitable for the maintenance, migration and propagation of the natural and established biota" as specified by the New Jersey Surface Water Quality Criteria. (See Appendix F.) To determine the numbers and types of aquatic vertebrates present, electroshocking and collecting was accomplished with the aid of personnel and equipment from the State of New Jersey, Division of Fish Game and Shellfisheries (Bureau of Fishery Management) and the NJ Department of Environmental Protection. Fish and other aquatic vertebrates were collected from a 200 feet reach of stream at each station, identified(25) and counted, and released unharmed. Some specimens were retained for chemical residue analyses.

1. Table G-28 lists the numbers and kinds of vertebrates collected at each station. North Run supported the greatest variety and mass of fish, reflecting the high quality of the water. Jumping Brook also was a stream of high quality with a good variety of vertebrate species. Jumping Brook actually harbored the unique fish fauna native to the acid-"tea-colored" waters of the area. Jumping Brook (Station 1) was the only place in the watershed where pickerel, mudminnow, pirate perch, banded sunfish and tessellated darters were collected. These species should be dispersed throughout the watershed, but they cannot survive in polluted waters. Fish life in South Run and the downstream portion of Crosswicks Creek was very different from that in Jumping Brook. Only the pollution tolerant killifish and bullheads were found in South Run. The stream was devoid of fish downstream from McGuire's outfall. Only semi-aquatic frogs were observed in this reach. The stream quality improved somewhat in Crosswicks Creek, but fish life was represented only by pollution-tolerant, trash fish. Although weights were not obtained, Crosswicks Creek did obviously support the greatest mass of fish, including medium sized carp, eels, and bullheads.

Table G-28. Aquatic Vertebrates Collected by Electro-shocking in Crosswicks Creek, Ft Dix and McGuire AFB, NJ, September 1972.

Kinds of Vertebrates	Stream Station							
	7	1	2	3	4	5	6	8
	Number of Animals							
American Eel, _Anguilla rostrata_	8					4	2	5
Eastern Mudminnow, _Umbra pygmaea_		1						
Chain Pickerel, _Esox niger_		2						
Carp, _Cyprinus carpio_						32	5	2
Golden Shiner, _Notemigonus crysoleucas_	4					15	4	4
Shiners, _Notropis sp._	2							
Spottail Shiner, _Notropis hudsonius_	6							
Creek Chub, _Semotilus atromaculatus_	2							
White Sucker, _Catostomus commersoni_	1							
Creek Chubsucker, _Erimyzon oblongus_						4		
Brown Bullhead, _Ictalurus nebulosus_	1			2			2	
Pirate Perch, _Aphredoderus sayanus_		2						
Banded Killifish, _Fundulus diaphanus_			42	5				
Banded Sunfish, _Enneacanthus obesus_		6						
Pumpkinseed, _Lepomis gibossus_	2							
Tessellated Darter, _Etheostoma olmstedi_		2						
Snapping Turtle, _Chelydra serpentina_		1						
Leopard Frog, _Rana pipens_		1			1			
Green Frog, _Rana clamitans_		1			2			
Bullfrog, _Rana catesbeiana_						1		
Total Kinds	8	8	1	2	2	5	4	4

2. Pumpkinseeds were seined from Hip's Folly pond on the upper reaches of the West Branch to South Run and placed in hardware cloth cages (8 fish per cage) at each of the stream stations. Table G-29 lists the mortality of the pumpkinseeds over an eight day exposure period. Survival was best in a small tributary (Station 2A) to South Run. The sunfish survived well in the stream reach between the Ft Dix outfall and McGuire outfall. This indicates that the lack of native fish is due to toxic discharges not observed during the field survey or chronic discharges that make the stream untenable over longer periods of time than the eight days. Immediately downstream of the McGuire outfall, all fish died within three hours. The McGuire effluent was acutely toxic to fish. Bioassays using the same species in the effluent prior to chlorination revealed no toxicity and no mortality. The high chlorine residual in the effluent effecitvely kills most stream biota. Mortality of the pumpkinseeds was about 50 percent after eight days in Crosswicks Creek at Station 5. There was 80 percent mortality at Station 5 which is explained by the data showing an oxygen depletion at that point in the stream. Conditions for sunfish survival were improved downstream below Oakford Lake. The pumpkinseed mortality in Jumping Brook likely is a result of nonadaptability to the low pH. The high mortality in North Run is unexplainable since the same species was collected in that stream.

E. PESTICIDE RESIDUES IN FISH

Several fish were selected for preliminary screening of the persistent, organo-chlorine pesticide residues. Results of these analyses are listed in Table G-30. Residues of the ubiquitous DDT and metabolites were present in all species. The concentrations of DDT and metabolites ranged from 0.028 to 1.316 µg/g. The U.S. Department of Interior's National Pesticide Monitoring Program found 6.47, 4.89 and 3.71 ppm DDT and metabolites in brown bullheads in 1967, 1968 and 1969, respectively, from the Delaware River at Camden NJ (Henderson, et al, 1969 and 1971). The residue of DDT and metabolites found in the Brown Bullhead from Crosswicks Creek was 0.398 ppm. This concentration is quite low. The chlordane and PCB levels were also very low.

F. BACTERIOLOGICAL ANALYSIS OF RECEIVING WATERS

1. Concurrent to the bacteriological analyses being accomplished on the STP effluents, similar studies were being performed on samples taken from each of the receiving water and control stations. This study was designed to determine whether the sewage outfalls affected the sanitary quality of the receiving waters.

2. Samples were collected at each station for ten consecutive days and analyzed for total coliforms, fecal coliforms and fecal streptococci by the membrane filter technic as referenced in Materials and Methods, Appendix B. Problems with incubation temperatures and culture media for the fecal streps invalidated many of the analyses. The New

Table G-29. Mortality of Pumpkinseeds (*Lepomis gibossus*) Caged in Crosswicks Creek, Ft Dix/McGuire AFB NJ September 1972

Station	Percent of Fish Mortality									
	Hours of Exposure									
	2	3	24	48	72	96	120	144	168	192
1	-	-	0	50	56	56	56	56	56	56
2	-	-	31	37	62	93	93	93	93	93
2A	-	-	0	0	0	0				
-[1]	100									
3	-	-	25	25	31	31	31	31	37	
-[2]	0	0	14	29	29					
-[3]	38	100								
4	-	-	100							
5	-	-	37	37	37	50	50	56	56	56
6	-	-	56	75	81	-[4]				
7	-	-	50	50	56	62	69	75	75	93
8	-	-	31	37	50	50	50	62	62	62

[1]Located ten feet downstream of Ft Dix Outfall.
[2]Located 30 feet upstream of McGuire Outfall.
[3]Located 30 feet downstream of McGuire Outfall.
[4]Cages vandalized.

Table G-30. Pesticide Residues in Fish Collected in Crosswicks Creek, Ft Dix and McGuire AFB NJ, September 1972

Fish	Station	Pesticide (μg/g dry wt)				
		DDE	DDD	DDT	Chlordane	PCB
Carp	5	.049	.038	.018	.227	ND
Brown Bullhead	6	.185	.163	.050	ND	ND
American Eel	7	.026	.020	.032	ND	ND
American Eel	7	.529	.394	.393	ND	1.314
Brown Bullhead	7	.011	.010	.007	ND	ND

Jersey Department of Environmental Protection, Division of Water Resources conducted a stream survey from 2 May to 21 September 1972 and published a preliminary report in October 1972. The bacteriological data is summarized and reproduced in this report for comparison with this Laboratory's bacteriological examination of the waters.

3. Table G-31 summarizes fecal coliform findings. The New Jersey Surface Water Quality Criteria for FW-2 waters specifies that "Fecal coliform levels shall not exceed a geometric mean of 200/100 ml." This level is grossly exceeded in North Run. The control stations had low levels of fecal coliforms. The Ft Dix sewage plant effluent violated this criterion with a geometric mean of 233 fecal coliform colonies per 100 ml. This level dropped rapidly as evidenced by the low levels of S-3. McGuire's sewage plant effluent contained low levels of fecal coliforms (160/100 ml). The fecal coliform level was observed to increase considerably in Crosswicks Creek. The source of these fecal coliforms was not discovered.

4. In addition to fecal coliforms analyses were accomplished for fecal streptococci and total coliforms. The presence of fecal streptococci (Table G-32) indicates the presence of warm-blooded animal pollution. The fecal streptococci do not multiply in water,[26] therefore, increases of fecal strep bacteria in the stream is a result of additional pollution. Control Station S-2 had high levels of fecal strep indicating fecal pollution from animals, possibly pets. Fecal strep concentrations were very low in South Run, but high in Crosswicks Creek. This indicates contamination of Crosswicks Creek by either wildlife or domestic animals.

Table G-31. Data Summaries of Fecal Coliform Analyses of Receiving Waters and Sewage Plant Effluents, Ft Dix and McGuire AFB NJ by EHL/K (September 1972) and NJ DEP (May-September 1972)

Station	Fecal Coliform					
	EHL/K			NJ DEP		
	N[1]	Range	GM[2]	N	Range	GM
S-7	7	50 - 19,600	2,475	9	80 - 1,300	418
S-1	6	10 - 40	21	5	<20 - 330	<35
S-2	7	80 - 2,500	203			
D-7	6	20 - 1,100	233			
S-3	7	20 - 6,400	137			
M-6	6	20 - 1,000	160			
S-4	7	20 - 3,500	168	8	50 ->24,000	>261
S-5	7	20 - 2,600	301	9	80 - 17,000	811
S-6	7	80 - 16,000	628	9	170 - 16,000	952
S-8	7	20 - 8,000	226	9	80 - 2,400	821

[1]N = Number of Samples
[2]GM = Geometric Mean

Table G-32. Data Summaries of Fecal Steptococci Analyses of Receiving Waters and Sewage Plant Effluents, Ft Dix and McGuire AFB NJ by EHL/K (September 1972) and NJ DEP (May-September 1972)

Station	Fecal Streptococci					
	EHL/K			NJ DEP		
	N[1]	Range	GM[2]	N	Range	GM
S-7	2	1180 - 2480	1711	9	22 - >2400	>252
S-1	2	<5 - 220	<33	5	23 - 350	73
S-2	2	780 - 1100	926			
D-7	2	<10	<10			
S-3	2	<10 - 20	<14			
M-6	2	<10 - 30	<17			
S-4	2	<5 - 10	<7	8	8 - 350	47
S-5	2	110 - 760	289	9	8 - 3500	175
S-6	2	140 - 700	313	9	140 - 1600	415
S-8	2	620 - 3440	1460	9	23 - 1600	413

[1]N = Number of Samples
[2]GM = Geometric Mean

The total coliform data (Table G-33 correlates well with the above discussion, indicating heavy bacterial pollution in North Run, moderate pollution of South Run, and heavy bacterial contamination of Crosswicks Creek. The ratios of fecal coliform/fecal streptococci geometric means are summarized in the text, Table G-34. Geldreich[27] states that in wastes of human origin, the ratio of number of fecal coliforms to fecal streptococci is greater than two-to-one, while such ratios for wastes from nonhuman animal sources tend to be less than one-to-one. Application of this theorem to the field survey data, indicates that S-1, S-2 and S-8 are not polluted by human wastes; S-7, S-5 and S-6 are possibly polluted by some human fecal material; D-7, S-3, M-6 and S-4 show definite pollution by human fecal bacteria.

G. EFFLUENT BIOASSAYS

The bioassay studies accomplished during this survey utilized continuous-flow monitoring of effluent toxicity. Two species of fish were used at each sewage treatment plant for these tests.

1. Experimental Animals

a. Fathead minnows (*Pimephales promelas*), which are the standard test fish at the EHL(K), were obtained from the National Fish Hatchery at Uvalde, Texas and flown in an insulated, aerated container to McGuire AFB/Ft Dix for these bioassays. Subadult fish ranging in weight from 0.45 - 1.20 g (mean weight = 0.64, standard deviation = 0.190) were used in these tests.

b. Pumpkinseeds (*Lepomis gibbosus*) were seined from Hips Folly Pond (man-made reservoir, upper reaches of South Run) on Ft Dix for in the bioassays. Subadult fish ranging in weight from 1.75 - 9.50 g (mean weight = 5.75, standard deviation = 2.338) were used in these tests.

2. Bioassay Test Procedure

a. Effluent bioassays were dynamic-type receiving sewage treatment plant final effluent (prior to chlorination). The effluents were delivered to flow-through chambers where fish were exposed as listed in Table G-35.

b. Controls were an integral part of the bioassays. Fathead minnows and pumpkinseeds were held in well water from deep wells on McGuire AFB under static conditions concurrent to the dynamic tests. The water was collected in polyethylene carboys prior to chlorination or any other treatment. The control water chemistry is presented in Table G-36.

c. All bioassays were aerated to prevent low oxygen stress. All exposure chambers were 1-gallon plyethylene containers and flow rates were adjusted to 25 ml/minute to give 2.5 hours detention time.

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Table G-33. Data Summary of Field Survey Total Coliform Analyses, Receiving Waters and Sewage Plant Effluents, Ft Dix and McGuire AFB NJ, Septemb er 1972

Station	Total Coliform		
	N[1]	Range	Geometric Mean
S-7	7	1,700 - 126,000	44,778
S-1	6	20 - 16,000	547
S-2	7	16,000 - 100,000	39,820
D-7	6	4,600 - 21,000	7,382
S-3	7	200 - 88,000	11,590
M-6	6	2,000 - 240,000	10,292
S-4	7	100 - 120,000	16,769
S-5	7	6,000 - 69,000	31,988
S-6	7	29,000 - 135,000	54,305
S-8	7	2,000 - 102,000	29,824

[1]N = Number of Samples

Table G-34. Ratios of Geometric Means for Fecal Coliforms/Fecal Streptococci as Analyzed in the Receiving Waters and Sewage Plant Effluents, Ft Dix and McGuire AFB NJ by EHL/K (September 1972) and NJ DEP (May-September 1972)

Station	Fecal Coliform/Fecal Streptococci Ratio	
	EHL/K	NJ DEP
S-7	1.4	1.7
S-1	0.6	0.5
S-2	0.2	
D-7	23.3	
S-3	9.8	
M-6	9.9	
S-4	24.0	5.6
S-5	1.0	4.6
S-6	2.0	2.3
S-8	0.2	2.0

Table G-35. Fish Bioassay Exposure Data, Ft Dix/MAFB Survey September 1972

	No. Exposure Chambers	No. Fish/ Chamber	Exposure Time (Consecutive Hours)
McGuire AFB			
Fathead Minnows	5	5	175
Pumpkinseeds	4	6	114
Ft Dix			
Fathead Minnows	1	25	96
Pumpkinseeds	1	25	96

d. Bioassay test fish were counted as dead when gill movement ceased and no response was elicted to touching.

Table G-36. Chemistry of Control Water From Deep Well on McGuire AFB Used for Fish Bioassays

pH	6.6 units
Alkalinity	44.0
Color	20.0
Turbidity	2.0
Hardness ($CaCO_3$)	144.0
Dissolved Solids	120.0
COD	0.0
Kjeldahl Nitrogen	<0.5
Ammonia Nitrogen	<0.1
Nitrites	<0.1
Nitrates	<0.1
Phenols	0.015
MBAS	<0.01
Chromium	<0.05
Hexavalent Chromium	<0.001
Copper	<0.02
Aluminum	0.48

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APPENDIX H

Industrial Waste Source Inventories

I. McGuire AFB Inventory

Following (Tables H-1 - H-4) is an industrial waste source inventory for MAFB compiled by the MAFB Bioenvironmental Engineer. The data are compiled by building number, the generating activity, approximate volumes of each contaminant when known, and the methods of ultimate disposal.

TABLE H-1 INDUSTRIAL WASTE SOURCE INVENTORY, MAFB NJ			
BLDG	FUNCTION	CONTAMINANT	DISPOSAL
17-08	Fire Dept	Oil	Drums to Salvage
	PAX Term Cafe	Detergent 6 gal/wk	
		Reward-Chlorinated 30 lb/wk	Sanitary Sewage
		Rapid-Dri 2 gal/wk	Sanitary Sewage
		Cleansing Powder 32 oz/wk	Sanitary Sewage
		Bleach-Na 12 qts/wk	Sanitary Sewage
		Ammonium Hydroxide 12 qt/wk	Sanitary Sewage
17-32	Flt Contr	Boraxo	Sanitary Sewage
		Floor Wax 1 gal/wk	Sanitary Sewage
		Floor Wax Remover 1 gal/wk	Sanitary Sewage
		Oil 500 gal/wk	Bowser
		Fasolv Degreaser	Oil Separator Into Sanitary
		PD 680 27 gal/wk	Oil Separator Into Sanitary
		Alkali 55 gal/wk (6850-935-0995)	Oil Separator Into Sanitary
		Carbon Remover (6850-803-6420)	Oil Separator Into Sanitary
		Detergent (7930-999-2417	Sanitary Sewage
18-23	Fuel Sys Rpr	JP-4 Fuel 10 gal/wk	Oil Separator
18-03	Protective Coatings	Ketone (6810-281-2762)	Ft Dix Landfill
		Lacquer	Ft Dix Landfill
		Dope Thinner	
		Water From Sprayer	Upon Grass
18-16	Prop Maint	Oil	Bowser
		Varsol	Bowser
		PS 66	Bowser
		Speedy Dri	Dumpster

TABLE H-2
INDUSTRIAL WASTE SOURCE INVENTORY, MAFB, NJ

BLDG	FUNCTION	CONTAMINANT	DISPOSAL
18-17	Eng Shop	Oil Fuel	Bowser Bowser
18-09	Rail Shop	Naptha	Evaporation
18-11	NJ Nat Guard	Cleaner MIL-C-25769 Oil Varsol Gunk	Sanitary Sewage Bowser Sanitary Sewage Sanitary Sewage
26-04	Consol Dine Hall	Compound 5,400 lb/mo (7930-531-7847) Rinso 24 gal/wk (7930-619-9575) Powder 24 cans/wk (7930-243-5940)	Sanitary Sewage Sanitary Sewage
22-01		Acft Cleaner 175 gal/wk (685- 935-0995)	Sanitary Sewage
22-02		Acft Cleaner Compound 1 ga/wk	Sanitary Sewage
22-03		Oil	Oil Sent to Bldg 22-01 Oil Separator
22-05		Fuel PS-661 Solvent	Bowser to POL Ramp Drainage to Oil Separator
22-40	Acft Corros Control Washrack	M.E.K. 20 gal/wk PD 680 800 gal/wk Toluene 10 gal/wk Acft Cleaner 200 gal/wk Turco MIL 25769F 330 gal/wk Stripper 35 gal/wk (8010-815-2970)	Into Floor Drains to Oil Separator & Then to Sanitary Sewage Note: Soluble & Miscible Compounds Bypass the Oil Separator.

TABLE H-3
INDUSTRIAL WASTE SOURCE INVENTORY, MAFB NJ

BLDG	FUNCTION	CONTAMINANT	DISPOSAL
22-50		Eng Oil 300 qt/day	Bowser
22-51		Eng Oil 300 qt/day	Bowser
32-09	Hyd Shop	Hyd Fluid 25 gal/mo Solvent 50 gal/wk Surgical Soap	Bowser Bowser Sanitary Sewage
	IRAN Dock	Oil	Bowser
	Aero Rpr	Naphtha 1 gal/wk (6810-238-8119) M.E.K. 5 gal/wk Sweeping Compound 100 lb/wk	Evaporation Evaporation Ft. Dix Landfill
32-06	Refuel Maint	JP-4 Fuel 300 gal/wk 115 AvGas 145 AvGas Acft Cleaning Compound 55 gal/wk	Underground Tank + Drain to Storm Drains
34-28	Heater Rpr	Paint Thinner 2 gal/wk Fuel Oil 2 gal/wk Acetone 2 gal/wk	Storm Drains Ft. Dix Landfill Bowser to Salvage
34-40	Heavy Equip Rpr	Acft Cleaning Compound Oil 440 gal/mo PS-661 27 gal/mo	Storm Drains Salvage Salvage
33-37	Test Cell	JP-4 Fuel Oil Hyd Fluid Acft Cleaner 55 gal/mo PS-680	Drainage Ditch to Stream Bowser

TABLE H-4
INDUSTRIAL WASTE SOURCE INVENTORY, MAFB NJ

BLDG	FUNCTION	CONTAMINANT	DISPOSAL
34-101	Paint Shop	Thinner 80 gal/mo	Ft. Dix Landfill
		Latex Paint	Washed Into Stream
		Oil-Base Enamel	Ft. Dix Landfill
34-31	Power Prod Maint	Diesel Fuel 100 gal/wk	Bowser
		Gasoline	Bowser
		Oil	Bowser
		Solvent	Bowser
		Acid-Battery	Dilute 1,000:1 & Wash Into Stream

II. Fort Dix Inventory

Following (Table H-5) is an inventory of vehicle wash racks on Fort Dix compiled by the Fort Dix Medical Department Sanitarian.

TABLE H-5
INDUSTRIAL WASTE SOURCE INVENTORY, VEHICLE WASHRACKS, FT. DIX NJ

BLDG	FUNCTION	CONTAMINANT/DISPOSAL
5372	TMP	1. Drainage - Into storm sewer. 2. Cleaning Agents - Liquid soap approx 3 gallons/vehicle; 150 vehicles/day. 3. Discharge volume: 3450 gal/day.
4302	363rd Trans.	1. Drainage - runoff into dirt road. 2. Cleaning Agents - None. 3. Discharge volume: 900 gal/day.
4465	85th Med Bn.	1. Drainage - Storm Sewer. 2. Cleaning Agents: Liquid soap. 3. Discharge Volume: 207 gal/day.
5723	532nd MP Co.	1. Drainage - Storm Sewer 2. Cleaning Agents: Liquid Soap. 3. Discharge volume: 500 gal/day.
5880	759th MP Bn.	1. Drainage: Into sump. 2. Cleaning Agents: Liquid soap. 3. Discharge volume: 690 gal/day.
5924	5th AIT Bde	1. Drainage into ditch in wooded area behind washrack. 2. Cleaning Agent: Liquid soap. 3. Discharge volume: 2300 gal/day.

NOTES:
1. Cleaning Agents: Only soap used. Manufacturer of liquid soap unknown. Also use solution of detergent, general purpose, Fed Spec P-D-22A, Type I Powder, Manufactured by Edick Lab. Estimated 3 gal/vehicle.
2. Discharge volume: Estimate based on approx 23 gallons of water used/vehicle, since water is left running during washing of vehicle. Maximum usage based on maximum number of vehicles.
3. Any oil, grease, etc., discharged into system comes from washing of vehicles.

APPENDIX I

EFFLUENT DISPOSAL ON THE LAND

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I. General

There are a number of advantages in returning treated wastewaters to the land, including: reduced costs over advanced waste treatment schemes; the soil-plant complex is an effective renovation media capable of using both excess water and nutrients; less degradation of surface water courses results; the treated waters are returned to the ground waters for reuse, and some economic return may be realized through crop production. If properly designed and well managed a land irrigation system will return renovated waters into either the surface or sub-surface water resources. Land disposal systems may be used where the waste contains pollutants which can successfully be removed through organic decomposition in the soil-plant complex, and by adsorptive, physical, and chemical reactions with earth materials.

A. System Objectives: Two approaches with differing objectives are apparent.

1. Agricultural Irrigation: This approach involves the application of water or effluent for maximum economic return from the cropping season. In this approach water is used on a seasonal basis and is greatly influenced by rainfall patterns. In this approach the amounts of water applied are generally small in relation to the disposal need. Small scale agricultural irrigation of the MAFB golf course is currently practiced, using chlorinated effluent from the sewage treatment plant.

2. Effluent Irrigation: This approach is the disposal of the maximum amount of effluent which can be renovated by the soil-plant filter without detrimental effects to the surface or ground water, soils or crops. In general, the particular soil's permeability or hydraulic conductivity will determine the amounts of water passing through the soil. However, the amount of application will be determined by the capability of the plant-soil complex to remove potential pollutants. In general, this approach also demands near maximum crop production to insure maximum removal of pollutant materials.

B. General Considerations of Disposal Site Selection: The prime consideration for site selection is the ability of the organic and earth materials to properly renovate the applied wastes. Particularly important with the effluent irrigation approach are: the exchange capacity of the soils, soil texture; drainage; bedrock; presence of fractures, porosity; the variable depth to the water table, its direction of flow and rate of movement and its quality.

II. General Description of Burlington and Ocean Counties

Most all of the Ft Dix Military Reservation lies within Burlington County, New Jersey. The east third of the Reservation lies within Ocean County. Essentially all of the Reservation, however, lies within the Delaware River drainage basin. All discussions in this preliminary evaluation are limited to Burlington and Ocean Counties. This should not necessarily imply that other nearby land areas would not be acceptable for effluent land disposal, but the scope of this work is presently limited, and time would not permit more extensive investigations.

III. Two Possible Disposal Sites

Two forested areas within the confines of federal boundries have been suggested as possible sites for effluent land disposal. (See Figure I-1)

A. Area One: One of these areas is in the southeast portion of the Ft. Dix Military Reservation and approximates 350 acres. This area is roughly triangular in shape and is bordered on the south and east by the Reservation boundry and on the north U. S. Highway 70. Both surface and ground waters in this area are within the Delaware River Basin drainage area. The surface elevation (0 to 5 percent slopes) ranges from 140 to 150 feet above sea level and the high ground water table aquifer is between 10 and 20 feet below the ground surface. The soils are generally sandy and the area is densely vegetated with pine oak forest.

B. Area Two: The second area has similar characteristics, and is located on U. S. Navy property on the common boundry between Ft. Dix Military Reservation and the Lakehurst Naval Air Station Reservation and includes approximately 650 acres. This area is also roughly triangular in shape and is bordered on the west by the common boundry of Ft. Dix and Lakehurst Military Reservations, on the south by the southern boundry of the Naval Military Reservation and on the east by a forest fire break on the Naval Reservation property. The ground surface elevation (0 to 5 percent slopes) ranges from 100 to 150 feet above sea level. The high ground water table ranges between 5 and 15 feet below the ground surface. The vegetation is generally pine-oak forest and the soils are sandy. Most all of this area falls outside of the Delaware River Basin and is contained in the Toms River Basin which flows to the Altantic Ocean.

IV. Preliminary Evaluation of Potential Disposal Sites

A. Location: The closest optimum location to the waste source should be selected to minimize pumping costs, pipe costs, etc.

B. Adjacent Land Use:

1. General: The possibilites of blowing spray, odors or other aspects of spraying dictate the cirtical evaluation of adjacent land use. Areas where housing or other building development exists or is anticipated should be avoided. Particular attention should be paid to adjacent area ground water users to assure that present or future downgradient beneficial uses of ground waters are protected and properly monitored to prevent the use of any ground waters which may become contaminated. Additional land areas near the optimum disposal site are desirable for future expansion.

2. Specific: Some beneficial uses of adjacent lands of Area 1 include public highways, U. S. Army communications units, and residential develop-

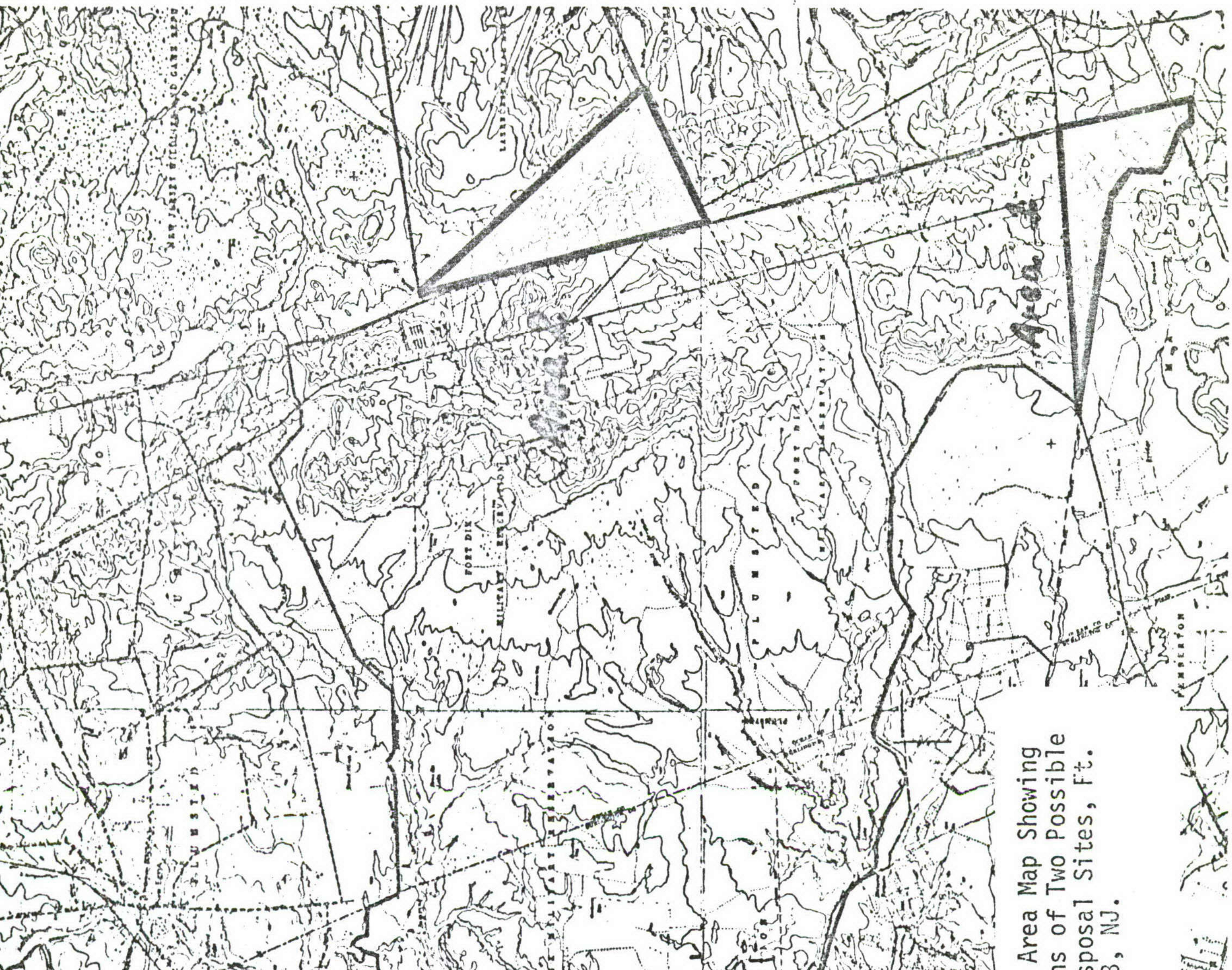

Figure I-1. General Area Map Showing Locations of Two Possible Land Disposal Sites, Ft. Dix/MAFB, NJ.

ments. Area 2 is quite isolated and adjacent land uses are limited to military field training operations. The general direction of ground water flow in these two areas is toward surface water course drainage. No major potable water pumpage is currently practiced from the ground water aquifer.

C. Climatology and Meterology

1. General: A number of weather/climate elements are considered to be critical in certain phases of effluent land disposal operations. These elements include: precipitation, average air temperature, freezing air temperature, snow cover, ice cover, frozen ground, wind, relative humidity, and evaporation and transpiration.

2. Specific: In general, the central portion of New Jersey has a humid climate with relatively long hot summers and comparatively mild winters. Total annual precipitation approximates 42 to 48 inches. Long term records show a rather uniform 3-5 inches of precipitation each month. The mean monthly temperature ranges from approximately 32 degrees F in January to 75 degrees F in July. The mean annual temperature is 54 degrees F. The average number of days without killing frost approximates 150 days. The vegetative growing seasons begins in late March and terminates in late November. Table I-1 contains a climatological data summary of records from McGuire AFB. Between April and October approximately 190 days should be available for spray irrigation. Between November and March a minimum of an additional 55 days should also be available. In total, approximately 245 days each year should be available for spray irrigation.

D. Geology

1. General: Effluent disposal sites should be located in stable geological formations that are not subject to collapse or to immediate inducement of applied wastewaters to the ground waters. A knowledge of the geological formations underlying a proposed disposal sites is very important in judging the suitability of any site.

2. Specific: The bedrock geology of Burlington and Ocean Counties varies from the northwest with complex unconsolidated sand, silt and clay deposits to the southeast with few clay lenses. The surface geology varies in the same direction from discontinuous Kansan (?) glacial deposites in the northwest containing fine sand and silt to discontinuous Illinoian glaciation along the Atlantic coast continuing a mixture of sand and gravel.

E. Soils

1. General: A knowledge of the detailed characteristics and depth of soil is critical in determining the degree of applied wastewater renovation. Most preferable for effluent land disposal are deep, well drained, loamy soils.

Table I-1

CLIMATOLOGICAL DATA SUMMARY - MEAN DAILY TEMPERATURE, PRECIPITATION, SNOWFALL, SNOWDEPTH, MCGUIRE AFB, NJ - 1942-46, 48-64

	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precip. Mean	2.85	2.86	3.99	3.67	2.87	2.92	4.53	4.66	3.42	3.11	3.56	3.66	42.09
% Days $\bar{c}$ P $\geq$ 0.01"	34.8	34.7	37.4	36.7	35.7	31.3	30.1	28.0	26.3	23.9	30.9	32.1	31.8
% Days $\bar{c}$ P $\geq$ 0.1"	19.9	20.7	24.6	24.1	20.0	27.8	18.8	18.2	16.1	15.7	20.0	21.6	19.8
% Days $\bar{c}$ P $\geq$ 1.0"	1.0	1.2	2.7	2.1	1.9	2.2	4.7	4.2	3.8	3.3	2.8	2.6	2.7
% Days $\bar{c}$ P $\geq$ 0.25"				15.2	11.1	11.9	12.9	13.9	10.6	10.6			
Snow Depth (in) Mean	3.7	3.5	3.7	0.1	0	0	0	0	0	0.1	0.2	2.6	
% Days $\bar{c}$ Depth $\geq$ 0.01"	16.6	15.2	8.4	0.2	0	0	0	0	0	0.2	0.4	13.4	
Fall (in)	5.1	4.5	5.1	0.2	T	0	T	0	0	0.1	0.8	4.2	
Temp. Mean	32.7	34.2	41.1	51.4	61.5	70.8	75.3	73.2	66.4	56.6	45.5	33.9	
% Days $T_{mean} \geq 30^oF$	64.6	72.9	90.8	100	100	100	100	100	100	100	98.3	67.9	
Minimum	24.9	26.1	32.1	41.1	50.7	60.3	65.4	63.7	56.7	46.7	36.5	26.1	
% Days $T_{min} \geq 30^oF$	32.3	36.8	64.4	94.9	100	100	100	100	100	99.4	81.2	38.1	
Avail Days for SI P $\leq$ 0.25"/day	-	10	15	26	28	27	27	27	27	28	20	10	

Extremes such as sands, silts, clays, and shaly and stony phases are generally unacceptable. Coarse, sandy or gravely soils permit the wastewater to pass through too quickly for adequate renovation, while soils with high clay content tend to reject infiltrating water, resulting in excessive surface runoff, elevated ground water table. and inadequate renovation.

2. Specific: Basically three major soil types prevail - Freehold-Collington, Lakewood and St Johns. All three are sandy in general composition. The Lakewood soils predominate in the area of the Ft Dix Military Reservation, and are formed on the dry sands of the seaward portion of the State. Most of these areas remain in the pine-oak forest, and there is little of these lands under cultivation. The permeability of these soils ranges from 0.2 inches per hour (Freehold-Collington) to greater than 6.3 inches per hour (Lakewood).

F. Hydrology

1. General: In conjunction with a proposed site's soil renovative capacities, its hydrologic capabilities must also be evaluated. Subsurface formations must have the capacity to transmit the applied water and renovated effluent that has moved through the superficial soil mantle. When vertical movement through the subsurface soil profile is restricted by impermeable soil layers or seasonally high water tables, tile drainage or lateral movement may permit continued operations. Upon reaching the prevailing ground water table the applied wastewater can be expected to move laterally away from the site with dilution and dispersion being the only continuing renovative processes. Vertical mixing and dispersal into the water table normally will be minimal.

2. Specific: Precipitation is the source of all ground waters in this area. In Ocean County about 40 percent of the precipitation infiltrates to the zone of saturation. In Burlington County a smaller percentage of the precipitation infiltrates to the ground water table since most aquifers are presently undeveloped and essentially full. The ground water aquifer ranges seasonally in elevation from the ground surface to depths of 40 to 50 feet below the ground surface. In the areas where the St Johns soils predominate generally a high water table prevails. The seasonal high water table for both of the other predominant soil types is greater than 5 feet below the ground surface. Available data on the ground water quality in this area reveals that, in general, these waters are acceptable as primary drinking water sources. Very little municipal pumpage of the ground water aquifer occurs in Burlington County, while only slightly more pumpage occurs in Ocean County. Stream flow in this area consists largely of base flow derived from ground water discharge. During periods of little or no precipitation, base flow accounts for virtually all stream flow.

G. Topography

1. General: A proposed site's topography must be adaptable to the

agricultural operations, if any, to be performed, the erosion control measures installed, and the desired level of applied wastewater renovation of the disposal system.

2. Specific: Most of the land in these areas is less than 220 feet above sea level, sloping south easterly from a maximum of approximately 200 feet in the northwest to the mean sea level along the Atlantic coast.

H. Agricultural Practice

1. General: Forested area, grasslands, and cultivated crop areas are acceptable for effluent land disposal. Essentially there are no restraints on the choice of vegetative cover with the exception that it should provide high evapotranspiration, induce acceptable nutrients removal, and prevent erosion from surface runoff. When agricultural use of a crop is anticipated, the species to be used, the harvesting frequency the relative crop toxicities and nutritional adequacies should be considered. System down-time for crop harvesting and re-planting or field maintenance should also be considered in the determination of land areas required for storage and effluent disposal. Two forest vegetation regions predominate in central New Jersey; oak-hickory in the northwest to pine-oak in the north central to coastal region. The pine-oak region which predominates in these two counties is coincident with the infertile, droughty, sandy soils.

2. Specific: Approximately 30 percent of the available land area of Burlington County is dedicated to agriculture. The principal crops in Burlington County are fruits, vegetables, cranberries and blueberries. Dairy farms constitute the bulk of livestock farming in Burlington County. Most of the area in the vicinity of the Ft Dix military reservation is timberland. Agriculture in Ocean County is a minor factor (less than 7 percent of the available land area). Cranberries and blueberries are the two principal crops. Most agriculture in Ocean County is related to the poultry industry. There are not significant agricultural land irrigation systems in either county.

I. Vegetation

A variety of forage crops, especially certain grasses have been studied extensively under effluent disposal practices. The crop production, toxicities, nutrient removal capabilities and overall responses to treated sewage effluent irrigation have been documented. The use of woodlands as an area for waste disposal and as a means of nutrient removal has not been studied intensively. The Pennsylvania studies are recent and give clues to what may be expected under certain conditions.

1. Nutrient Removal: Although trees may be expected to bring

nutrients and water from greater soil depths than will other types of vegetation, the actual removal of nutrients, particularly the nitrogen forms, may be expected to be very limited since frequent harvesting of woodlands is not practiced and nutrients are retained in the system ultimately building up in the recharged ground waters. Elements recovered from the deep soil layers by the tree roots are returned to the soil surface in the annual leaf fall. Even periodic tree harvesting removes little of the nutrients because more than 95 percent of the nitrogen and ash constituents are in the tree foliage and young branches that remain on the ground. The most efficient means of nutrient removal is through the removal of annual forage crops. The buildup of nutrients in the ground waters may be anticipated from predominantly sandy forest lands effluent irrigation disposal operations, unless the system is designed to reduce the nitrates through denitrification. Conditions favoring denitrification can be established by altering the sequence of irrigation applications to create short periods of soil saturation thereby promoting the anaerobic evolution of nitrogen gas. The tolerance of the tree species for these short periods of inundation would have to be fully evaluated. Because phosphorous is readily fixed by most soil types and held in an unavailable form, no problem with phosphorous accumulation should be anticipated.

2. Evapotranspiration: Little is known about the evapotranspiration of trees under continuous optimum moisture supply. The annual water losses for pine-oak forests in the eastern part of the United States have been estimated at between 25 and 35 inches. Under more optimum moisture conditions this evapotranspiration rate may be substantially higher. In the Pennsylvania studies, water losses within the biologically active zone were estimated at 1 inch per week during the growing season. Any water naturally or artificially applied to the land surface in excess of those water requirements would be potentially available for ground water recharge. During the nongrowing season the potential for recharge is greatest because both evaporation and transpiration are reduced. The Pennsylvania studies concluded that at an annual application rate of 100 inches the ground water recharge amounted to 90 percent of the applied effluent.

3. Toxicity to Trees: Some work has been done on toxicity in seedling trees but little is known about element buildup in mature stands of trees. Many variables come into play, including tree content, microorganisms and the interaction of the elements themselves. Hydrogen sulfide which is known to be toxic to trees, may result from the anaerobic reduction of sulfates normally found in treated sewage effluents. Other possible toxicants would include chlorine, selenium, boron, arsenic, copper, and sodium. At the Seabrook Farms operation in southern New Jersey, a mixed oak forest was essentially converted to a marsh grass environment because of water saturation at the root zone.

V. Estimated Land Area Requirements

A. The total land area required is based on the time available in any given year for land application. Wastes generated during non-application periods (during periods of excessive precipitation, freezing conditions, high water table, etc.) must be stored. The total volume of wastewater from Ft Dix and MAFB was estimated to be 1,642 million gallons per year (5,037 Acre-feet per year). Figure I-2 is a graph of land area requirements for varying periods of available time for land application. (See Table I-2). These data were derived on the basis of certain assumptions.

1. Waste Volumes: Ft Dix - 3.0 MGD
   MAFB - 1.5 MGD

2. Spray Irrigation Application Rate: 2-inches/week @ 0.25 inches per hour for 8 hours per week.

3. Evaporation from storage ponds equals precipitation.

4. Storage pond depth: 10 feet.

B. Review of long-term climatological data reveals that between 27 to 35 weeks per year are readily available for spray irrigation. The total land area required based on the above analyses would range from 1,368 acres (27 weeks) to 1,030 acres (35 weeks). Experience gained by the Pennsylvania project involving land disposal in forested areas indicates that year-round (52 weeks/year) application may be possible in the area of Ft Dix and MAFB. For design purposes, however, more conservative estimates of available application periods are probably warranted.

C. The two proposed land disposal sites combined would provide approximately 1,000 acres. Provided at least 70 inches of treated waste could be applied each year, (35 weeks at 2-inches/week) the two proposed areas combined would provide sufficient land area.

VI. Applicable Standards and Criteria

Official standards for land disposal have not been adopted by the State of New Jersey, Department of Environmental Protection (NJDEP) or the Delaware River Basin Commission (DRBC). However, the DRBC has adopted (Dec 1972) ground water quality standards (See DRBC Resolution No. 72-14, Atch I-1) and the NJDEP has unofficial guidelines used in the evaluation of proposed spray irrigation projects (See NJDEP "Elements of Submission for Approval of Spray Irrigation Facilities," Atch I-2).

VII. Conclusions

1. Available climatological data indicates that 27 to 35 weeks per year are available for land disposal operations in the general area of the Ft Dix Military Reservation.

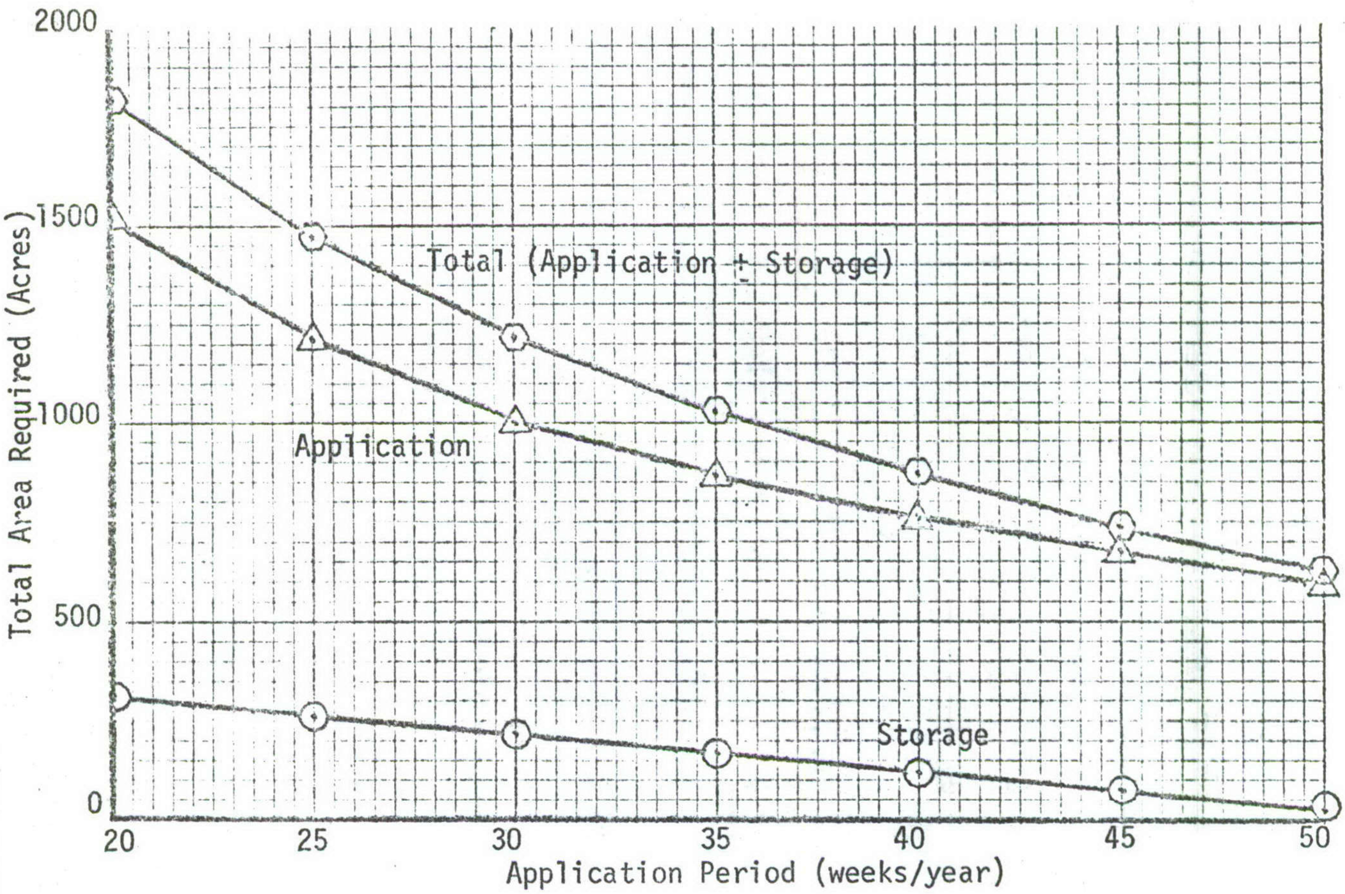

Figure I-2. Estimated Land Area Requirements for Spray Irrigation - (See Table I-2 for constraints).

No of Weeks Available Per Year (weeks)	Total Applic. Per Year (inches)	No of Weeks Storage Required (weeks)	Volume of Storage Required (MG)	(Ac Ft)	Area Required (Acres) Storage (10ft deep)	Applic.	Total	Total Area Required (Acres/MGD Flow) Storage	Applic	Total
50	100	2	68	208	21	605	626	5	134	139
45	90	7	225	690	69	672	741	16	149	165
40	80	12	382	1170	117	755	872	26	168	194
35	70	17	540	1655	166	864	1030	37	192	229
30	60	22	698	2140	214	1000	1214	48	222	270
25	50	27	855	2622	262	1210	1472	58	269	327
20	40	32	1010	3097	310	1511	1821	69	336	405

(Total Waste Volume: $(4.5\ \text{MGD})\ (365\ \frac{\text{days}}{\text{yr}})\ (\frac{\text{Ac Ft}}{0.326\ \text{MG}}) = 5{,}037\ \frac{\text{Ac Ft}}{\text{yr}}$)

Table I-2. Estimated Land Area Requirements for Spray Irrigation - Ft Dix (3.0 MGD), MAFB (1.5 MGD); Application Rate: 2-inches per week; Evaporation from Storage Equals Preciptation; Storage Pond Depth: 10 ft.

2. Two proposed parcels of federally owned lands combined would provide the minimum estimated area required to dispose of the secondary sewage effluents from Ft Dix and MAFB. These land parcels are relatively close to the main cantonement areas and since they are federally owned and accessible, right-of-way and easement costs for pumping and transport facilities would be minimal.

3. In general, the climate, geology, and topography in these areas are acceptable for land disposal operations. However, detailed on-site investigations of these or other proposed areas would be required to determine assimilative capacities of the soil/vegetation complex, the critical hydrological constraints, and the controlling system design considerations.

Attachment I-1

Delaware River Basin Commission Resolution No. 72-14,
12 December 1972

NO. 72-14

A RESOLUTION to amend the water quality standards in relation to protection of ground water.

WHEREAS, protection of ground water quality in the Delaware Basin is a necessary feature of water resources management, and will contribute to environmental improvement generally; and

WHEREAS, the Commission wishes to augment its water quality standards by the addition thereto of new provisions relating to ground water, and a public hearing on proposed text of such provisions was held by the Commission on November 8, 1972; now therefore

BE IT RESOLVED by the Delaware River Basin Commission:

1. The Commission's Administrative Manual, Part III, Basin Regulations-Water Quality, is amended by the addition thereto of a new Article 2-4 to read as follows:

Article 2-4

Ground Water--Basinwide

Section 2-4.1 Application. This Article shall apply to the ground water of the Delaware River Basin.

Section 2-4.2 Description. Ground water shall include all water beneath the surface of the ground.

Section 2-4.3 Water Uses. The quality of ground water shall be maintained in a safe and satisfactory condition for use as domestic, agricultural, industrial, and public water supplies, and as a source of surface water suitable for recreation, wildlife, fish and other aquatic life, except where such uses are precluded by natural quality. Other uses may be designated by the Commission.

Section 2-4.4 Ground Water Quality Objectives.

(1) Nondegradation of Ground Waters. It is the policy of the Commission to prevent degradation of ground water quality. In implementing this policy, the Commission will require the best water management determined to be practicable. No quality change will be considered which, in the judgment of the Commission, may be injurious to any designated present or future ground or surface water use.

(2) Limits. The ground waters of the basin shall not contain substances or properties attributable to the activities of man in concentrations or amounts sufficient to endanger or preclude the water uses to be protected. Within this requirement, the ground waters shall be free from substances or properties in concentrations or combinations which are toxic or harmful to human, animal, plant, or aquatic life, or that produce color, taste, or odor of the waters. Concentrations at any point shall not be degraded by the activities of man to exceed values specified by current U. S. Public Health Service Drinking Water Standards.

Section 2-4.5 Ground Water Quality Control.

(1) Controls. The processing, handling, transportation, disposal, storage, excavation or removal of any solid, liquid, or gaseous material on or beneath the ground surface of the basin shall be conducted in such manner and with such facilities, in accordance with such regulations and requirements as the Commission may prescribe, as to prevent any of the criteria or requirements of this Article from being violated.

(2) Limitations.

a. No substances or properties which are in harmful or toxic concentrations or that produce color, taste, or odor of the water shall be permitted or induced by the activities of man to become ground water.

b. Heat discharges which may adversely affect ground water shall be regulated by the Commission.

c. Notwithstanding any other criteria or requirements of this Article, the Commission may establish requirements, conditions, or prohibitions which, in its judgment, are necessary to protect ground water quality.

d. Certain activities otherwise prohibited by paragraph (1) of this section, such as approved solid or liquid waste disposal systems or fertilizer applications for farming practices, may be permitted subject to such requirements as may be prescribed.

2. This resolution shall take effect immediately.

Maurice K. Goddard

Maurice K. Goddard, Chairman pro-tem

W. Brinton Whitall

W. Brinton Whitall, Secretary

ADOPTED: December 12, 1972

Attachment I-2

New Jersey Department of Environmental Protection - Elements of Submission for Approval of Spray Irrigation Facilities, Undated.

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF WATER POLLUTION CONTROL

ELEMENTS OF SUBMISSION FOR APPROVAL OF SPRAY IRRIGATION FACILITIES

A. WASTE

1. Analyses of wastewater for color, odor, pH alkalinity or acidity, nitrite N, nitrate N, ammonia N, total N, chloride, suspended and total solids and ash, PO_4, detergents, phenols, COD, ether solubles, heavy metals (specific), total and fecal coliform and 5-day BOD should be submitted wherever applicable or possible.

2. Information should be provided on waste generation including a detailed summary of the processes or treatment methods involved, changes in character of the waste, rate of generation and fluctuations thereof on seasonal, daily and hourly bases, and the ability of the waste generation rate to be controlled without substantially disrupting plant operations.

3. Any anticipated changes in the character or generation of waste should be outlined in detail including, where relevant, population data, changes in treatment facilities, and/or changes in type or scale of industrial processes.

4. Technical and economic studies should be provided demonstrating that spray irrigation is either the only or the most satisfactory means of waste disposal.

B. SPRAYING SITE

1. Documentation of the applicant's ownership of the land to be utilized or, alternately, permission to do so must be submitted. Information on zoning and value of the land, developement of land in the area, and the applicant's possible future need of land for expansion should be included in order to establish the continued availability of the spraying site.

2. Documentation must also be provided which will show that local health authorities are aware of and will permit the proposed spray irrigation.

3. Any other uses of the spraying site should be specified. These include farming, grazing, recreation and disposal of solids. If crops are grown, a description of farming procedures should be provided giving the types of crops grown, the types, frequencies and amounts of pesticide and fertilizer applications, and information on harvesting or picking of crops stating periods involved and whether spray irrigation must be curtailed. The applicant should also specify any restrictions on the use of the land and the present and anticipated uses of adjacent lands.

4. A map should be submitted showing the spraying site, the spraying region or fixtures, the buffer zone and any nearby residences or businesses. A 500 foot clearance in all directions is required, but if weather data indicates that there is a prevalent wind direction, it is desirable to provide additional clearance in the downwind direction. It may also be permissible to relocate the spraying area upwind in order to do so. An evaluation of possible odor problems should be included.

5. Security provisions at the spraying site should be outlined.

C. ASSIMILATIVE CAPABILITY OF SOIL

1. The soil strata should be evaluated in relation to the spray irrigation fields. This should include an interpretation of Soil Conservation Service data plus the results of site borings. Data submitted should also include the permeability of the soil before spraying (and after if this can be determined) and the presence of any clay layers.

2. The applicant should also provide an evaluation of the bedrock geology in relation to the spray irrigation fields.

3. Data should be submitted describing the prevailing hydrologic conditions in the area of the spray irrigation fields. U.S.G.S. readings should be included along with the results of sampling at least one on-site well. All uses of groundwater in the area should be specified.

4. Analyses should be performed on groundwater obtained from potable water wells located in the down gradient of the spray irrigation fields.

5. An evaluation should be made of the possible effects of the effluent on the soil strata and groundwater of the spray irrigation fields. This should include the effects of soil microbial activity upon the effluent and the degree of filtration of solids during percolation. An oxygen balance should also be performed for the system using effluent COD data. One very important consideration is the possible buildup of nitrates in an underground potable water supply.

6. Effects of seasonal and daily weather variations upon the operation and performance of the spray irrigation fields should be determined. National Weather Service records for five or more preceeding years should be included. Periods of frozen ground (temperatures below 25°F) should be summarized by frequency, duration, and durations of thawing intervals. Precipitation data should also be included and analyzed, particularly if trucks are used for transporting or spraying effluent.

D. SYSTEM DESIGN

1. The means of transporting and distributing waste should be explicitly described, preferably with construction plans.

2. The spraying sequence including loading rates, land utilization scheme, and basic spraying technique should be described.

3. The system's ability to function during inclement weather and under other adverse conditions such as power failure must be demonstrated. Data indicating sufficient holding capacity and commensurate accelerated spraying performance should be correlated with weather data in order to do this. Freezing of liquid in pipes is an important consideration if the system is not to be used continually. Backup trucking and/or pumping systems must be available.

4. The number of personnel involved in the operation and maintenance of the system should be specified.

E. SYSTEM PERFORMANCE

1. A format for monitoring should be provided. This should include a listing of on-site and off-site wells, surface waters and system effluents to be sampled, the frequency of such sampling and the tests to be performed. A map showing test wells should be submitted.

Douglas F. Wright

Douglas F. Wright
Enforcement Unit
Bureau of Water Pollution Control
New Jersey State Department of
Environmental Protection

E46:lmk

Appendix I

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13. ABSTRACT

This report contains data and discussion of the results of a field wastewater survey conducted by the USAF Environmental Health Laboratory, Kelly AFB, Texas at McGuire AFB and Ft Dix, New Jersey in September 1972. Extensive physical, chemical and biological sampling and analyses of these facility's sewage treatment plants and the surface waters to which the plants discharge were accomplished. The quality of the receiving waters was found to be degraded as a result of the sewage plant discharges. This report recommends that these two federal facilities join in efforts to create a regional wastewater management system, and during the interim period until such a system materializes, maintain the existing secondary sewage treatment facilities with minimum expenditure of capital investment funds. Performance specifications as required by current Executive Order are proposed for the interim period, and recommendations for interim upgrading of the existing facilities are made. Alternative courses of action are evaluated in the event the regional management system does not materialize.

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Water Quality Criteria						
Performance Specifications						
Wastewater Treatment						
Regional Treatment						
Advanced Wastewater Treatment						
Land Disposal						
Treatment Plant Evaluation						
Evaluation of Receiving Waters						
Federal Facilities						