REPORT OF INVESTIGATION
LAKE TANEYCOMO DISSOLVED OXYGEN STUDY

by

U. S. ENVIRONMENTAL PROTECTION AGENCY
Region VII
Surveillance and Analysis Division

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I. INTRODUCTION

For a number of years the Missouri Department of Conservation (MDC) has been concerned about the reported fall decline in the trout catch rate in Lake Taneycomo. The MDC has reasoned that this seasonal decline in the catch rate was because of low dissolved oxygen (DO) levels in the power releases from Table Rock Dam which is operated by the U.S. Army Corps of Engineers (Little Rock District). The Corps and MDC have well documented the fall low DO levels in the withdrawl zone behind Table Rock Dam and at selected stations in the upstream reaches of Lake Taneycomo.

Although the reason for the low DO levels in Lake Taneycomo was generally understood and accepted by all concerned parties, there was very little data from Lake Taneycomo to document the scope of the problem. For this reason, the Surveillance and Analysis Division (SVAN) of the Environmental Protection Agency (EPA) Region VII was directed to develop a field investigation study which would adequately document the extent of the fall low DO problem in Lake Taneycomo. A proposal was developed; and after receiving input from other interested agencies, SVAN carried out the field work. This report presents the results of that investigation.

II. GENERAL BACKGROUND AND TECHNICAL INFORMATION

A. TABLE ROCK DAM AND RESERVOIR

Table Rock Dam is located on the White River about 6 miles [10 kilometers (8 river miles)] southwest of Branson, Missouri. The powerhouse is equipped with four 50-megawatt (MW) units which discharge 13,400 cubic feet per second (cfs) [379 cubic meters per second (cu m/sec)] at rated capacity. At power peaking operation, the generators can be operated at 15 percent overload (230 MW) with a discharge of 15,400 cfs (436 cu m/sec). Intake centerlines for the penstocks are at elevation 775.4 feet (ft) [236.3 meters (m)] which is 80 ft (24 m) above the bottom and 140 ft (43 m) below the top of the power pool.

Table Rock Reservoir extends westerly along the White River to Beaver Dam. Principal streams below Beaver Dam tributary to the reservoir are the James River in Missouri and the Kings River and Indian and Long Creeks in Arkansas. Depth of the reservoir at the dam [top of conservation or power pool, elevation 915 ft (279 m)] is 220 ft (67 m). Total storage in the lake below the power pool is 2.702×10^6 acre ft (2.553×10^9 cu m).

B. LAKE TANEYCOMO AND OZARK BEACH DAM

Lake Taneycomo is located immediately downstream from Table Rock Dam and is formed by Ozark Beach Dam which was constructed in 1913. Ozark Beach Dam is a non-Federal power project and has four generators with a total capacity of 16 megawatts. Total storage for the lake is 28,000 acre ft (35 million cu m). Theoretically, when the Table Rock turbines

are generating at full capacity, all of the water in Lake Taneycomo could be displaced in 24 hours. Depth of the lake at the dam is approximately 50 ft (15 m). The distance between the Ozark Beach Dam and Table Rock Dam is approximately 22.7 river miles (36.5 km).

C. DESCRIPTION OF PROBLEM

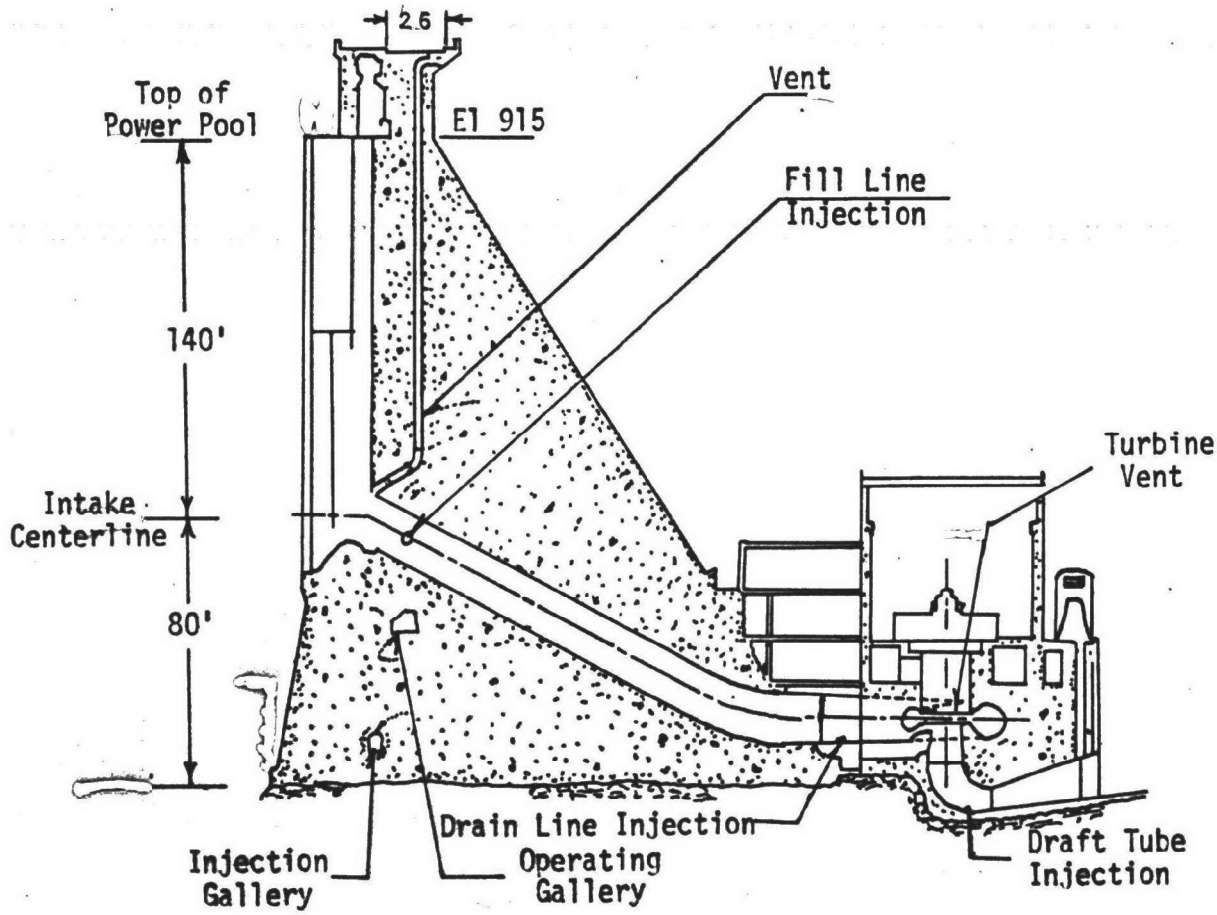
The MDC has measured low DO levels in Lake Taneycomo and in Table Rock Reservoir since the complete filling in 1960 and 1961. After the initial filling, the MDC reported that the DO had improved in the reservoir. They reported that the DO in Lake Taneycomo at Branson City Water Supply intake, which is about 8 miles (3 km) downstream from Table Rock Dam, rarely dropped below 7.0 mg/l during the period from 1962 to 1967. Also during this period, MDC reported DO concentrations between 3-5 mg/l in the turbine intake zones in the months of September and October. In 1974, the measured DO in the turbine intake zones for the same two months approached 1 mg/l or less. In 1975, the DO level in the intake zone dropped to 1 mg/l in November. The files indicate the first meetings held to discuss the low DO problem in Lake Taneycomo began in the fall of 1970. The Corps recognized the problem and, at first, tried to curtail power generation and make spillway releases of higher DO concentrations in order to meet the 6.0 mg/l water quality standard. They found that in early fall when the surface releases were high in temperature and DO, the water would not mix with the colder power releases and the downstream channel became stratified. One portion of the lake had adequate DO but unsuitable temperatures for the trout, while the other portion had acceptable temperature values, but low DO. Later in the fall, surface releases

were more favorable because of the lower lake temperature. However, to maintain the 6.0 mg/l standard by spilling, the cost of reducing generation would be quite substantial. (Note: When employing surface releases, the total discharge into Lake Taneycomo should never exceed the maximum capacity of 15,400 cfs (436 cu m/sec), otherwise, downstream erosion would be very detrimental.

Following those controlled release methods for maintaining DO levels, the Corps initiated a study in the fall of 1971 to evaluate two methods of aeration in an attempt to alleviate the low DO problem at Table Rock-Lake Taneycomo. One method involved the operation of an air-diffusing apparatus in the reservoir immediately above Table Rock Dam. The other method evaluated was the injection of compressed air directly into the penstocks. The injection points were the penstock fill line, penstock drain line, and the draft tube dewatering line (See Figure 1). Also included with these tests was an evaluation of the effectiveness of the turbine air vents in aerating the power releases. A combination of air injection and vent-open tests were also conducted.

The diffusion test indicated that Table Rock Reservoir could not be destratified and that the downstream Taneycomo DO concentration was only increased by approximately 1 mg/l.

The results of the fill line injection, drain line injection, and the draft tube injection were more successful in adding DO to the power releases than the lake diffuser system. The Corps found that with drain line injection, the entire range of generation could be aerated to a DO of at least 5.5 mg/l (an increase of over 3 mg/l) with a maximum air



SECTION THROUGH POWERHOUSE

20 0 20 40 60 80

Scale of Feet

Figure 1. - Table Rock Dam Cross Section

input of 5500 cubic feet per minute (cfm) [156 cubic meters per minute (cu m/min)] per turbine unit. With draft tube injection, a substantial increase in air input would be required to reach the same DO level attained by drain line injection.

The tests that considered the effectiveness of the turbine vents were successful, but with limitations. With the vents open, less injected air was needed to reach a target DO as compared to when the turbine vents were closed. Without any air injection and by blocking the turbine vents open, a maximum DO increase of 2.0 mg/l was measured at a generation capacity of 20 MW with decreasing efficiency at lower and higher rates of generation. The effectiveness of the open turbine vents completely disappeared at a 50 MW capacity (full load) at an air input of 5000 cfm (142 cu m/min).

The test results indicated the turbine efficiency to be unaffected at a power load of 50 MW and a decrease of not more than 0.5 percent at power loads between 35 and 50 MW. At 20 MW, with 1800 cfm (51 cu m/min) efficiency decreased approximately 2 percent. When blocking the turbine vents open, the tests indicated no significant difference in efficiency.

In the fall of 1973, the Corps of Engineers decided to inject pure liquid oxygen into the penstocks hoping to raise the DO to meet the 6.0 mg/l standard. This action appeared to solve the problem, although the oxygen system was about 50 percent efficient when operating at half capacity. The cost of liquid oxygen was about $45./ton in 1973. To maintain 6.0 mg/l in the discharge when operating at full capacity required 7.5 tons (6.7 metric tons) of liquid oxygen per hour (approximately $350./hour).

In 1974 the price of liquid oxygen more than doubled to $100./ton, and there appeared to be a supply shortage. The Corps could only obtain 40 tons (36 metric tons) per week, which was not enough to maintain the DO at the 6.0 mg/l level during critical situations. At the request of the MDC, fall power releases have been reduced but the DO remains below the standard.

III. SCOPE OF INVESTIGATION

A. MONITORING SITES

Following a reconnaisance by SVAN staff members in the summer of 1976, nine sites were selected for DO monitoring and sampling. These sites are shown in Figure 2 which is a reduced, simplified tracing of USGS topographical maps covering the area. A description of these sites follows along with the station number designation and the distance measured downstream from Table Rock Dam. These mileages differ somewhat from those nominal distances indicated in the study plan (1). These changes were necessary to aid in locating stations at night. Stations were established, for the most part, adjacent to lighted boat docks.

Station Number	Distance* Miles	Description
TR-1	--	Table Rock Reservoir at buoy safety line.
T-1	0.09	Lake Taneycomo 500 ft (150 m) downstream from Table Rock Dam. This station coincided with the permanent DO monitoring point established by the Corps.
T-2	1.0	Lake Taneycomo at public boat launch area.
T-3	3.1	Lake Taneycomo in front of Fall Creek Trout Dock.
T-4	5.6	Lake Taneycomo at School of the Ozarks water intake.
T-5	10.2	Lake Taneycomo at Boy Scout Camp recreational area.
T-6	13.0	Lake Taneycomo at mile marker 10.
T-7	19.2	Lake Taneycomo at "Musgrove" boat dock approximately 0.5 miles (0.8 km) upstream from mile marker 5.
T-8	22.7	Lake Taneycomo at buoy safety line behind Ozark Beach Dam.

* Multiply by 1.609 to get distance in kilometers.

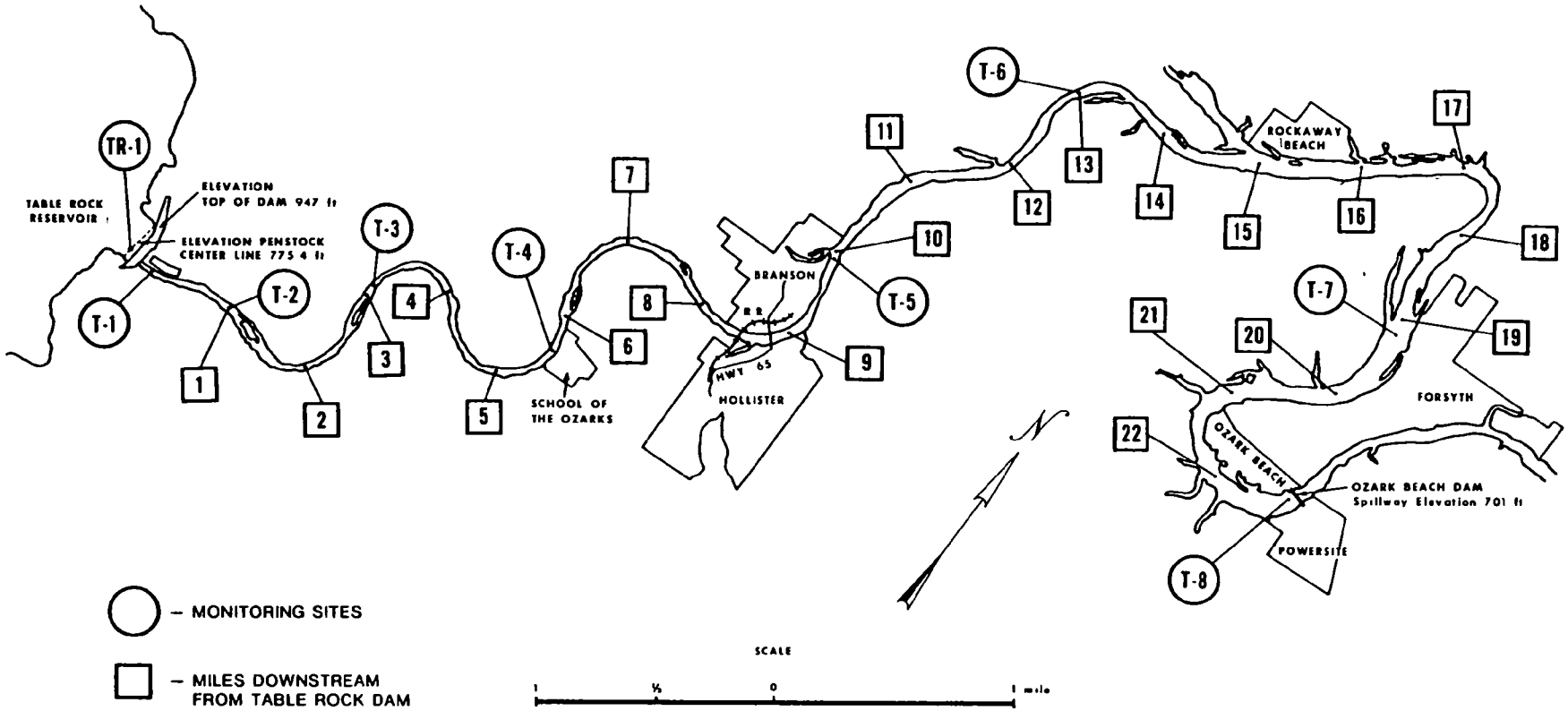


Figure 2 - LOCATION MAP OF DISSOLVED OXYGEN MONITORING SITES ON LAKE TANEYCOMO

B. STUDY PERIODS

The field investigative work covered by this report was conducted during the following periods.

August 16-19, 1976
September 6-7, 1976
October 14-16, 1976
October 23-24, 1976
January 7-8, 1977

Additional work of a biological nature is scheduled for January 22-23, 1977. This future work will be written as a supplement to this report and added at a later date.

The August and September study periods accounted for the major portion of the effort at Lake Taneycomo. These two study periods included the collection of nutrient samples and intensive DO monitoring. The October 14-16 period was of limited extent and was conducted in the upper reaches of Lake Taneycomo primarily for the purpose of confirming the DO data resulting from the two previous periods. The October 23-24 period was conducted on a weekend without power generation. The January 7-8 period was used to get DO data following the fall turnover in Table Rock Lake and to verify previous data.

C. PARAMETERS

The water chemistry and physical parameters of interest during the investigation were as follows:

Parameter	Abbreviation
Total Phosphorous	Total P
Nitrite-Nitrate Nitrogen as Nitrogen	NO_2-NO_3-N
Total Kjeldahl Nitrogen	TKN
Ammonia Nitrogen as Nitrogen	NH_3-N
pH	pH
Dissolved Oxygen	DO
Water Temperature	--
Flow Rate	--
Lake Profile	--

Nutrient samples were collected with messenger activated mechanical samplers.* These samples were preserved in the field and delivered to the EPA Regional Laboratory** for analysis following completion of the field work. These analyses were performed as specified by the EPA Methods Manual (2). The pH measurements were performed in the field using a portable pH meter† on those samples collected for nutrient analysis. Dissolved oxygen measurements were made in the field with two Yellow Springs Instrument Company (YSI)†† Model 57 oxygen meters fitted with YSI Pressure Compensating Probes (No. 5419) with 50 and 100-ft leads and YSI submersible stirrers (No. 5791). For the January 7-8 study period, YSI Probe (No. 5739) and submersible stirrer (No. 5795) were used. Temperature measurements were made with two YSI Tele-Thermometers (Model 46TUC and 44H). Power generation release flow rates were provided by the Corps of Engineers.

Depth profiles of Lake Taneycomo were made with a Raytheon Model DE719B Survey Fathometer.†††

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* Foerst Mechanical Specialties Company, 2407 North St. Louis Avenue, Chicago, Illinois.

** 25 Funston Road, Kansas City, Kansas 66115.

† Porta-Matic Model 175, Instrumentation Laboratory Inc., 113 Hartwell Avenue, Lexington, Massachusetts 02173.

†† Yellow Springs, Ohio 45387.

††† Raytheon Marine Company, 676 Island Pond Road, Manchester, New Hampshire 03103.

D. PROCEDURE

1. August Study Period

The August field work consisted of essentially three separate endeavors. The initial work consisted of getting depth profiles at each sampling station and of making a profile of the length of Lake Taneycomo at the visual center of the stream. The second endeavor consisted of collecting samples for nutrient and pH analysis at each of the Taneycomo stations. The third and main effort was devoted to the collection of DO and temperature data.

In running the depth profile on Taneycomo, the portable fathometer was mounted in the boat and the transmitting element mounted on the side of the boat with the head approximately 1 ft (0.3 m) below the water surface. The instrument was calibrated according to the manufacturer's instructions, and the profile started. The profiles were made by starting at T-3, making a cross section, and then proceeding down the visual center of the lake to the next station. The boat speed was kept at about 4 miles per hour (6 km per hour). Profiles were not made at T-1 and T-2 because of the wide depth fluctuations introduced by varying power generation releases.

Samples for nutrient analysis were collected at quarter points [in the middle of the lake and at points which were, respectively, halfway between the lake centerline and (facing downstream) the left and right banks]. At each of the quarter points, samples were collected just below the surface, at middepth, and near the bottom. In total, nine samples were collected at each station. Following collection of all the lake nutrient samples, the pH of each sample was determined and the samples then preserved with 5 ml of sulfuric acid.

Collection of DO and temperature data involved three separate operations. The first two efforts were structured in an attempt to determine, respectively, morning and evening DO levels at all the Taneycomo stations. The third phase involved a 24-hour run at all the stations to document diurnal variation.

To obtain morning DO data, two three-man crews were fielded in separate boats and were on the water at sunrise. One crew monitored the DO levels at stations T-1 through T-4, while the other team monitored the DO levels at stations T-5 through T-8. Evening DO levels were determined in a similar manner by using the same crews at the same stations at sunset of the same day. The DO meters were air-calibrated according to the manufacturer's instructions immediately prior to each run.

Similar to the collection procedure for the nutrient samples, DO and temperature measurements were made at quarter points at each station at 2-ft (0.6-m) depth intervals. At the upstream stations, these intervals were reduced at times in response to variations in lake depth resulting from changes in generation rates. For both the morning and evening runs, only one set of DO measurements was made at each station.

Following completion of the evening run at approximately 2000 hours, a 24-hour measurement period was begun using one crew to make as many runs throughout the lake and stopping at all the stations as frequently as time and night visibility conditions would permit. This crew was replaced by an alternate crew on the morning of the following day. During this 24-hour period, measurements were also taken at quarter

points. The depth interval during the 24-hour run was increased from 2 ft (0.6 m) to 4 ft (1.2 m) following an examination of the data collected during the morning and evening runs. The calibration of the DO meters was checked periodically and any necessary adjustments made several times throughout this 24-hour period.

The date, time span, and DO measurement frequency of the morning, evening, and 24-hour runs were as follows:

Run	Date August 1976	Time Span Military	No. of Runs
Morning DO run	18	0613-1213	1
Evening DO run	18	1817-2018	1
24-hour DO run	18-19	2230-1629	3

The field crew was only able to complete one set of measurements during the hours of darkness of the 24-hour run because of fog and reduced visibility. Additionally, no measurements were made at station T-1 at night. No work was done in Table Rock Reservoir during the August study period.

2. September Study Period

The nature of the field work during the September study period was similar to the August period with the exception that the depth profiling was not repeated and the number of DO measurements was reduced. Additionally, samples for pH and nutrient analysis and DO measurements were taken in Table Rock Reservoir at the buoy safety line behind the dam.

The DO data collected during the August period indicated no significant difference between the quarter points and very little difference with depth except at the downstream stations which exhibited some DO and

temperature stratification. Consequently, during the September period, the DO measurements were restricted to the lake center line. Measurement depth intervals were maintained at 4 ft (1.2 m). The nutrient sampling was repeated at the quarter points. During the 24-hour run, monitoring at station T-1 was eliminated because of the shallow water and the time needed to reach this station during periods of no power generation. Deletion of this station enabled the boat crews to make more frequent measurements at the other stations.

Nutrient sampling in Table Rock Reservoir proceeded from the north to the south bank along the buoy safety line. Samples, except near the banks, were collected at a depth of 75 ft (23 m). Lateral distance between the sampling points was 50 ft (15 m); this interval was chosen to coincide with the buoy positions. Collection of DO and temperature data in the reservoir also proceeded from the north to the south bank. Measurements were taken at every other buoy [100 ft (30 m)]. Measurements were generally taken down to a depth of about 26 ft (8 m) which marked the depth of the thermocline. Some stations were measured at depths of 100 ft (30 m) for verification of the location of the thermocline. This depth reflected the maximum length of the DO probe lead which was available at the time.

The dates and time spans of the significant phases of the September field work were as follows:

Work Element	Date September 1976	Time Span Military	No. of Runs
Lake Taneycomo			
Morning DO run	7	0620-0739	1
Evening DO run	8	1730-1820	1
24-hour DO run	8-9	2000-1725	6
Table Rock Reservoir			
DO run	8	0940-1300	1

Two of the six runs during the 24-hour period on Lake Taneycomo were made during the hours of darkness.

3. October 14-16 Study Period

The October 14-16 study period was of limited scope and was conducted primarily, to determine if the theories resulting from an analysis of the previous DO data had any validity. During these two days, DO measurements were made in the upper reaches of Lake Taneycomo from station T-1 down to as far as station T-5. Most of the work was confined to the lake between T-1 and T-3. This reach of the lake was floated with a DO and temperature probe suspended over the side of the boat. The meters were monitored continuously looking for points of inflection. Measurements were made in the mornings and evenings under both generating and non-generating conditions.

In addition to the DO monitoring, some samples were collected for biological analysis. Grab samples were collected for periphytic and phytoplankton analysis at station T-3 and at a point in a riffle area about 300 ft (90 m) downstream from the Shepherd of the Hills Fish Hatchery lower outfall. This outfall is located approximately 0.4 miles (0.6 km) downstream from Table Rock Dam. The macroinvertebrate community was also sampled in this riffle area with a square foot Surber sampler.* No other stations were sampled for benthic macroinvertebrates because of the irregular rock bottom of the upper reaches of the lake.

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* Wildlife Supply Company, 301 Cass Street, Saginaw, Michigan 48802.

4. October 23-24 Study Period

The October 23-24 period was intentionally conducted on a weekend during a period of non-generation. Work was confined to additional day-time DO measurements in the upper reaches of Lake Taneycomo and observation and documentation of dead trout.

5. January 7-8 Study Period

The January 7-8 study period was undertaken primarily to get additional DO data following the fall "turnover" in Table Rock Reservoir and to verify the significance of certain hydraulic characteristics of the upper reaches of Taneycomo. During this period, samples for nutrient and pH analysis were collected at T-1. Additionally, the three hatchery discharges and Lake Taneycomo were gauged in order to estimate the amount of leakage from Table Rock Dam during periods of non-generation.

IV. PRESENTATION AND DISCUSSION OF DATA

A. AUGUST AND SEPTEMBER STUDY PERIOD

Table I summarizes the center line Lake Taneycomo DO and nutrient data resulting from the August and September study periods. The raw data from which this summary table was made may be found in Appendix A, in Tables A-1 through A-7. Data on water release rates during the two weeks of study may be found in Tables A-8 and A-9. The raw data resulting from the September work on Table Rock Reservoir (station TR-1) may be found in Appendix B, Tables B-1 through B-4.

The weather conditions during the August and September periods are summarized as follows:

August	Weather Description
Morning Run (August 18)	Fog
Daylight Hours (August 18)	Clear and warm
Evening Run (August 18)	Clear
24-hour Run (August 18-19)	Scattered fog 1800 to 0600 hours, clear and warm on August 19.
September	
Morning Run (September 8)	Fog
Daylight Hours (September 8)	Sunny, scattered clouds
Evening Run (September 8)	Scattered clouds
24-hour Run (September 8-9)	Scattered fog 1800 to 0600 hours, overcast on September 9 till 1200 hours. Sunny with scattered clouds after 1200 hours.

An examination of Table I would indicate that the only significant concentration of nutrients was the NO_2-NO_3-N level at station T-2 in August. The mean concentration (nine samples) was 3.3 mg/l. This concentration was greater by a factor of approximately 10 than the mean concentrations found at stations T-1 and T-3 which were, respectively, upstream and

TABLE I

SUMMARY OF LAKE TANEYCOMO DATA

Study Period and Parameter	Lake Taneycomo Stations							
	T-1	T-2	T-3	T-4	T-5	T-6	T-7	T-8
	Distance Downstream From Table Rock Dam, Miles*							
	0.09	1.0	3.1	5.6	10.2	13.0	19.2	22.7
August								
Average Depth†, ft	--††	--††	8.6	13.4	13.5	30.8	15.7	28
pH**	7.4	7.4	7.3	7.3	7.4	7.3	7.6	7.5
Nutrients								
NO_2-NO_3-N, mg/l	0.38	3.3	0.32	0.31	0.28	0.29	<0 2	<0 21
TKN, mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0 2	<0 2	<0.2
NH_3-N, mg/l	<0.08	<0.07	<0.08	<0.04	<0.06	<0.06	<0 06	<0.1
Total P, mg/l	<0.1	<0.1	0.2	0.25	0.16	<0 1	<0.1	<0.09
Morning DO run								
Mean DO, mg/l	6.6	7.0	6.5	6.6	6.0	5.9	6.0	6.9
Min. DO, mg/l	6.5	7.0	6.4	6.6	5.3	5.9	5.3	5.3
Max. DO, mg/l	6.6	7.1	6.6	6.7	6.0	6.0	7.5	10.8
Mean Temp., °C	13.6	13.2	13.6	14.2	13.6	14	17.0	20
Min. Temp., °C	13.6	13.2	13.6	14.0	13.5	14	16.5	17
Max. Temp., °C	13.6	13.2	13.6	14 5	14 0	14	19.0	24
Mean Sat., %	63	66	62	64	53	57	63	76
Min. Sat., %	63	66	62	63	51	57	54	55
Max. Sat., %	63	67	62	66	58	58	80	127
Evening DO run								
Mean DO, mg/l	5.5	5.7	6.0	6 1	6 5	4.9	5 6	6.1
Min. DO, mg/l	5.5	5.6	6.0	6.0	6.5	4.8	5 3	5.2
Max. DO, mg/l	5.5	5.7	6.1	6.1	6.6	5 2	6.9	11.2
Mean Temp., °C	13.6	13.6	13.8	13 8	16	15.5	17.5	19
Min. Temp., °C	13.6	13.6	13.7	13 8	16	15.0	16.5	18
Max. Temp., °C	13.6	13 6	13.8	13.8	16	15 5	22 0	26
Mean Sat., %	53	55	58	59	65	49	60	72
Min. Sat., %	53	54	58	58	65	48	55	55
Max. Sat., %	53	55	59	59	66	52	78	137
24-hour DO run								
Mean DO, mg/l	4.6	5.5	6.0	5.6	5.3	6 4	5.9	6 5
Min. DO, mg/l	4.3	4 3	4.7	4.3	4.9	5.9	5.2	4.2
Max. DO, mg/l	4.9	6.8	6.5	7.5	5.7	6.7	7.6	10.4
Mean Temp., °C	14	14.0	15	14	15.0	16.0	17	19
Min. Temp., °C	14	13.6	14	14	14.5	15 5	16	17
Max. Temp., °C	15	15.0	15	15	15.5	17.5	20	25
Mean Sat., %	44	53	58	54	52	64	60	72
Min. Sat., %	41	41	45	41	48	59	52	44
Max. Sat., %	48	65	68	74	57	67	81	124
September								
pH**	7.1	7.4	7.5	7.3	7.4	7.5	7.5	7.6
Nutrients								
NO_2-NO_3-N, mg/l	0.31	0.28	0.31	0.32	0.30	0.30	0.21	<0.14
TKN, mg/l	<0.2	<0 2	<0.2	<0.2	<0 2	<0.2	0 2	<0.2
NH_3-N, mg/l	<0.09	0.10	<0.07	<0.04	<0.06	<0.06	<0.06	<0.04
Total P, mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1
Morning DO run								
Mean DO, mg/l	1.5	4.1	4.0	4.4	6.6	6.5	7.3	8.1
Min. DO, mg/l	1.5	3.8	4.0	4.4	6.3	6.4	6 8	6.6
Max. DO, mg/l	1.5	4.2	4.0	4.4	6.8	6.7	7.8	10.6
Mean Temp., °C	13.4	13.7	13.9	13.9	15.6	16	17.5	19
Min. Temp., °C	13.4	13.6	13.8	13.8	15.5	16	17.0	17
Max. Temp., °C	13.4	13.7	13.9	13.9	16.0	16	18.5	22
Mean Sat., %	14	39	38	42	66	65	76	87
Min. Sat., %	14	37	38	42	65	64	72	68
Max. Sat., %	14	40	38	42	68	67	82	120
Evening DO run								
Mean DO, mg/l	4.1	4.2	4.8	5.2	6.7	7.0	7 4	8.4
Min. DO, mg/l	4.0	4.2	4.8	5.2	6.6	6.8	7.0	6.9
Max. DO, mg/l	4.2	4.3	4.8	5.3	7.0	7.4	8.2	11.7
Mean Temp., °C	14	14	14.2	14.5	15.9	16.5	19	19.0
Min. Temp., °C	14	14	14.2	14.5	15.5	16.5	17	17.5
Max. Temp., °C	14	14	14.2	14.5	16.0	17.0	22	24.0
Mean Sat., %	39	40	46	52	68	72	79	92
Min. Sat., %	38	40	46	51	66	68	72	73
Max. Sat., %	40	41	46	52	70	76	93	132
24-hour run								
Mean DO, mg/l	--	7.0	5.9	6.0	6.8	6.3	7.0	7.5
Min. DO, mg/l	--	4.9	5.0	5.1	6.1	5.4	6.0	5.3
Max. DO, mg/l	--	8.8	7.2	7.0	7.8	7.1	8.4	11.7
Mean Temp., °C	--	15	16	16	16	16	18	19
Min. Temp., °C	--	14	15	15	16	16	17	17
Max. Temp., °C	--	16	18	17	17	18	21	23
Mean Sat., %	--	68	59	60	68	64	74	81
Min. Sat., %	--	47	49	50	60	55	60	56
Max. Sat., %	--	88	76	71	78	76	93	136

* Multiply by 1.609 to obtain kilometers.

** Mean based upon average hydrogen ion concentration of nine measurements.

† Averages are at time of measurement only and do not reflect variations due to range of generation rates, multiply by 0 305 to obtain depth in meters.

†† Depth highly variable depending upon generation rates.

downstream from T-2. This increase was not found in September. In response to a telephone query, hatchery personnel checked their record of cleaning operations. They indicated they had not cleaned the hatchery raceways on the day the samples were collected. Since all nine samples exhibited a similar increase at T-2, it was unlikely the increase resulted from sample contamination or laboratory error. Consequently, the source of the NO_2-NO_3-N increase is inexplicable.

The DO data from Table I is presented graphically in Figures 3 and 4 which show, respectively, the August and September profiles. In studying these profiles, it should be kept in mind that the mean 24-hour profiles do not include the DO data collected during the morning and evening runs. The plotted levels for the saturation concentration are based upon the mean water temperature at each station which included depth as well as time variations. Contrary to anticipated results, it can be seen that during August (Figure 3), the morning DO levels in the upper reaches of Lake Taneycomo were greater than the evening concentrations. Figure 3 shows that the minimum DO concentration of 1.5 mg/l occurred during the morning run in September. This concentration was recorded before generation began.

It should also be pointed out that the DO data collected during the 24-hour run in September represented a period of no generation. The other mean values and plotted data include data recorded both during periods of generation and non-generation.

Table II shows the total number of DO measurements which were made at the station centers during August and September. The table also indicates

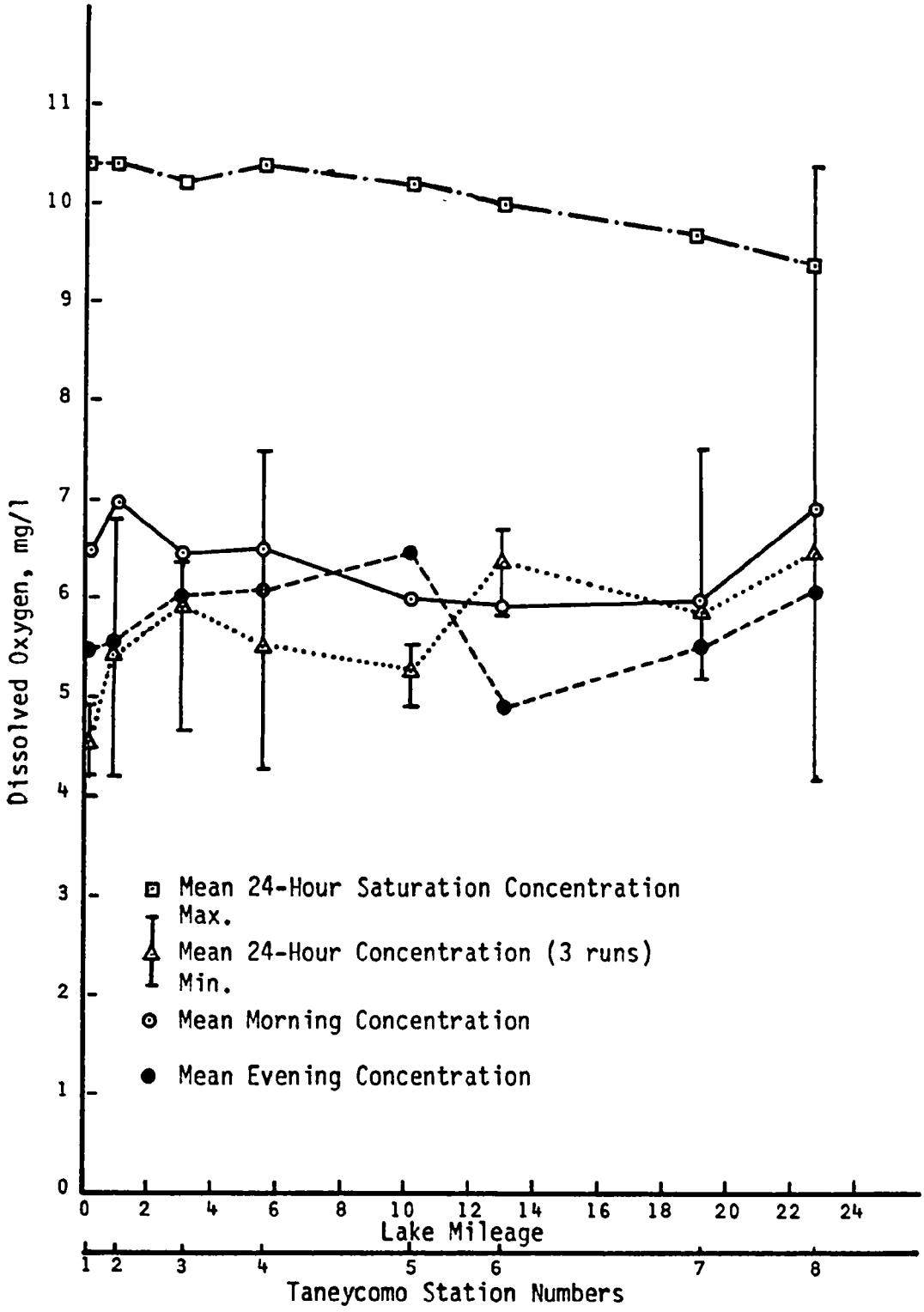

Figure 3.- Lake Taneycomo Dissolved Oxygen Data - August Study Period.

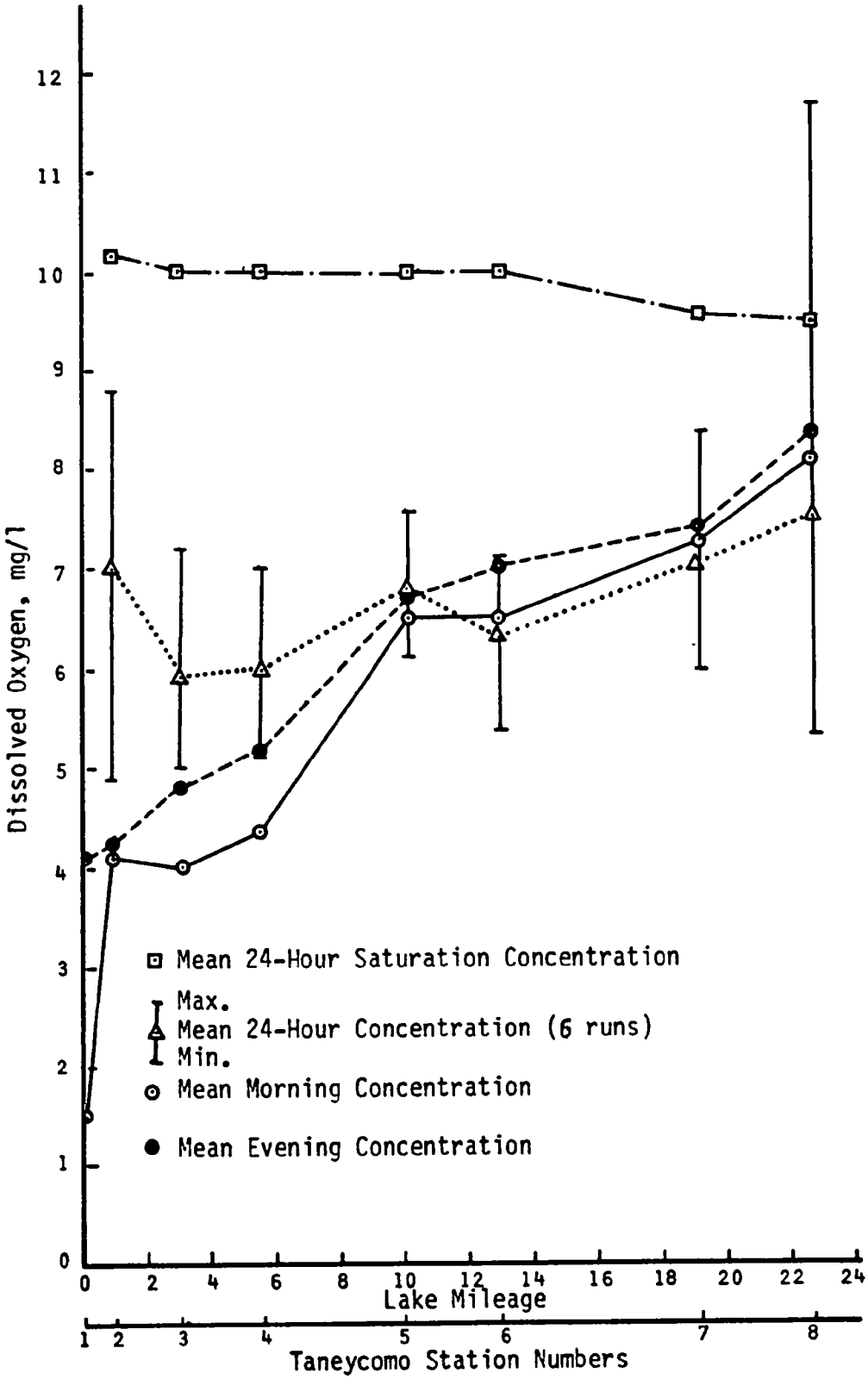

Figure 4.- Lake Taneycomo Dissolved Oxygen Data - September Study Period.

TABLE II

DISSOLVED OXYGEN MEASUREMENTS LESS THAN 4, 5, AND 6 mg/l

Period And Station	Total Number of DO Measurements	less than 4 mg/l		less than 5 mg/l		less than 6 mg/l	
		NO.	%	NO.	%	NO.	%
August							
T-1	11	0	00	6	55	8	73
T-2	16	0	00	3	19	12	75
T-3	15	0	00	2	13	2	13
T-4	23	0	00	8	35	8	35
T-5	37	0	00	2	05	25	68
T-6	64	0	00	13	20	39	61
T-7	43	0	00	0	00	30	70
T-8	68	0	00	2	03	36	53
September							
T-1	8	3	38	8	100	8	100
T-2	23	1	04	9	39	11	48
T-3	29	0	00	10	34	22	76
T-4	33	0	00	7	21	24	73
T-5	46	0	00	0	00	1	2
T-6	65	0	00	0	00	17	26
T-7	46	0	00	0	00	1	2
T-8	76	0	00	0	00	10	13

the number of measurements which were less than 4, 5, and 6 mg/l. It is apparent that the DO concentration was less than 6 mg/l throughout the length of Lake Taneycomo and that the upper reaches of the lake were below 5 mg/l. With the exception of stations T-1 and T-2, no DO concentrations below 4 mg/l were recorded.

Figures 5 and 6 are three-dimensional plots which graphically show the mean DO levels at all the center monitoring points of the Lake Taneycomo stations. These DO concentrations are plotted as a function of lake mileage and time of day. The cross hatching on the DO planes of each station are the result of projecting over the times and magnitudes of power generation releases at Table Rock Dam. As can be seen, these generation periods are plotted on the extreme left vertical axis of the figures. Most of the cross hatching on the August T-1 DO plane (Figure 5) had to be deleted to improve the readability of the graph. These graphs do not indicate any apparent DO fluctuation as a function of generation rates or times.

Table III summarizes the magnitude of the vertical and lateral DO variations found in the August and September data. The mean vertical stratification values were calculated by taking the average of the center line maximum minus minimum DO concentration (ΔDO) measured at any one time at the station. The lateral means were calculated by taking the average of the maximum difference in DO concentration found between the surface quarter points during the August study period. The surface measurements were used because they generally reflected the maximum lateral variation. The values shown in Table III include the results of the morning, evening, and the 24-hour runs. In studying the vertical ΔDO values,

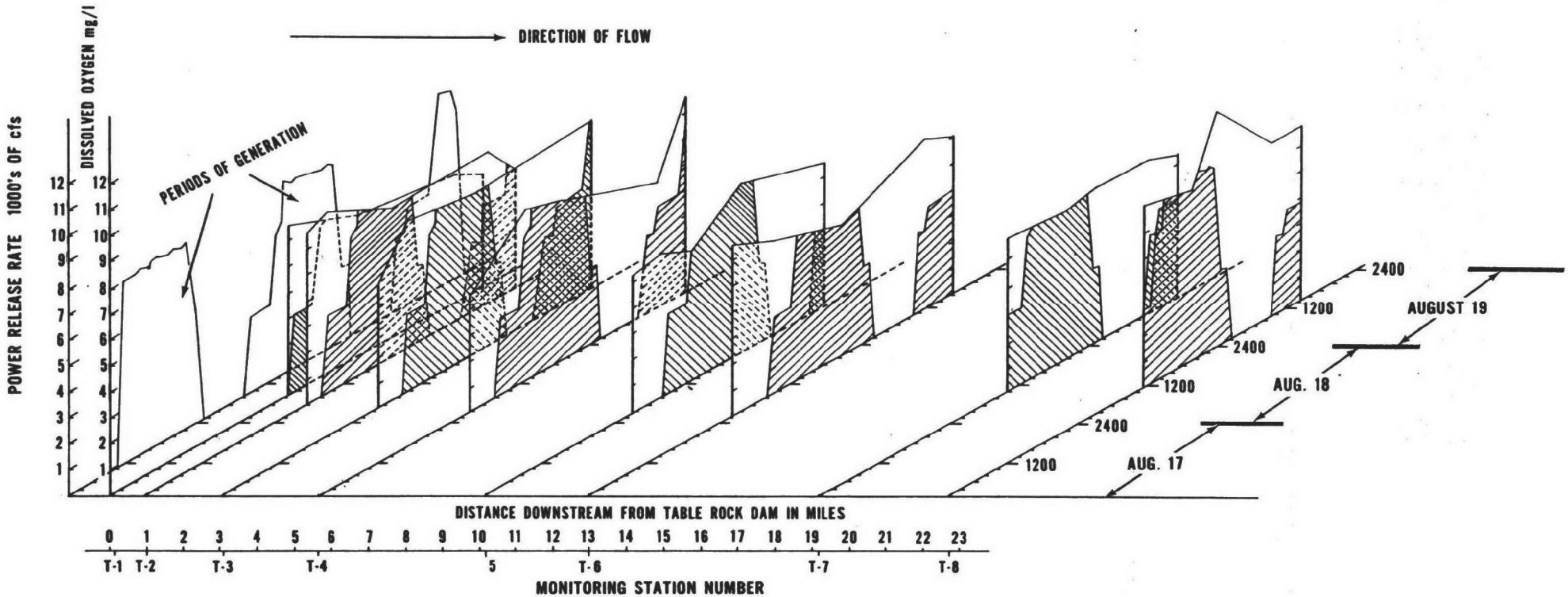

FIGURE 5. - AUGUST DISSOLVED OXYGEN LEVELS AS A FUNCTION OF LAKE MILEAGE, TIME, AND POWER RELEASE RATES.

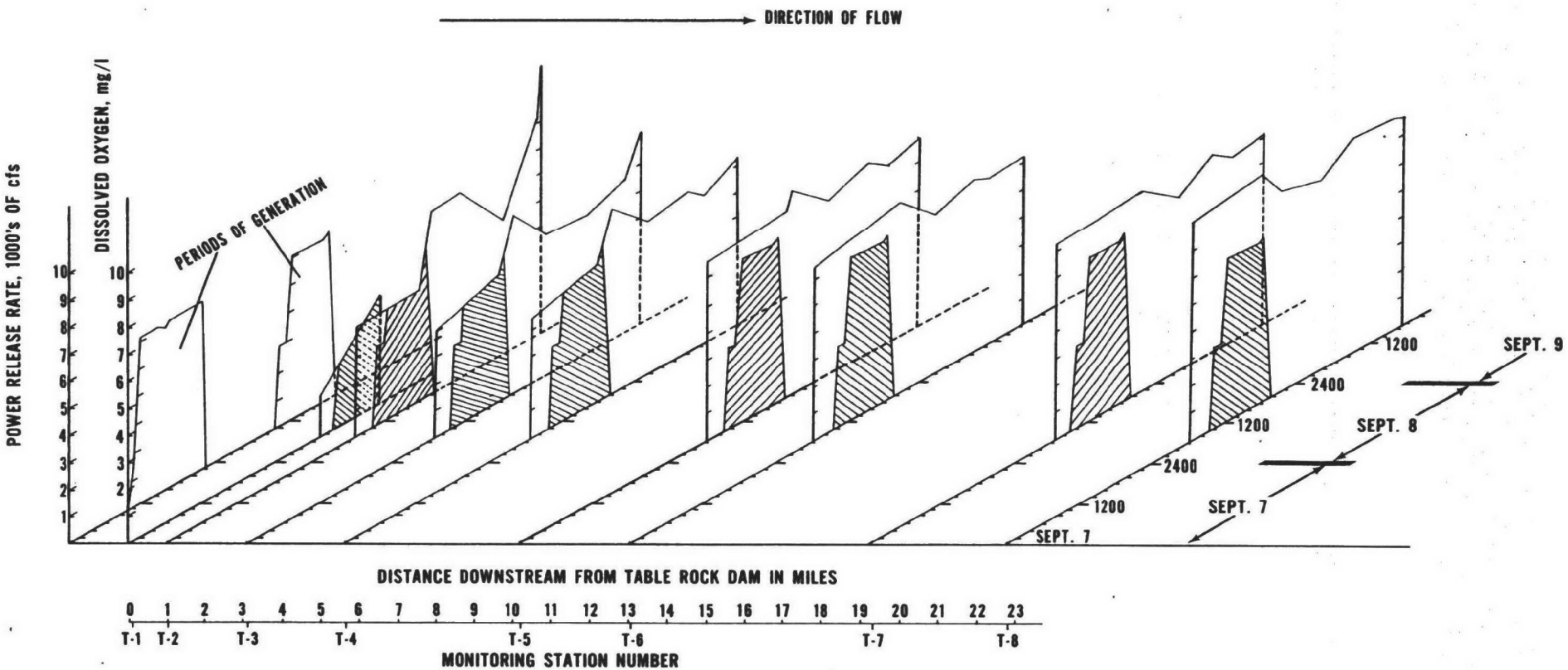

FIGURE 6.- SEPTEMBER DISSOLVED OXYGEN LEVELS AS A FUNCTION OF LAKE MILEAGE, TIME, AND POWER RELEASE RATES

TABLE III
MEAN MAXIMUM VERTICAL AND LATERAL
DISSOLVED OXYGEN VARIATIONS

Station	Vertical Stratification Δ DO, mg/l		Horizontal Stratification Δ DO, mg/l
	August	September	August
T-1	0.1	0.1	0.6
T-2	0.2	0.3	0.7
T-3	0.1	0.2	0.6
T-4	0.1	0.5	0.1
T-5	0.3	0.6	0.1
T-6	0.2	1.0	0.2
T-7	1.6	1.5	1.4
T-8	5.4	4.5	0.5

it should be pointed out that the maximum and minimum values at the upstream stations were not necessarily at the surface and bottom, respectively. At T-7 and T-8 the DO concentrations did decrease consistently from top to bottom.

Table III shows Lake Taneycomo was vertically well mixed through most of its length and that stratification was not significant until one reached T-7 and T-8. The August maximum vertical ΔDO at T-7 and T-8 were 2.2 and 6.0 mg/l, respectively. In September these maximums were 2.0 and 6.0 mg/l, respectively. Lateral variations indicated by the August quarter point sampling were reasonably consistent throughout the lake.

Figures 7 and 8 show the range of center line DO saturation levels calculated from the data collected during the 24-hour runs in August and September. It can be seen that stratification became increasingly significant as one proceeded downstream.

Looking at the 24-hour plots in Figures 3 and 4, it can be seen that a DO peak concentration occurred at T-3 and T-2 in August and September, respectively. Several theories were developed to account for these peaks and the lower downstream concentrations. As was previously noted, the 24-hour September data was recorded during a period of non-generation. Since the peak was further upstream in September when the lake water velocity was minimal, it was reasoned that the lower DO levels were the result of an unaccounted for source of organic material which was introduced into the lake at some point upstream from station T-2. It was initially thought that this source was the fish hatchery outfalls.

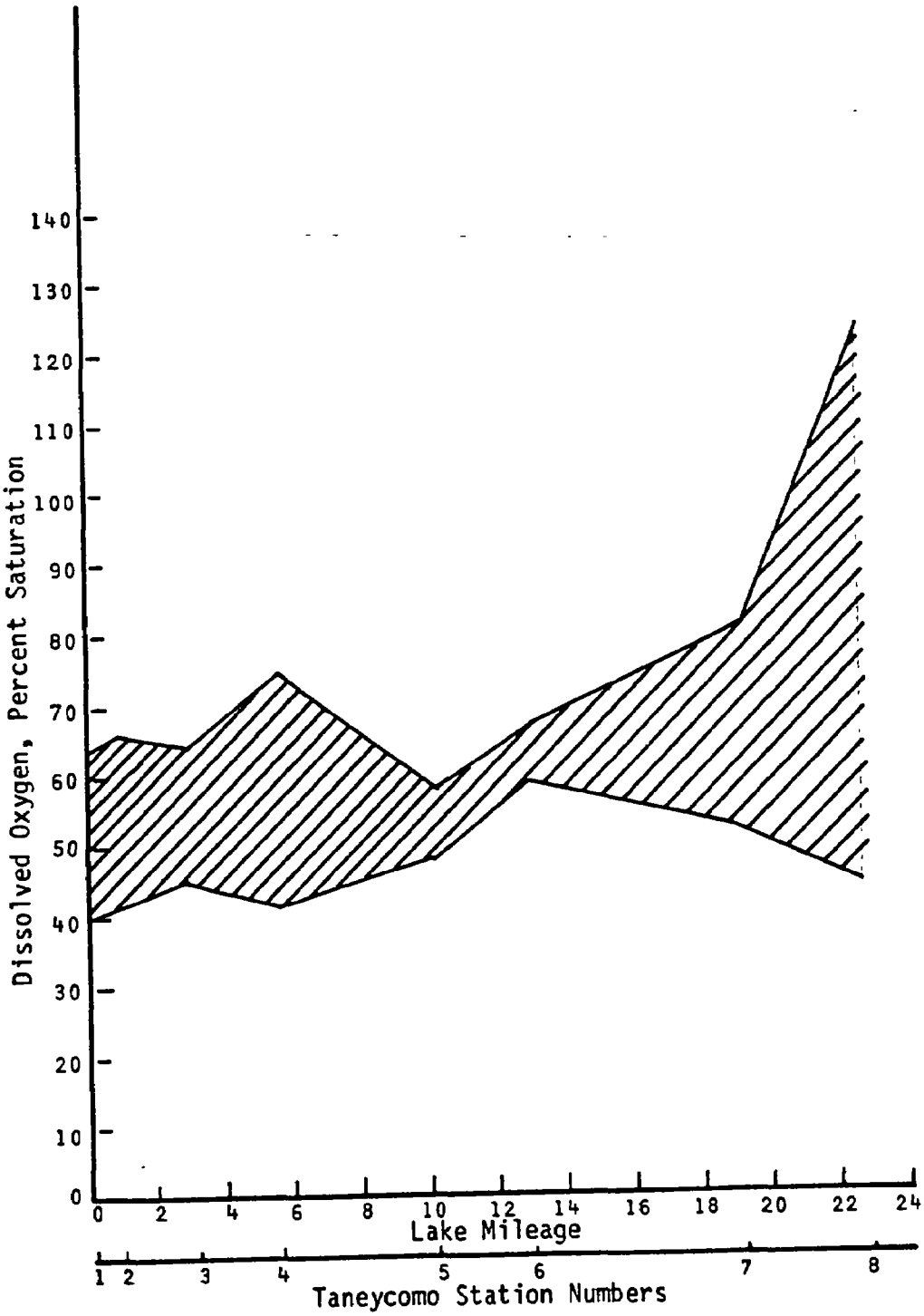

Figure 7.- Range of Dissolved Oxygen Saturation Levels - August 24-Hour Run.

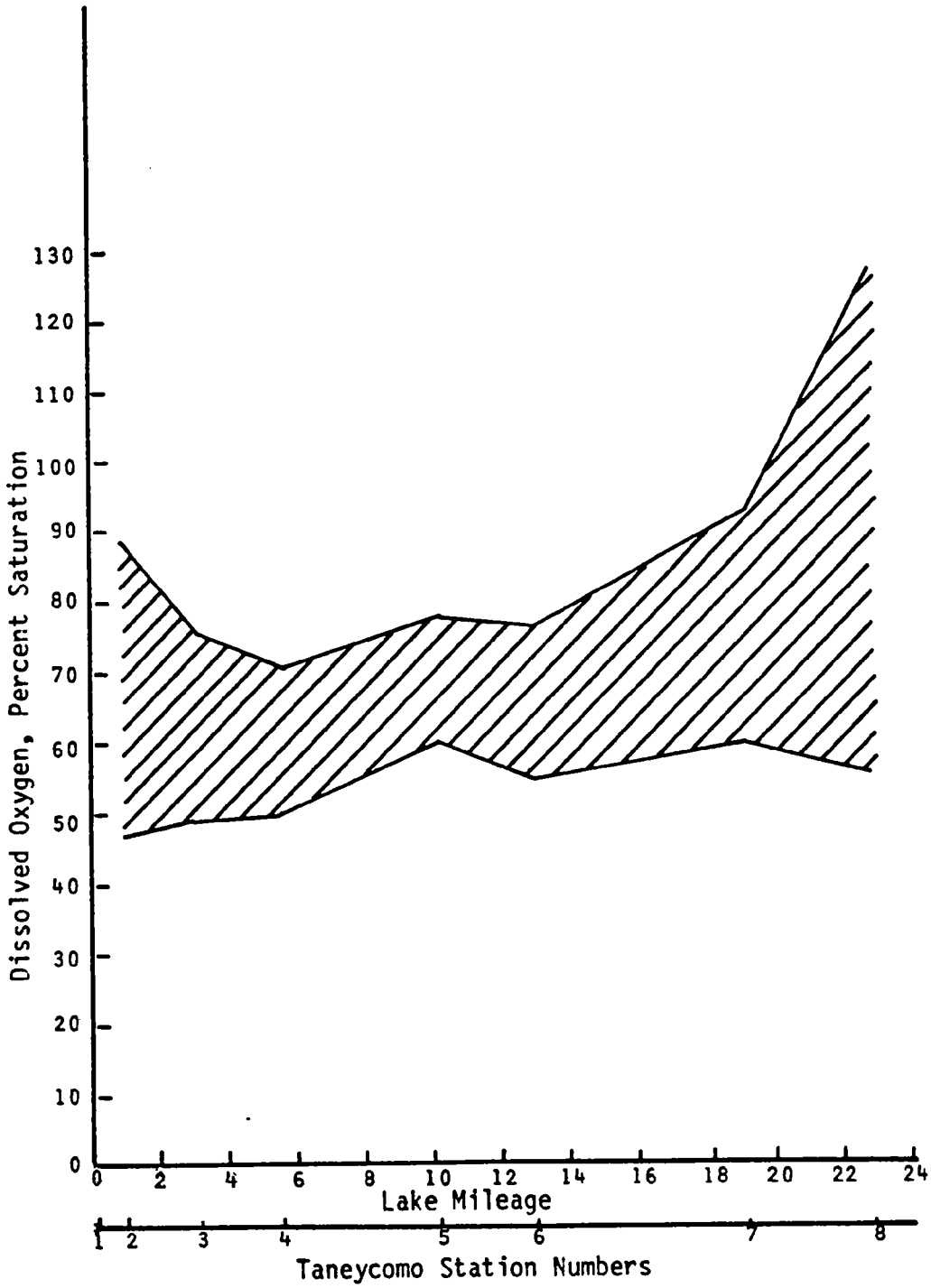

Figure 8.- Range of Dissolved Oxygen Saturation Levels September 24-Hour Run.

However a check of the SVAN files and some simple calculations indicated that the amount of organic material in the hatchery discharge was not sufficient to account for the decrease in DO.

Figure 3 indicated a DO decrease of greater than 1 mg/l. Using this concentration and the volume of water released during the 24-hour run [2000 million gallons (7.6 million cubic meters)] produced a calculated oxygen deficit of 8.4 tons (7.7 metric tons) or a BOD_5 population equivalent* of 99,000. A SVAN report (3) on the hatchery, which did not include BOD_5 data, indicated a maximum chemical oxygen demand (COD) of 770 lb (350 kg) per day during clean-up of tanks and raceways. It was therefore concluded that the hatchery was not responsible for the reduced DO levels downstream from the peak.

After discarding the theory of the hatchery discharge, it was reasoned that because of the magnitude of the calculated DO deficit, the decrease was linked to some chemical reaction in the water released from Table Rock Reservoir. Consequently, on October 6, a grab sample was collected from the withdrawl zone in the reservoir and returned to the EPA laboratory for analysis. Special precautions were taken to avoid aeration of this sample during collection and transport to the laboratory. Table IV presents the results of the analysis of the sample. It can be seen that there was no inhibition of the atmospheric reaeration of the sample, that bacteriological and BOD_5 analysis were insignificant, and that iron and hydrogen sulfide were below detection limits. Because of these results, it was concluded that the decreased DO concentration was not due to a chemical reaction.

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* Based on 0.1716 (77 grams) per capita per day.

TABLE IV

TABLE ROCK GRAB SAMPLE DATA

Point of Collection: Tap on line serving hatchery
Lab No.: 960063
Date: October 6, 1976
Time: 0800 hours

Parameters

Temperature: 12°C

Dissolved Oxygen:

Initial: 0.5 mg/l
Atmospheric Re-aeration (minimal agitation)
after 7 hours: 1.5 mg/l
after 28 hours: 4.0 mg/l
after 51 hours: 6.0 mg/l

Bacteriological Analysis:

Fecal Coliform: 0/100 ml
Total Plate Count:
500/100 ml after 24 hours
1200/100 ml after 144 hours

Biochemical Oxygen Demand:

Time	Seeded	Unseeded
1 day	0.2 mg/l	0.2 mg/l
5 day	0.5 mg/l	0.5 mg/l

Total Iron: <50 µg/l

Hydrogen Sulfide: None detected on site after sample acidification.
None detected with lead-acetate paper.

B. OCTOBER 14-16 STUDY PERIOD

Following rejection of the chemical reaction theory, it was suspected that the DO deficit was caused by some benthic demand. It was this theory which resulted in the October 14-16 field effort. It was reasoned that if the lower DO levels were caused by benthic demand, the location of the demand could be determined by floating the upper reaches of Lake Taneycomo while making continuous DO measurements and looking for significant differences in surface and bottom concentrations or sudden deflections of the meter.

Figure 9 presents the results of the October 14-16 period which was undertaken to verify the benthic demand theory. The DO concentrations plotted in Figure 9 have not been tabulated in this report because of the lack of lake mileage reference points and the impossibility of precisely locating many of the points of measurement. The points are believed to be correct within ±500 ft (150 m). Figure 9 shows that the DO levels were highly variable and were a function of time of day and dam operating mode. It can be seen that maximum DO concentrations occurred in the afternoon of October 14 during non-generation and that the minimum levels occurred on the morning of October 16 during a period of non-generation. Since the dam operating mode was the same on both occasions, it was apparent that diurnal photosynthetic variation was responsible for the fluctuations at T-1. The variation at T-2 can be explained by the combination of two factors of diurnal photosynthetic activity and atmospheric reaeration between T-1 and T-2.

Weather conditions during the DO runs are summarized as follows:

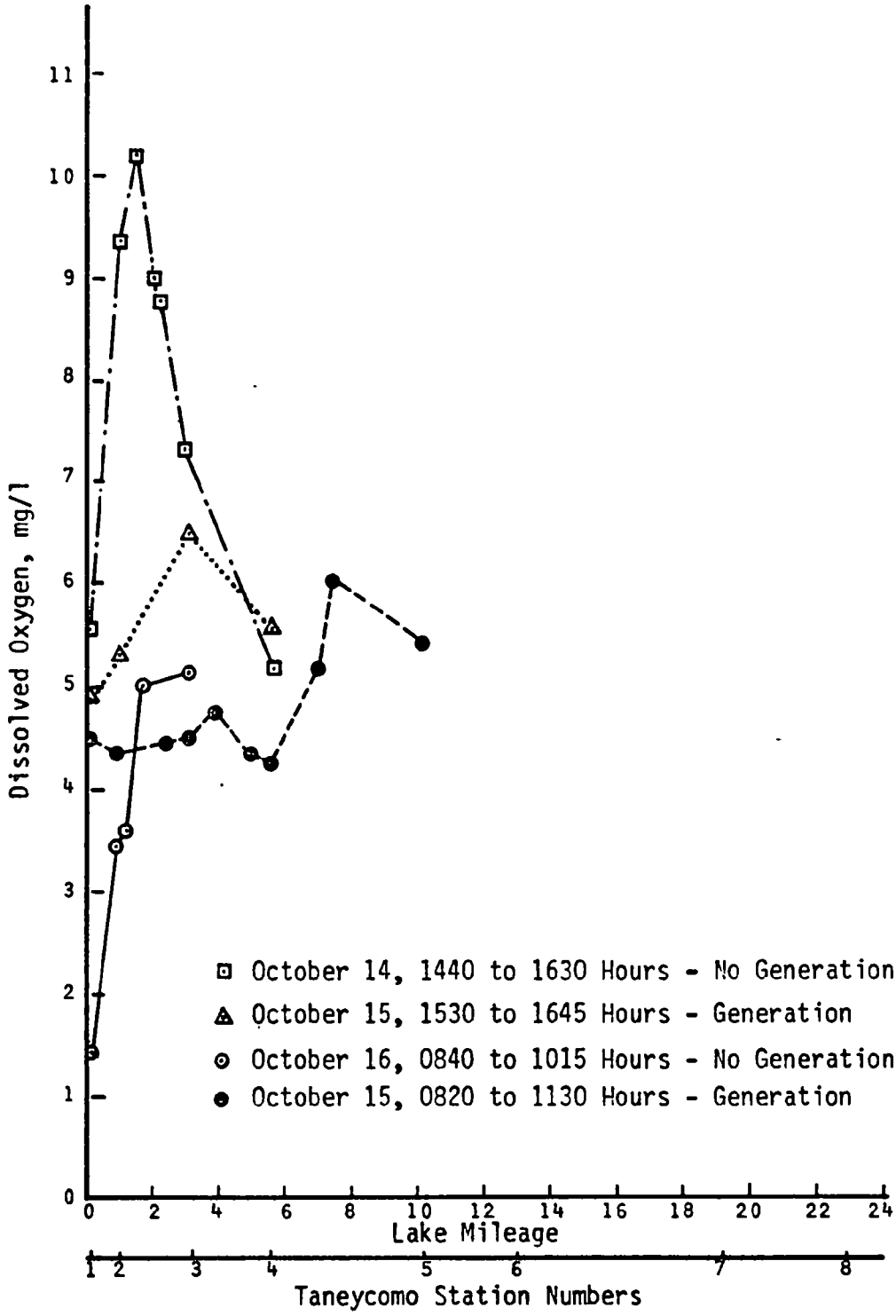

Figure 9.- Dissolved Oxygen Levels in Upper Reaches of Lake Taneycomo - October 14-16 Study Period.

Period	Weather Description
Afternoon, October 14	Sunny and cool
Morning, October 15	Overcast
Afternoon, October 15	Overcast
Morning, October 16	Sunny and cool

The hydraulic characteristics of the upper reaches of Taneycomo vary a great deal with power generation rates. Even during periods of non-generation there is still some flow in the upper reaches due to the three aerated hatchery discharges and the flow from the small turbine which supplies the internal power requirements of the dam. Total flow during non-generation has been estimated to be approximately 100 cfs (2.8 cu m/sec). About 20 cfs (0.57 cu m/sec) goes through the powerhouse generator and another 20 cfs (0.57 cu m/sec) goes to the fish hatchery. The Corps estimated that approximately 60 cfs (1.7 cu m/sec) leaked through the turbines. During periods of non-commercial generation, the upper reaches of Taneycomo (between T-1 and T-2) resemble a typical rocky Ozark stream with alternate stretches of riffles and deep pools. The riffle areas are broad and 2 to 4 inches (in.) [5 to 10 centimeters (cm)] deep in some areas. These shallow riffles, as indicated by Figure 9, are extremely effective in reaerating the small flows during periods of non-generation. During periods of commercial generation, the hydraulic characteristics of the channel are changed considerably. The depth of water is increased approximately 4 or 5 ft (1.2 or 1.5 m) and turbulence is reduced. Because of the narrow well-incised channel, water surface area is not greatly increased, and atmospheric reaeration is diminished.

As was pointed out previously in the description of the monitoring sites, station T-1 coincided with the permanent DO monitoring point

established by the Corps of Engineers. This point, although convenient and adjacent to Corps property, must be considered to be the one least representative of average DO levels in Lake Taneycomo.

Based upon the October 14-16 data, it was concluded that the DO peaks and downstream decline shown in Figures 3, 4, and 9 were not caused by a benthic demand, but instead, resulted from the various operating modes of the dam. The high DO concentrations shown in Figure 9 coincided with the riffle areas whereas the low DO concentrations downstream from T-2 were recorded in the deeper pools. It was therefore concluded that lower DO concentrations resulted from low-flow, high-DO water being diluted by low-DO water left in the large-volume, deep-water areas from the previous generation period.

It would appear that during periods of non-commercial generation, the riffle areas are increasing the DO by about 4 mg/l before the low-flow water becomes diluted in the deep pool areas. From a DO loading standpoint, there may be some greater flow rate which would optimize the reaeration effect of the riffle areas and increase downstream DO concentrations..

In addition to the DO data presented in Figure 9, some samples were collected for biological analysis during the October 14-16 period. Grab samples were collected for periphytic and phytoplankton analysis at station T-3 and at a point in a riffle area about 300 ft (90 m) downstream from the lower hatchery outfall. The macroinvertebrate community was also sampled in this riffle area with a square foot Surber sampler. The data resulting from this sampling may be found

in Appendix C. The periphyton community at T-3 was dominated by pennate diatoms of the genus Navicula (Table C-1). Diatoms accounted for 53 percent of the periphyton population. Filamentous blue-green and green algaes accounted for 33 percent and 13 percent, respectively.

The phytoplankton community at T-2 was dominated by equal numbers of the filamentous blue-green algae Anabaena and the green flagellate Chlamydomonas (Table C-2). Filamentous blue-green algae represented 39 percent, green flagellates represented 35 percent, and diatoms represented 26 percent of the phytoplankton community.

The periphyton community downstream of the hatchery effluent was dominated by pennate diatoms of the genus Navicula (Table C-3). Diatoms accounted for 66 percent of the periphytic community. Second and third ranked members of the periphytic community were filamentous blue-greens (23 percent) and green flagellates (9 percent).

Analysis of the periphytic community at both T-3 and downstream from the hatchery effluent identified groups of diatoms, filamentous blue-green algae, filamentous green algaes, and green flagellate algaes that were characteristic of organically enriched environments. Since there was no significant source of allochthonous organic material in this reach, this community structure was a response to other favorable environmental factors of which readily available nutrients was one.

Analysis of the square foot sample demonstrated a macroinvertebrate community dominated by Gammarus faciatus (53 percent). The midges Cricotopus (31 percent) and Orthocladius (10 percent) were the second and third ranking members of the community (Appendix C). Over all, the

community demonstrated a depressed diversity. The Shannon-Weaver diversity index ($\bar{d}$) was 1.66 with an equitability factor (e) of 0.67. Under natural river conditions these parameters would indicate some weakening of the community structure due to organic enrichment. Considering the absence of organic enrichment and the absence of comparative data for high stress lotic communities at the base of impoundments, it would be inadvisable to base any major hypothesis on the $\bar{d}$ and e factors. These factors are presented solely for the purpose of providing an historical data base for future comparisons.

An attempt was made on October 16 to assess the impact of benthic photosynthetic activity. The experiment involved measuring the oxygen production of periphytic material and plain lake water (with its complement of phytoplankton) in sunlight and measuring the oxygen consumption of identical samples kept in the dark. All samples were kept submerged in Lake Taneycomo. The samples in the dark were kept in a sunken ice chest.

The experiment was interupted after one and half hours, and the DO levels were determined. The results are presented in Table V. The increase in DO in the plain "dark" bottle severely weakens any hypothesis that may be formed from the experiment. A later attempt to repeat the experiment was unsuccessful because of overcast weather. The large increase in DO in the "light" periphyton bottle and the small decrease in DO in the "dark" periphyton bottle suggested that the heavy periphytic growths of the upper reach of Lake Taneycomo were a major source of DO during daylight and a moderate source of oxygen demand during darkness.

TABLE V
RESULTS OF LIGHT-DARK PERIPHYTON
AND PHYTOPLANKTON EXPERIMENT

Time	Periphyton mg/l		Phytoplankton mg/l	
	Light	Dark	Light	Dark
1000 hrs	5.4	5.7	4.7	4.8
1125 hrs	11.00	4.3	6.3	7.1

Additional credence to this supposition is found in the increased DO levels observed during periods of non-generation in quiet water out of the main current. The lingering waters were approximately 1 mg/l greater in DO than "main current" waters because of the longer contact time over substrates that were covered with thick periphytic growths.

C. OCTOBER 23-24 STUDY PERIOD

On October 23 and 24, observations were made for the purpose of assessing fish mortality in the reach from 200 ft (60 m) below Table Rock Dam downstream to T-2.

On the morning of October 23, a dead 15-in. (38-cm) rainbow trout was found in the rocks approximately 300 ft (90 m) downstream of the power station (Figure 10). The fish was examined, and no external trauma was found. The fish had been dead at least 12 hours, and decomposition made further examination useless. This fish was found upstream from T-1, an area closed to fishing. Because of its size, it was unlikely that it could have been a creel cull.* When the fish was found, the DO level in that area was 1.4 mg/l.

On the morning of October 24, a 22-in. (56-cm) rainbow trout (Figure 11) was found near station T-1. Examination of the fish showed no external trauma and no damage to the inside of the mouth, esophagus, or gills. The fish had been dead for approximately six hours. Again, because of the location (at the boundary line of open and closed water), the lack of external trauma, and the size, it was unlikely that this fish was a creel cull. The DO at the discovery point was 1.4 mg/l.

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* Fish released in anticipation of catching a larger fish or to allow continued fishing by avoiding filling of one's limit.

Figure 10. - Fifteen Inch Rainbow Trout Found October 23, 1976 in Waters Closed to Fishing.

Figure 11. - Twenty-Two Inch Rainbow Trout Found October 24, 1976 at Station T-1.

Figure 12 is a plot of the discrete oxygen measurements made on October 23 during overcast weather. It can be seen that the horizontal scale of this figure has been expanded and that all measurements were made between stations T-1 and T-2. Again, it can be seen that during a period of non-generation there was a rapid increase in DO levels between T-1 and T-2 as a result of the reaeration introduced by the riffle areas.

D. JANUARY 7-8 STUDY PERIOD

On January 7-8, DO runs were made in Lake Taneycomo to get data following the fall "turnover" in Table Rock Reservoir and to verify the effect of the upstream riffle areas. The DO runs included one run on January 7 at all the Taneycomo stations and one run during non-generation in the upper reaches on January 8. Additionally, one DO measurement was taken at the hatchery influent line at a point in the pipe which precluded any atmospheric reaeration. Quarter point samples were collected at T-1 at the surface, middepth, and bottom for pH and nutrient analysis. Also, in order to get a more accurate estimate of Table Rock Dam turbine leakage, Lake Taneycomo and the hatchery discharges were gauged on January 8 during a period of non-generation.

The January 7 DO data and the power generation release rates are tabulated in Appendix D. The January 8 DO data was not tabulated because of the lack of bank reference points for many of the stations. Because of difficulties with laboratory analytical equipment, the nutrient data will be added to this report as a supplement at a later date.

Figure 13 graphically shows the results of the January 7 and 8 DO runs. It can be seen that DO levels in the lake were near saturation and that,

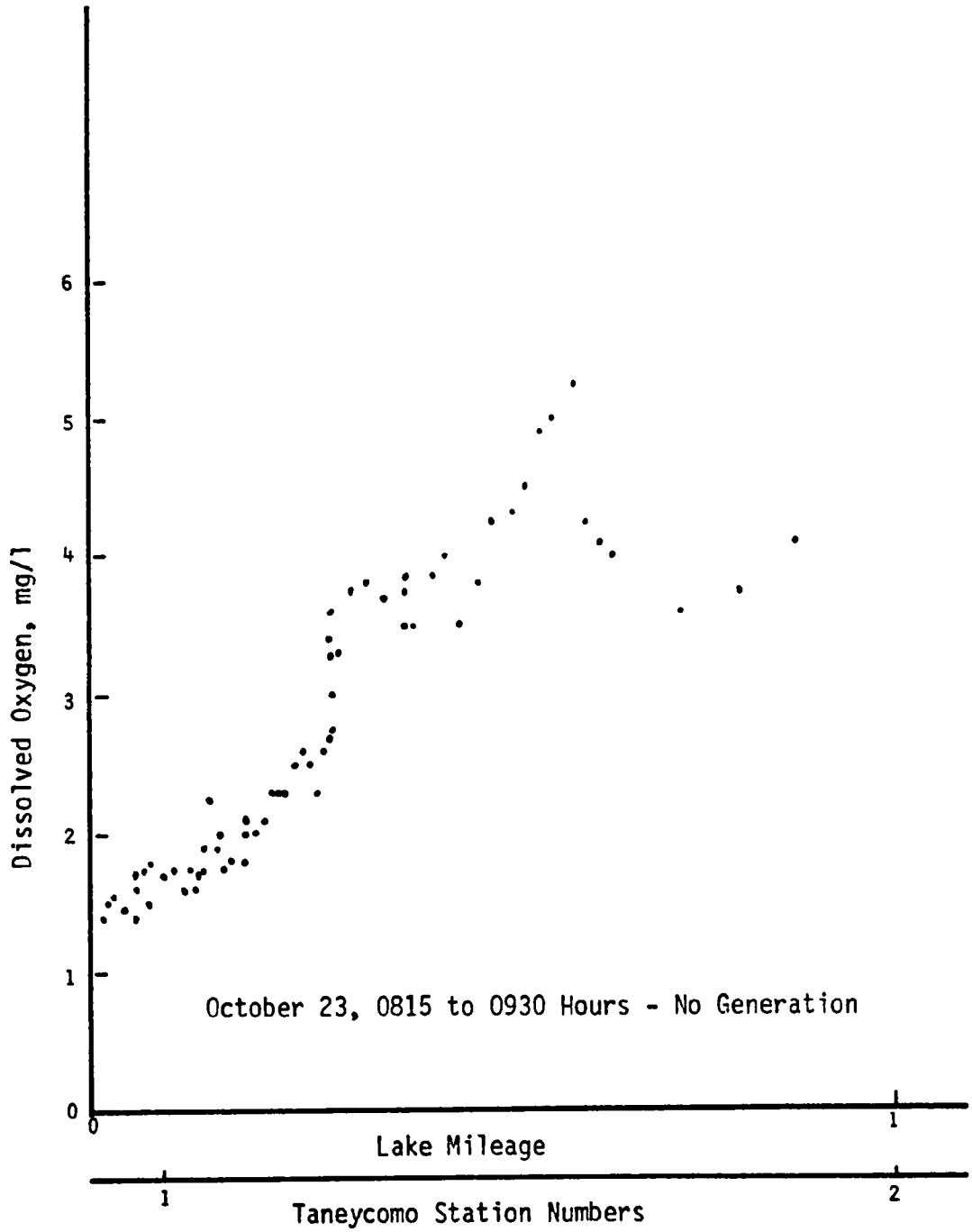

Figure 12 - Dissolved Oxygen Levels in Upper Reaches of Lake Taneycomo - October 23, 1976.

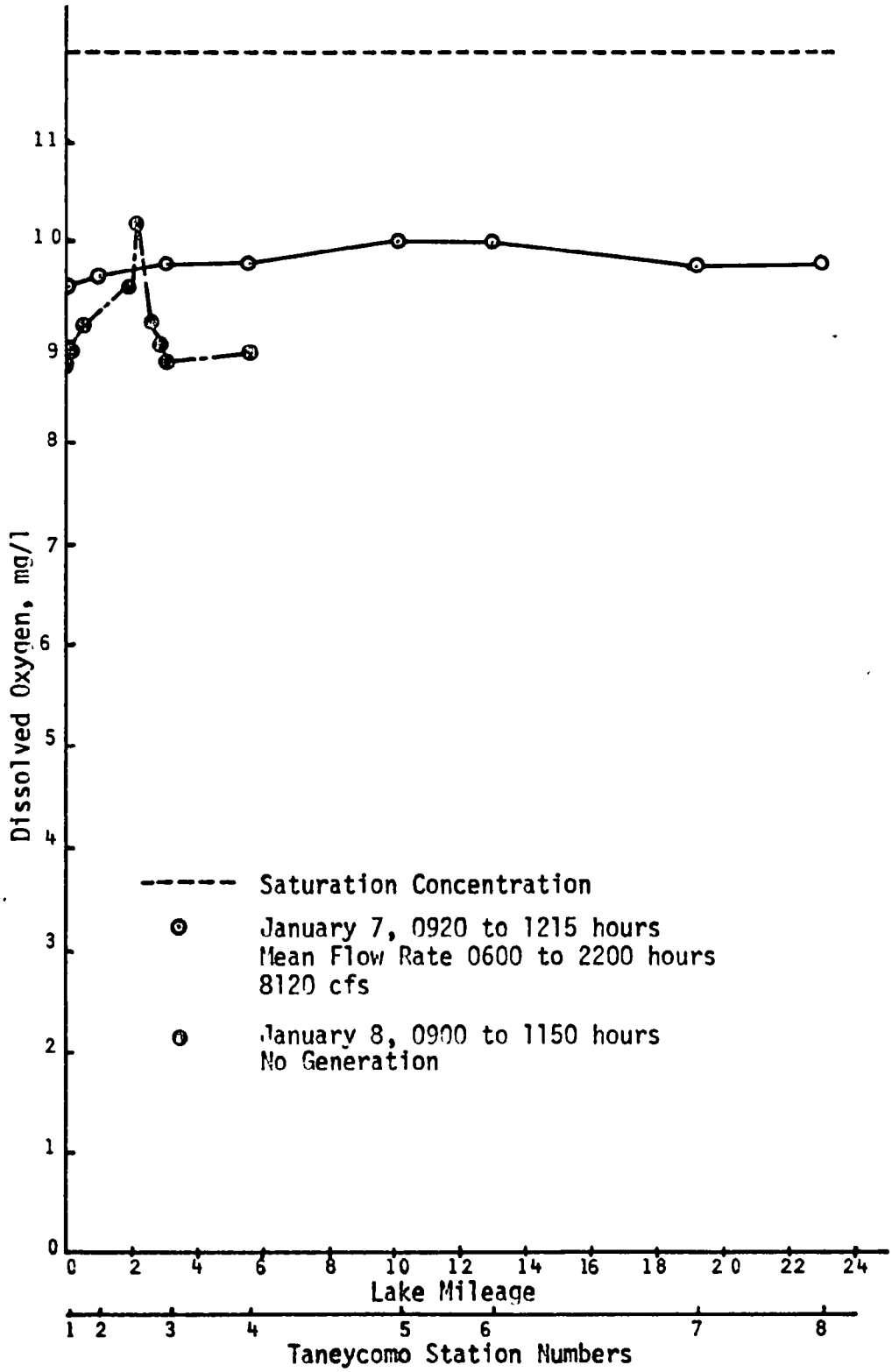

Figure 13. - Dissolved Oxygen Levels in Lake Taneycomo - January 7-8 Study Period.

during generation, DO concentrations were relatively constant throughout the length of Lake Taneycomo. An examination of Table D-1 would also indicate that there was no significant depth stratification of DO or temperature in Taneycomo even at the downstream stations. At T-8, the surface DO was 10.0 mg/l while the bottom DO [38 ft (12 m)] was 9.5 mg/l. The January 8 DO run indicated that the DO peak resulting from the riffle areas was still present. The weather was clear and cold on the morning of January 7 and overcast and cold on January 8.

The DO of the hatchery intake was measured at 1630 hours on January 7 and was found to be 11.8 mg/l. Why this value was greater than the DO concentrations found in Lake Taneycomo is not known.

The pH measurements of the nine samples collected at T-1 on January 7 are shown below. The average pH (based on mean hydrogen ion concentration) of these nine measurements was 8.0.

	Horizontal Location		
Vertical Location	Left Bank	Midstream	Right Bank
Surface	8.1	8.3	7.9
Middepth	8.0	8.3	7.7
Bottom	8.0	8.2	7.8

The results of the gauging of the three hatchery discharges and Lake Taneycomo immediately downstream from the three discharges were as follows:

Location	Flow Rate*
Upstream Discharge	2.4 cfs
Middle Discharge	6.4 cfs
Lower Discharge	3.9 cfs
Total Hatchery Discharge	12.7 cfs

* Multiply by 0.0283 to obtain cu m/sec.

Location	Flow Rate*
Lake Taneycomo Downstream from Hatchery Discharge	127.3 cfs
Calculated Flow Rate from Table Rock Dam	114.6 cfs
Estimated In-house Generation	20.0 cfs
Calculated Turbine Leakage	94.6 cfs

The gauging sites of the discharges and Lake Taneycomo were less than satisfactory and the resulting flow rates are estimated to be correct within ±20 percent. Additionally, the gauged flow rate in Lake Taneycomo should be considered a minimum value since the bottom is composed of course gravel and a significant amount of subsurface flow cannot be ruled out. It must, therefore, be concluded that the dam turbine leakage is greater than the 60 cfs (1.7 cu m/sec) estimated by the Corps.

E. STUDY LIMITATIONS

The data collected to date has satisfied the primary objective of the study which was to determine the extent of the low DO problem in Lake Taneycomo. However, there are several factors imposed by the limited scope of the study which one should consider.

The low DO problem, depending upon yearly climatic fluctuations, apparently extends from the late summer to late fall and is a function of the controlled release rates from Table Rock Dam. During this fall period, the Corps tries to limit generation rates and, if necessary, make surface releases to maintain 4 mg/l. It is extremely improbable with only two 24-hour study periods that a "worst case" condition under this controlled operating mode was documented.

* Multiply by 0.0283 to obtain cu m/sec.

Additionally it would have been highly desireable to approximate an absolute "worst case" condition by documenting DO levels at maximum generation rates which were sustained over a two or three-day period. It is possible that maximum generation could be needed at some time in the future because of a breakdown in a base load generating facility. Obviously, this situation could not be simulated without interfering with normal power production needs and running the high risk of a major fish kill.

Another factor one must consider when studying the data in this report, was the number of variables involved. There was no attempt made to create a controlled situation during any of the study periods. Consequently, the data reflected specific periods and magnitudes of generation and non-generation as well as diurnal and seasonal variations. It was not possible to separate out the significance of these separate variables. Again, it would have been desireable to monitor DO concentrations over extended periods of both non-generation and generation at some constant rate. This situation was also not possible without interfering with normal power production needs.

Finally, the data indicated large daily fluctuations in DO levels. To provide enough data for modelling and to establish cause and effect relationships would require practically continuous 24-hour monitoring of the Taneycomo stations for extended periods. This monitoring could not be feasible accomplished by the manpower intensive methods used in August and September. If it becomes necessary to determine cause and effect relationships and prior to creating a controlled operating

condition, it will be necessary to make a substantial investment in monitoring and recording equipment. It would also be necessary to make a major manpower commitment.

V. SUMMARY

The data presented in this report has shown that during the August and September study periods, the DO concentration in Lake Taneycomo was essentially less than the 6.0 mg/l water quality standard throughout the length of the lake. This fact becomes particularly apparent if one does not recognize the stratification in the downstream reaches of Lake Taneycomo by ignoring mean values and, instead, considers discrete measurements which a strict interpretation of the water quality standard would require. The data further indicated that major portions of the lake had DO concentrations of less than 5 mg/l. During the periods of study, the DO concentration in Lake Taneycomo was consistently equal to or greater than 4 mg/l with the exception of that area upstream from T-2.

The August and September data indicated Lake Taneycomo to be vertically well-mixed throughout most of its length. There was no evidence of stratification except at stations T-7 and T-8 which are within 4 miles (6.4 km) of the downstream Ozark Beach Dam. The January DO data indicated no significant stratification at any of the Taneycomo stations. The August quarter point DO monitoring further indicated that the lake was reasonably well-mixed laterally.

The investigation revealed wide fluctuations in the DO concentration at station T-1. The lowest DO values (1.4 to 1.5 mg/l) always occurred at T-1 in the morning hours before commercial generation began. The lowest DO value recorded at T-1 during commercial generation was 4.0 mg/l. The highest value recorded during generation was 7.5 mg/l. During daylight hours and periods of non-generation DO concentrations of up to

5.5 mg/l were recorded at T-1. It was concluded that the DO fluctuations at T-1 were due to the combination of respiration and photosynthetic reoxygenation. Because of the large daily fluctuations at T-1 which included diurnal variations not directly related to generation rates, it was concluded that the permanent monitoring station established by the Corps at this point was not producing data which was representative of average DO concentrations in Lake Taneycomo. However, it did clearly produce data which was reflective of minimum concentrations.

The DO fluctuation during non-generation at T-2 resulted from the combination of the diurnal photosynthetic cycle and the atmospheric reaerating effect of the shallow riffle areas located upstream from T-2. The data showed that, during periods of non-commercial power production, the riffle areas were increasing low-flow DO concentrations by about 4 mg/l.

The riffle areas were found to be responsible for the DO peaks and apparent reduced downstream concentrations found during periods of non-generation. It was concluded that the decreases in oxygen concentration were not due to organics, chemical reaction, or benthic demand, but instead, resulted from low-flow, high-DO water being diluted in the downstream large-volume pools by water remaining from a previous commercial generation period.

In considering the effect of the riffle areas from a DO loading standpoint, it was surmised that downstream DO concentrations might be maximized at some flow rate greater than that presently contributed by hatchery operations, powerhouse internal power generation, and turbine leakage.

The results of the stream gauging indicated that the amount of turbine leakage from Table Rock Dam may be more than the Corps estimated.

VI. CONCLUSIONS

Within the range of environmental conditions and the scope of this investigation, the following conclusions are made:

1. The fall DO concentration levels throughout the length of Lake Taneycomo were less than the water quality standard of 6.0 mg/l, and major portions of the lake had DO concentrations of less than 5 mg/l.

2. The DO concentration throughout Lake Taneycomo was equal to or greater than 4 mg/l with the exception of the first mile downstream from Table Rock Dam.

3. The lowest DO concentrations occurred at station T-1 during periods of non-generation. No DO concentration of less than 4 mg/l was recorded at T-1 during periods of commercial generation.

4. The wide fluctuation in DO concentrations in the upper reaches of Lake Taneycomo were due to a combination of the benthic diurnal photosynthetic cycle, atmospheric reaeration and power generating mode.

5. The reduced DO concentrations found downstream from the peak values recorded in the riffle areas resulted from the dilution of low-flow, high-DO water produced during periods of non-generation.

6. The permanent monitoring station established by the Corps of Engineers produced data which was reflective of minimum DO concentrations in Lake Taneycomo.

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APPENDIX A

LAKE TANEYCOMO
NUTRIENT, pH, DO, AND
FLOW RATES

AUGUST AND SEPTEMBER, 1976

TABLE A-1

NUTRIENT AND pH LEVELS AT STATION T-1

Date 1976	Time Military	Vertical Location	Left Bank*					Mid Stream					Right Bank*				
			pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l
Aug 18	1200	Surface	7.3	0.36	<0.2	<0.04	<0.1	7.4	0.35	<0.2	0.08	<0.1	7.3	0.36	<0.2	0.14	<0.1
		Mid Depth	7.4	0.35	<0.2	<0.04	<0.1	7.3	0.43	<0.2	0.11	<0.1	7.4	0.35	<0.2	0.09	<0.1
		Bottom	7.4	0.53	<0.2	0.04	<0.1	7.4	0.36	<0.2	0.13	<0.1	7.5	0.34	<0.2	0.08	<0.1
		Mean**	7.4	0.41	<0.2	<0.04	<0.1	7.4	0.38	<0.2	0.11	<0.1	7.4	0.36	<0.2	0.10	<0.1
Sept 7	1330	Surface	7.3	0.31	0.3	0.15	0.1	7.0	0.32	<0.2	0.05	0.2	7.2	0.32	0.2	0.05	0.1
		Mid Depth	7.1	0.30	<0.2	0.21	0.1	7.1	0.31	<0.2	0.09	0.1	7.1	0.31	<0.2	0.08	0.1
		Bottom	7.2	0.32	<0.2	<0.04	0.1	7.3	0.31	<0.2	0.10	0.1	7.0	0.30	<0.2	<0.04	<0.1
		Mean**	7.2	0.31	<0.23	<0.13	0.1	7.1	0.31	<0.2	0.08	0.1	7.1	0.31	<0.2	<0.06	<0.1

* Facing downstream.

** Mean pH levels are based upon average hydrogen ion concentrations.

† Nitrite plus Nitrate Nitrogen as Nitrogen.

TABLE A-1, CONTINUED

NUTRIENT AND pH LEVELS AT STATION T-2

Date 1976	Time Military	Vertical Location	Left Bank*					Mid Stream					Right Bank*				
			pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l
Aug 18	1215	Surface	7.4	3.8	<0.2	0.12	<0.1	7.5	3.0	<0.2	0.08	<0.1	7.4	3.1	0.2	0.07	<0.1
		Mid Depth	7.5	5.3	<0.2	<0.04	<0.1	7.5	2.9	<0.2	<0.04	<0.1	7.4	2.9	0.2	<0.04	<0.1
		Bottom	7.4	2.9	<0.2	0.04	<0.1	7.4	2.8	<0.2	0.04	<0.1	7.4	3.0	<0.2	0.16	<0.1
		Mean**	7.4	4.0	<0.2	<0.07	<0.1	7.5	2.9	<0.2	<0.05	<0.1	7.4	3.0	<0.2	<0.09	<0.1
Sept 7	1400	Surface	7.4	--	<0.2	0.05	<0.1	7.3	0.28	<0.2	0.13	<0.1	7.4	0.27	<0.2	0.13	<0.1
		Mid Depth	7.2	0.32	<0.2	0.12	<0.1	7.5	0.28	<0.2	0.11	<0.1	7.2	0.27	<0.2	0.11	0.2
		Bottom	7.6	0.28	<0.2	0.11	<0.1	7.5	0.28	0.2	0.07	<0.1	7.6	0.28	<0.2	0.12	<0.1
		Mean**	7.4	0.30	<0.2	0.09	<0.1	7.4	0.28	<0.2	0.10	<0.1	7.4	0.27	<0.2	0.12	<0.1

* Facing downstream.

** Mean pH levels are based upon average hydrogen ion concentrations.

† Nitrite plus Nitrate Nitrogen as Nitrogen.

TABLE A-1, CONTINUED

NUTRIENT AND pH LEVELS AT STATION T-3

Date 1976	Time Military	Vertical Location	Left Bank*					Mid Stream					Right Bank*				
			pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l
Aug 17	1120	Surface	7.1	0.36	0.2	0.13	0.1	7.4	0.33	<0.2	<0.04	0.3	7.3	0,34	< 0.2	0.12	0.2
		Mid Depth	7.3	0.33	<0.2	0.07	0.1	7.3	0.32	<0.2	0.08	0.2	7.4	0.30	< 0.2	<0.04	0.3
		Bottom	7.2	0.32	0.2	0.21	0.3	7.3	0.30	<0.2	0.06	0.2	7.3	0.30	< 0.2	<0.04	0.3
		Mean**	7.2	0.34	<0.2	0.14	0.2	7.3	0.32	<0.2	<0.06	0.2	7.3	0.31	< 0.2	<0.04	0.3
Sept 7	1430	Surface	7.5	0.31	<0.2	0.09	<0.1	7.5	0.31	<0.2	0.09	<0.1	7.7	0.31	<0.2	0.05	<0.1
		Mid Depth	7.3	0.30	<0.2	0.09	<0.1	8.0	0.30	<0.2	0.07	<0.1	7.5	0.30	0.2	<0.04	<0.1
		Bottom	7.3	0.31	< 0.2	0.11	<0.1	7.4	0.31	0.3	<0.04	<0.1	7.3	0.31	0.2	<0.04	<0.1
		Mean**	7.4	0.31	< 0.2	0.10	<0,1	7.6	0.31	< 0.2	<0.07	<0.1	7.5	0.31	<0.2	<0.04	<0.1

* Facing downstream.

** Mean pH levels are based upon average hydrogen ion concentrations.

† Nitrite plus Nitrate Nitrogen as Nitrogen.

TABLE A-1, CONTINUED

NUTRIENT AND pH LEVELS AT STATION T-4

Date 1976	Time Military	Vertical Location	Left Bank*					Mid Stream					Right Bank*				
			pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l
Aug 17	1205	Surface	7.5	0.29	0.1	<0.04	0.35	7.2	0.30	<0.2	<0.04	0.22	7.3	0.32	<0.2	<0.04	0.24
		Mid Depth	7.8	0.31	0.2	<0.04	0.50	7.3	0.33	<0.2	0.06	0.14	7.3	0.31	<0.2	<0.04	0.17
		Bottom	7.4	0.33	<0.2	<0.04	0.21	7.2	0.31	<0.2	<0.04	0.18	7.4	0.31	<0.2	<0.04	0.27
		Mean**	7.5	0.31	<0.2	<0.04	0.35	7.2	0.31	<0.2	<0.05	0.18	7.3	0.31	<0.2	<0.04	0.23
Sept 7	1450	Surface	7.4	0.31	<0.2	<0.04	<0.1	7.4	0.32	<0.2	<0.04	<0.1	7.4	0.31	<0.2	<0.04	<0.1
		Mid Depth	7.2	0.30	<0.2	<0.04	<0.1	7.5	0.32	<0.2	<0.04	<0.1	7.5	0.33	<0.2	<0.04	<0.1
		Bottom	7.7	0.32	0.2	<0.04	<0.1	7.5	0.31	<0.2	<0.04	<0.1	7.0	0.32	<0.2	<0.04	<0.1
		Mean**	7.4	0.31	<0.2	<0.04	<0.1	7.5	0.32	<0.2	<0.04	<0.1	7.2	0.32	<0.2	<0.04	<0.1

* Facing downstream.

** Mean pH levels are based upon average hydrogen ion concentrations.

† Nitrite plus Nitrate Nitrogen as Nitrogen.

TABLE A-1, CONTINUED

NUTRIENT AND pH LEVELS AT STATION T-5

Date 1976	Time Military	Vertical Location	Left Bank*					Mid Stream					Right Bank*				
			pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l
Aug 17	1230	Surface	7.5	0.26	<0.2	0.08	0.28	7.5	0.30	<0.2	0.10	0.13	7.5	0.27	<0.2	<0.03	0.23
		Mid Depth	7.5	0.27	<0.2	<0.04	0.16	7.4	0.28	<0.2	<0.04	0.15	7.4	0.27	<0.2	0.18	0.19
		Bottom	7.3	0.28	<0.2	<0.04	0.10	7.3	0.29	<0.2	0.05	0.10	7.5	0.28	<0.2	<0.04	0.12
		Mean**	7.4	0.27	<0.2	<0.05	0.18	7.4	0.29	<0.2	<0.06	0.13	7.5	0.27	<0.2	<0.08	0.18
Sept 7	1500	Surface	7.3	0.31	<0.2	<0.04	<0.1	7.4	0.31	<0.2	0.06	<0.1	7.5	0.28	<0.2	0.11	<0.1
		Mid Depth	7.4	0.30	<0.2	<0.04	<0.1	7.5	0.28	<0.2	0.05	<0.1	7.2	0.31	<0.2	<0.04	<0.1
		Bottom	8.0	0.31	<0.2	0.09	<0.1	7.5	0.30	<0.2	0.05	<0.1	7.3	0.25	<0.2	0.07	0.1
		Mean**	7.5	0.31	<0.2	<0.06	<0.1	7.5	0.30	<0.2	0.05	<0.1	7.3	0.28	<0.2	<0.07	<0.1

* Facing downstream.

** Mean pH levels are based upon average hydrogen ion concentrations.

† Nitrite plus Nitrate Nitrogen as Nitrogen.

TABLE A-1, CONTINUED

NUTRIENT AND pH LEVELS AT STATION T-6

Date 1976	Time Military	Vertical Location	Left Bank*					Mid Stream					Right Bank*				
			pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l
Aug 17	1330	Surface	7.3	0.27	<0.2	<0.04	<0.11	7.3	0.27	<0.2	<0.04	<0.1	7.2	0.33	<0.2	0.11	<0.1
		Mid Depth	7.4	0.29	<0.2	<0.04	<0.10	7.3	0.28	<0.2	<0.04	<0.1	7.3	0.30	<0.2	<0.04	<0.1
		Bottom	7.3	0.30	<0.2	<0.04	<0.10	7.3	0.30	<0.2	<0.04	0.16	7.2	0.27	<0.2	0.12	<0.1
		Mean**	7.4	0.29	<0.2	<0.04	<0.10	7.3	0.28	<0.2	<0.04	<0.12	7.2	0.30	<0.2	<0.09	<0.1
Sept 7	1510	Surface	7.3	0.29	<0.2	<0.04	0.3	7.3	0.31	<0.2	<0.04	0.27	7.3	0.30	<0.2	0.06	<0.1
		Mid Depth	7.7	0.31	<0.2	<0.04	<0.1	7.6	0.29	<0.2	0.05	0.12	7.7	0.31	<0.2	0.07	<0.1
		Bottom	7.8	--	<0.2	<0.04	<0.1	7.7	0.31	<0.2	0.07	<0.1	7.6	0.29	<0.2	0.14	<0.1
		Mean**	7.5	0.30	<0.2	<0.04	<0.2	7.5	0.30	<0.2	<0.05	<0.16	7.5	0.30	<0.2	0.09	<0.1

* Facing downstream.

** Mean pH levels are based upon average hydrogen ion concentrations.

† Nitrite plus Nitrate Nitrogen as Nitrogen.

TABLE A-1, CONTINUED

NUTRIENT AND pH LEVLES AT STATION T-7

Date 1976	Time Military	Vertical Location	Left Bank*					Mid Stream					Right Bank*				
			pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l
Aug 17	1400	Surface	8.3	--	<0.2	<0.04	<0.1	8.2	<0.1	<0.2	<0.04	<0.1	8.1	<0.1	--	0.13	0.15
		Mid Depth	7.8	0.11	<0.2	<0.04	<0.1	7.5	0.26	<0.2	<0.04	<0.1	7.5	0.22	--	<0.04	<0.1
		Bottom	7.3	0.28	<0.2	0.10	<0.1	7.2	0.29	<0.2	<0.04	<0.1	7.4	0.34	--	<0.04	<0.1
		Mean**	7.6	0.20	<0.2	<0.06	<0.1	7.5	<0.22	<0.2	<0.04	<0.1	7.7	<0.22	--	<0.07	<0.12
		Surface	8.3	0.06	0.3	0.07	0.31	--	0.11	0.3	0.10	<0.1	7.9	0.12	0.2	<0.04	<0.1
		Mid Depth	7.8	0.19	0.2	0.06	<0.1	7.4	0.29	0.2	<0.04	<0.1	7.4	0.27	0.1	<0.04	<0.1
		Bottom	7.7	0.27	0.2	0.08	<0.1	7.5	0.28	0.3	0.07	<0.1	7.4	0.30	0.2	<0.04	<0.1
		Mean**	7.9	0.17	0.2	0.07	<0.17	7.4	0.23	0.3	<0.07	<0.1	7.5	0.23	0.17	<0.04	<0.1

* Facing downstream.

** Mean pH levels are based upon average hydrogen ion concentrations.

† Nitrite plus Nitrate Nitrogen as Nitrogen.

TABLE A-1, CONTINUED

NUTRIENT AND pH LEVELS AT STATION T-8

Date 1976	Time Military	Vertical Location	Left Bank*					Mid Stream					Right Bank*				
			pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2NO_3† mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l
Aug 17	1415	Surface	8.3	0.19	<0.2	<0.04	<0.1	8.4	<0.1	<0.2	0.14	<0.1	8.5	<0.1	<0.2	<0.04	<0.1
		Mid Depth	8.0	0.21	<0.2	0.10	<0.1	7.4	0.18	<0.2	0.29	0.13	7.3	0.26	<0.2	<0.04	<0.1
		Bottom	7.5	0.31	<0.2	0.22	<0.1	7.2	0.26	<0.2	0.06	<0.1	7.3	0.26	<0.2	<0.04	<0.1
		Mean**	7.8	0.24	<0.2	<0.12	<0.1	7.4	<0.18	<0.2	0.16	<0.08	7.5	<0.21	<0.2	<0.04	<0.1
Sept 7	1550	Surface	8.4	<0.02	0.3	<0.04	<0.1	8.4	<0.02	<0.2	<0.04	<0.1	8.6	<0.02	0.2	<0.04	<0.1
		Mid Depth	8.0	<0.02	0.2	<0.04	<0.1	7.4	0.22	<0.2	<0.04	<0.1	7.2	0.27	<0.2	0.06	0.1
		Bottom	7.2	0.15	0.2	<0.04	<0.1	7.5	0.25	<0.2	<0.04	<0.1	7.6	0.28	<0.2	<0.04	<0.1
		Mean**	7.6	<0.06	0.2	<0.04	<0.1	7.6	<0.16	<0.2	<0.04	<0.1	7.5	<0.19	<0.2	<0.05	<0.1

* Facing downstream.

** Mean pH levels are based upon average hydrogen ion concentrations.

† Nitrite plus Nitrate Nitrogen as Nitrogen.

TABLE A-2

AUGUST 18, 1976 DISSOLVED OXYGEN DATA - MORNING RUN

Station	Date Aug. 1976	Time	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-1		0715 to 0725	2980	1	13.6	7.0	67	1	13.6	6.6	63	1	13.6	6.6	63
				2	13.6	7.5	72	2	13.6	6.6	63	2	13.6	6.6	63
				4	13.6	7.2	69	4	13.6	6.5	63	4	13.6	6.6	63
				--	--	--	--	--	--	--	--	6	13.6	6.8	65
				--	--	--	--	--	--	--	--	8	13.6	6.8	65
				--	--	--	--	--	--	--	--	9	13.5	6.9	66
			Mean	--	13.6	7.2	69	--	13.6	6.6	63	--	13.6	6.7	64
T-2		0730 to 0735	2980	1	13.1	7.7	67	1	13.2	7.1	67	1	13.2	6.3	59
				2	13.1	6.9	65	2	13.2	7.0	66	2	13.2	6.3	59
				4	13.1	6.8	64	4	13.2	7.0	66	--	--	--	--
				6	13.1	6.7	63	--	--	--	--	--	--	--	--
			Mean	--	13.1	6.9	65	--	13.2	7.0	66	--	13.2	6.3	59

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-2, CONTINUED

AUGUST 18, 1976 DISSOLVED OXYGEN DATA - MORNING RUN

Station	Date Aug. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-3		0745 to 0755	2980	2	13.6	6.2	60	1	13.6	6.6	63	2	13.6	7.9	76
				4	13.6	6.2	60	2	13.6	6.5	63	4	13.6	7.4	74
				6	13.6	6.2	60	4	13.6	6.4	62	6	13.6	7.4	72
				7	13.6	6.1	59	5	13.6	6.4	62	7	13.6	6.9	66
			Mean	--	13.6	6.2	60	--	13.6	6.5	62	--	13.6	6.9	72
T-4		1202 to 1213	5600	0	15	6.5	64	0	14.5	6.6	65	0	14.5	6.6	65
				2	14.5	6.5	64	2	14.5	6.6	65	2	14.5	6.6	65
				4	14.5	6.4	63	4	14	6.6	63	4	14.5	6.6	65
				6	14.5	6.5	64	6	14	6.6	63	--	--	--	--
				8	14.5	6.5	64	8	14	6.6	63	--	--	--	--
				10	14.5	6.5	64	10	14	6.6	63	--	--	--	--
				12	14.5	6.5	64	12	14.5	6.7	66	--	--	--	--
				14	14.5	6.6	65	--	--	--	--	--	--	--	--
			Mean	--	14.6	6.5	64	--	14.2	6.6	64	--	14.5	6.6	65

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-2, CONTINUED

AUGUST 18, 1976 DISSOLVED OXYGEN DATA - MORNING RUN

Station	Date Aug. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-5		0613 to 0630	None	0	14.0	5.9	57	0	14.0	6.0	58	0	14	5.9	57
				2	14.0	5.7	55	2	14.0	5.7	55	2	14	5.8	56
				4	14.0	5.6	54	4	13.5	5.6	54	4	13.5	5.6	54
				6	13.5	5.5	53	6	13.5	5.5	53	6	13.5	5.6	54
				8	13.5	5.3	51	8	13.5	5.5	53	8	13.5	5.6	54
				10	13.5	5.3	51	10	13.5	5.5	53	10	13.5	5.5	53
				12	13.5	5.3	51	12	13.5	5.4	52	12	13.5	5.5	53
				14	13.5	5.3	51	14	13.5	5.4	52	14	13.5	5.4	52
				16	13.5	5.3	51	16	13.5	5.4	52	16	13.5	5.4	52
				18	13.5	5.2	50	18	13.5	5.4	52	--	--	--	--
				20	13.5	5.2	50	20	13.5	5.3	51	--	--	--	--
			Mean	--	13.6	5.4	52	--	13.6	6.0	53	--	13.6	5.6	54

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-2, CONTINUED

AUGUST 18, 1976 DISSOLVED OXYGEN DATA - MORNING RUN

Station	Date Aug. 1976	Time mil	Power Generation cfs	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-6		0655 to 0725	None	0	14	6.0	58	0	14	6.0	58	0	14	6.4	62
				2	14	5.9	57	2	14	5.9	57	2	14	6.2	60
				4	14	5.9	57	4	14	5.9	57	4	14	6.1	59
				6	14	5.9	57	6	14	5.9	57	6	14	6.0	58
				8	14	5.9	57	8	14	5.9	57	8	14	6.0	58
				10	14	5.9	57	10	14	5.9	57	10	14	6.0	58
				12	14	5.9	57	12	14	5.9	57	12	14	6.0	58
				14	14	5.9	57	14	14	5.9	57	14	14	6.0	58
				16	14	5.9	57	16	14	5.9	57	16	14	6.0	58
				18	14	5.9	57	18	14	5.9	57	18	14	6.0	58
				20	14	5.9	57	20	14	5.9	57	20	14	6.0	58
				22	14	5.9	57	22	14	5.9	57	22	14	5.9	57
				24	14	5.9	57	24	14	5.9	57	24	14	5.9	57
				26	14	5.9	57	26	14	5.9	57	26	14	5.9	57
				28	14	5.9	57	28	14	5.9	57	28	14	5.9	57
				30	14	5.9	57	30	14	6.0	58	30	14	5.9	57
				32	14	5.9	57	32	14	6.0	58	32	14	5.9	57
				34	14	5.9	57	34	14	6.0	58	34	14	5.9	57
				36	14	5.9	57	36	14	6.0	58	36	14	5.9	57
				38	14	5.9	57	38	14	6.0	58	38	14	5.9	57
				40	14	5.9	57	40	14	6.0	58	40	14	5.8	56
				42	14	5.9	57	42	14	6.0	58	42	14	5.8	56
				44	14	5.9	57	44	14	6.0	58	44	14	5.8	56
			Mean	--	14	5.9	57	--	14	5.9	57	--	14	6.0	58

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-2, CONTINUED

AUGUST 18, 1976 DISSOLVED OXYGEN DATA - MORNING RUN

Station	Date Aug. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-7		0818 to 0831	2900	0	19	7.2	77	0	19	7.5	80	0	19	7.2	77
				2	18	6.7	71	2	17.5	6.6	69	2	18	6.7	71
				4	18	6.5	68	4	17.5	6.5	68	4	18	6.5	68
				6	17	6.4	66	6	17.5	6.6	69	6	17	6.4	66
				8	17	6.4	66	8	17.5	6.6	69	8	17	6.4	66
				10	17	6.4	66	10	17	6.5	68	10	17	6.4	66
				12	17	6.2	64	12	17	6.3	65	12	17	6.2	64
				14	17	6.3	65	14	17	6.3	65	14	17	6.3	65
				16	17	6.2	64	16	17	6.3	65	16	17	6.2	64
				18	17	6.1	63	18	17	5.9	61	18	17	6.1	63
				20	17	6.0	62	20	17	5.6	58	20	17	6.0	62
				22	17	6.0	62	22	16.5	5.5	57	22	17	6.0	62
				24	17	6.0	62	24	16.5	5.3	55	24	17	6.0	62
				26	17	6.0	62	26	16.5	5.3	54	26	17	6.0	62
				28	17	6.0	62	28	16.5	5.3	55	28	17	6.0	62
				30	17	6.0	62	30	16.5	5.3	55	30	17	6.0	62
				32	17	6.0	62	32	16.5	5.3	55	32	17	6.0	62
				34	17	6.0	62	34	16.5	5.6	57	34	17	6.0	62
				36	17	6.0	62	--	--	--	--	36	17	6.0	62
				--	--	--	--	--	--	--	--	38	17	6.0	62
				--	--	--	--	--	--	--	--	40	17	6.0	62
				--	--	--	--	--	--	--	--	42	17	6.0	62
				--	--	--	--	--	--	--	--	44	17	6.0	62
			Mean	--	17	6.2	64	--	17	6.0	63	--	17	6.3	66

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-2, CONTINUED

AUGUST 18, 1976 DISSOLVED OXYGEN DATA - MORNING RUN

Station	Date Aug. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-8		0959 to 1034	2900	0	24	10.6	125	0	24	10.8	127	0	23.5	10.6	125
				2	24	10.6	125	2	24	10.8	127	2	23.5	10.6	125
				4	21	9.8	108	4	21	9.5	106	4	22	9.8	111
				6	21	8.7	96	6	20.5	8.3	90	6	20.5	8.8	98
				8	19.5	7.9	86	8	20	7.7	84	8	19.5	7.6	83
				--	--	--	--	10	19	7.2	77	10	19	6.8	72
				--	--	--	--	12	18.5	6.5	69	12	18	6.1	62
				--	--	--	--	14	18	6.2	65	14	18	6.0	64
				--	--	--	--	16	18	6.1	64	16	18	6.0	63
				--	--	--	--	18	18	6.0	63	18	18	6.0	63
				--	--	--	--	20	17.5	5.7	60	20	18	6.0	63
				--	--	--	--	22	17	5.5	57	22	18	6.0	63
				--	--	--	--	24	17	5.5	57	24	18	5.9	62
				--	--	--	--	26	17	5.4	56	26	17.5	5.4	57
				--	--	--	--	28	17	5.3	55	28	17	5.4	56
				--	--	--	--	30	17	5.4	56	30	17	5.4	56
				--	--	--	--	--	--	--	--	32	17	5.35	55
				--	--	--	--	--	--	--	--	34	17	5.4	56
				--	--	--	--	--	--	--	--	36	17	5.3	55
				--	--	--	--	--	--	--	--	38	17	5.2	54
				--	--	--	--	--	--	--	--	40	17	5.1	53
				--	--	--	--	--	--	--	--	42	17	4.8	49
				--	--	--	--	--	--	--	--	44	17	4.6	47
			Mean	--	21	9.5	108	--	20	6.9	76	--	18	6.4	69

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-3

AUGUST 18, 1976 DISSOLVED OXYGEN DATA - EVENING RUN

Station	Date Aug. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-1		1835 to 1845	7270	0	13.6	6.3	61	0	13.6	5.5	53	2	13.8	5.5	53
				2	13.6	5.6	54	1	13.6	5.5	53	4	13.8	5.5	53
				--	--	--	--	--	--	--	--	6	13.8	5.5	53
				--	--	--	--	--	--	--	--	10	13.8	5.5	53
			Mean	--	13.6	6.0	58	--	13.6	5.5	53	--	13.8	5.5	53
T-2		1855 to 1905	7270	0	13.7	6.1	59	0	13.6	5.7	55	0	13.6	5.8	56
				2	13.7	5.9	57	2	13.6	5.7	55	2	13.6	5.8	56
				4	13.7	5.8	56	4	13.6	5.7	55	4	13.6	5.8	56
				6	13.7	5.7	55	6	13.6	5.6	54	6	13.6	5.8	56
				--	--	--	--	--	--	--	--	8	13.6	5.8	56
				--	--	--	--	--	--	--	--	10	13.6	5.4	52
			Mean	--	13.7	5.9	57	--	13.6	5.7	55	--	13.6	5.7	52

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-3, CONTINUED

AUGUST 18, 1976 DISSOLVED OXYGEN DATA - EVENING RUN

Station	Date Aug. 1976	Time mil	Power Generation cfs*	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-3		1920 to 1930	7270	0	13.8	6.5	63	0	13.8	6.1	59	0	13.8	6.4	62
				2	13.8	6.0	58	4	13.8	6.0	58	4	13.8	6.2	60
				4	13.8	6.0	58	8	13.7	6.0	58	6	13.8	6.0	58
				6	13.8	6.0	58	--	--	--	--	--	--	--	--
				8	13.8	6.0	58	--	--	--	--	--	--	--	--
				10	13.8	6.0	58	--	--	--	--	--	--	--	--
			Mean	--	13.8	6.1	59	--	13.8	6.0	58	--	13.8	6.2	60
T-4		1950	7270	0	13.8	6.0	58	0	13.8	6.1	59	0	13.8	6.1	59
				4	13.8	6.0	58	4	13.8	6.1	59	4	13.9	6.1	59
				8	13.8	6.0	58	8	13.8	6.1	59	8	13.9	6.2	60
				10	13.8	6.0	58	12	13.8	6.0	58	12	13.9	6.2	60
			Mean	--	13.8	6.0	58	--	13.8	6.1	59	--	13.9	6.2	60

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-3, CONTINUED

AUGUST 18, 1976 DISSOLVED OXYGEN DATA - EVENING RUN

Station	Date Aug 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-5		2000 to 2018	7270	0	16	6.6	66	0	16	6.6	66	0	16	7.0	70
				2	16	6.5	65	2	16	6.5	65	2	16	7.0	70
				4	16	6.5	65	4	16	6.5	65	4	16	6.9	69
				6	16	6.5	65	6	16	6.5	65	6	16	6.9	69
				8	16	6.5	65	8	16	6.5	65	8	16	6.9	69
				10	16	6.5	65	10	16	6.5	65	10	16	6.8	69
				12	16	6.5	65	12	16	6.5	65	12	16	6.8	69
				14	16	6.5	65	14	16	6.5	65	14	16	6.9	69
				16	15.5	6.4	64	16	16	6.5	65	16	16	6.9	69
				18	15.5	6.4	64	18	16	6.5	65	--	--	--	--
				--	--	--	--	20	16	6.5	65	--	--	--	--
			Mean	--	15.9	6.5	65	--	16	6.5	65	--	16	6.9	69

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-3, CONTINUED

AUGUST 18, 1976 DISSOLVED OXYGEN DATA - EVENING RUN

Station	Date Aug. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-6		1932 to 1952	7270	0	15.5	5.0	50	0	15.5	5.2	52	0	15.5	5.3	53
				2	15.5	4.9	49	2	15.5	5.0	50	2	15.5	5.1	51
				4	15.5	4.8	48	4	15.5	5.0	50	4	15.5	5.0	50
				6	15.5	4.8	48	6	15.5	4.9	49	6	15.5	5.0	50
				8	15.5	4.8	48	8	15.5	4.9	49	8	15.5	5.0	50
				10	15.5	4.8	48	10	15.5	4.9	49	10	15.5	5.0	50
				12	15.5	4.8	48	12	15.5	4.9	49	12	15.5	5.0	50
				14	15.5	4.8	48	14	15.5	4.9	49	14	15.5	5.0	50
				16	15.5	4.8	48	16	15.5	4.9	49	16	15.5	5.0	50
				18	15.5	4.8	48	18	15.5	4.9	49	18	15.5	5.0	50
				20	15.5	4.9	49	20	15.5	4.9	49	20	15.5	5.0	50
				22	15.5	4.9	49	22	15.5	4.9	49	22	15.5	4.9	49
				24	15.5	4.9	49	24	15	4.9	49	24	15.5	4.9	49
				26	15.5	4.9	49	26	15	4.8	48	26	15.5	4.9	49
				28	15.5	4.9	49	28	15	4.8	48	--	--	--	--
				30	15.5	4.9	49	30	15	4.8	48	--	--	--	--
			Mean	--	15.5	4.8	49	--	15.5	4.9	49	--	15.5	5.0	50

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-3, CONTINUED

AUGUST 18, 1976 DISSOLVED OXYGEN DATA - EVENING RUN

Station	Date Aug. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-7		1900 to 1918	7270	0	23	7.6	87	0	22	6.9	78	0	21.5	7.0	80
				2	18	6.2	65	2	20	6.6	72	2	20	6.6	72
				4	17	5.7	59	4	17	5.7	59	4	18	6.0	63
				6	17	5.5	57	6	17	5.5	57	6	17	5.7	59
				8	17	5.5	57	8	17	5.5	57	8	17	5.6	58
				10	17	5.4	56	10	17	5.4	56	10	17	5.5	57
				12	17	5.4	56	12	17	5.4	56	12	17	5.5	57
				14	17	5.4	56	14	16.5	5.3	55	14	17	5.5	57
				16	17	5.5	55	16	16.5	5.3	55	16	17	5.5	57
				--	--	--	--	18	16.5	5.3	55	18	17	5.4	56
				--	--	--	--	--	--	--	--	20	17	5.4	56
				--	--	--	--	--	--	--	--	22	17	5.4	56
				--	--	--	--	--	--	--	--	24	17	5.4	56
				--	--	--	--	--	--	--	--	26	17	5.4	56
			Mean	--	18	5.7	61	--	17.5	5.6	60	--	17.5	5.7	60

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-3, CONTINUED

AUGUST 18, 1976 DISSOLVED OXYGEN DATA - EVENING RUN

Station	Date Aug 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-8		1817 to 1850	7270	0	27	12.4	153	0	26	11.2	137	0	26	10.6	129
				2	25	11.2	133	2	25	11.2	133	2	25	10.0	120
				4	24	12.0	141	4	24	10.9	128	4	24	10.8	127
				6	21	9.2	102	6	21	8.6	96	6	22	10.0	114
				8	20	8.1	88	8	20	7.2	78	8	21	9.0	100
				10	20	7.9	86	10	20	6.8	74	10	20	7.3	79
				--	--	--	--	12	19	6.5	69	12	19	6.0	64
				--	--	--	--	14	19	6.3	67	14	19	5.8	62
				--	--	--	--	16	19	6.1	65	16	19	5.8	62
				--	--	--	--	18	19	6.0	64	18	19	5.8	61
				--	--	--	--	20	19	6.0	64	20	19	5.7	61
				--	--	--	--	22	19	5.8	62	22	19	5.7	61
				--	--	--	--	24	19	5.8	62	24	18.5	5.5	59
				--	--	--	--	26	18.5	5.6	60	26	18.5	5.5	59
				--	--	--	--	28	18.5	5.5	59	28	18.5	5.4	57
				--	--	--	--	30	18	5.4	56	30	18	5.3	56
				--	--	--	--	32	18	5.3	56	32	18	5.2	55
				--	--	--	--	34	18	5.2	55	34	18	5.2	55
				--	--	--	--	36	18	5.2	55	36	18	5.2	55
				--	--	--	--	38	18	5.2	55	38	18	5.2	54
				--	--	--	--	40	18	5.2	55	40	18	5.1	54
				--	--	--	--	42	18	5.2	55	42	18	5.0	53
				--	--	--	--	44	18	5.2	55	44	18	5.0	53
			Mean	--	23	10	120	--	19	6.1	72	--	20	6.5	70

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-4

AUGUST 18-19, 1976 DISSOLVED OXYGEN DATA - 24 HOUR RUN

Station	Date Aug. 1976	Time mil.	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-1	19	1134 to 1140	3300	0	15	4.3	42	0	15	4.9	48	0	15	5.0	49
				4	15	4.2	42	4	15	4.8	47	4	15	5.0	49
				8	15	4.2	42	6	15	4.9	48	6	15	5.0	49
				--	--	--	--	--	--	--	--	--	--	--	--
			Sub Mean	--	15	4.2	42	--	15	4.9	48	--	15	5	49
		1619 to 1629	7500	0	14	4.2	40	0	14	4.4	42	0	14	4.6	44
				2	14	4.0	38	4	14	4.3	41	4	14	4.5	43
				4	14	4.0	38	6	14	4.3	41	8	14	4.5	43
				6	14	3.9	38					10	14	4.5	43
			Sub Mean	--	14	4.0	38	--	14	4.3	41	--	14	4.5	43
			Mean	--	14	4.1	40	--	14	4.6	44	--	14	4.8	46

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-4, CONTINUED

AUGUST 18-19, 1976 DISSOLVED OXYGEN DATA - 24 HOUR RUN

Station	Date Aug. 1976	Time mil.	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft**	Temp °C	Dissolved Oxygen		Depth Ft**	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-2	19	0415 to 0425	None	0	13.8	7.5	72	0	15.6	6.8	65	0	13.4	6.5	61
				3	13.8	7.1	68	2	13.6	6.5	63	2	13.4	6.5	61
			Sub Mean	--	13.8	7.3	70	--	13.6	6.6	64	--	13.4	6.5	61
		1110 to 1118	3100	0	15	5.6	55	0	15	5.8	57	0	15	6.2	61
				2	15	5.6	55	2	15	5.8	57	2	15	6.1	60
				4	15	5.7	56	4	15	5.8	57	--	--	--	--
				6	15	5.7	56	6	15	5.7	56	--	--	--	--
			Sub Mean	--	15	5.6	56	--	15	5.8	57	--	15	6.1	60
		1603 to 1614	7500	0	14	4.4	42	0	14	4.5	43	0	14	4.6	44
				4	14	4.2	40	4	14	4.4	42	2	14	4.6	44
				6	14	4.2	40	6	14	4.3	41	4	14	4.6	44
			Sub Mean	--	14	4.3	41	--	14	4.4	42	--	14	4.6	44
			Mean	--	14	5.5	54	--	14	5.5	53	--	14	5.6	53

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-4, CONTINUED

AUGUST 18-19, 1976 DISSOLVED OXYGEN DATA - 24 HOUR RUN

Station	Date Aug 1976	Time mil.	Power Generation cfs*	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft**	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-3	19	0305 to 0315	none	0	14	4.7	45	0	14	4.7	45	0	14	4.9	47
				2	14	4.7	45	2	14	4.7	45	2	14	4.7	45
				3	14	4.6	44	--	--	--	--	4	14	4.7	45
				--	--	--	--	--	--	--	--	6	14	4.7	45
			Sub Mean	--	14	4.7	45	--	14	4.7	45	--	14	4.8	45
		1049 to 1056	3050	0	15	6.9	68	0	15	6.5	64	0	15	6.4	63
				4	15	6.9	68	4	15	6.4	63	4	15	6.3	62
				8	15	6.9	68	8	15	6.4	63	8	15	6.3	62
			Sub Mean	--	15	6.9	68	--	15	6.4	63	--	15	6.3	62
		1546 to 1554	7000	0	15	6.7	66	0	15	6.5	64	0	14.5	6.4	63
				4	15	6.6	65	4	15	6.3	62	4	15	6.4	63
				8	15	6.7	66	8	15	6.3	62	6	15	6.4	63
				10	15	6.7	66	--	--	--	--	--	--	--	--
			Sub Mean	--	15	6.7	66	--	15	6.4	63	--	15	6.4	63
			Mean	--	15	6.2	60	--	15	6.0	58	--	15	5.7	56

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-4, CONTINUED

AUGUST 18-19, 1976 DISSOLVED OXYGEN DATA - 24 HOUR RUN

Station	Date Aug 1976	Time mil.	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-4	19	0230 to 0240	none	0	14	4.4	42	0	14	4.5	43	0	14	4.5	43
				4	14	4.4	42	4	14	4.4	42	4	14	4.4	42
				8	14	4.3	41	8	14	4.4	42	8	14	4.4	42
				9	14	4.3	41	10	14	4.3	41	12	14	4.4	42
			Sub Mean	--	14	4.3	42	--	14	4.4	42	--	14	4.4	42
		1036 to 1042	3050	0	14	4.9	47	0	14	4.9	47	0	14	4.8	46
				4	14	4.8	46	4	14	4.8	46	4	14	4.8	46
				8	14	4.8	46	8	14	4.8	46	8	14	4.8	46
				--	--	--	--	12	14	4.9	47	12	14	4.8	46
				--	--	--	--	--	--	--	--	16	14	4.8	46
			Sub Mean	--	14	4.8	46	--	14	4.8	46	--	14	4.8	46
		1524 to 1538	5600	0	15	7.4	75	0	15	7.5	74	0	15.5	7.2	72
				4	15	7.4	73	4	15	7.4	73	4	15.5	7.2	72
				8	15	7.5	74	8	15	7.5	74	8	15.5	7.4	74
				12	15	7.5	74	12	15	7.5	74	12	15.5	7.5	75
				--	--	--	--	--	--	--	--	16	15.5	7.6	76
			Sub Mean	--	15	7.4	74	--	15	7.5	74	--	15.5	7.4	74
			Mean	--	16	6.2	53	--	14	5.6	54	--	15	5.6	55

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-4, CONTINUED

AUGUST 18-19, 1976 DISSOLVED OXYGEN DATA - 24 HOUR RUN

Station	Date Aug 1976	Time mil.	Power Generation cfs*	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-5	19	0135 to 0145	none	0	14.5	5.5	54	0	15	5.4	53	0	14	5.5	53
				4	14.5	5.4	53	4	15	5.3	52	4	15	5.4	53
				8	14.5	5.3	52	8	14.5	5.2	51	8	15	5.3	53
				12	14.5	5.3	52	12	14.5	5.2	51	12	15	5.3	53
				16	14.5	5.2	51	16	14.5	5.2	51	--	--	--	--
				20	14.5	5.3	52	--	--	--	--	--	--	--	--
			Sub Mean	--	14.5	5.3	52	--	14.7	5.3	52	--	15	5.4	53
		1010 to 1019	3050	0	15.5	5.7	57	0	15.5	5.7	57	0	15.5	5.7	57
				4	15.0	5.5	54	4	15.0	5.5	54	4	15.0	5.5	54
				8	15.0	5.5	54	8	15.0	5.5	54	8	15.0	5.5	54
				12	15.0	5.3	52	12	15.0	5.4	53	12	15.0	5.4	53
				16	15.0	5.2	51	16	15.0	5.4	53	--	--	--	--
				20	15.0	5.2	51	--	--	--	--	--	--	--	--
			Sub Mean	--	15.0	5.4	53	--	15.1	5.5	54	--	15.1	5.5	54

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-4, CONTINUED

AUGUST 18-19, 1976 DISSOLVED OXYGEN DATA - 24 HOUR RUN

Station	Date Aug 1976	Time mil.	Power Generation cfs*	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft**	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-5 (contd)	19	1458 to 1507	3750	0	15.5	5.3	53	0	15.5	5.3	53	0	16	5.4	54
				4	15.0	5.0	49	4	15.5	5.1	51	4	15	5.1	50
				8	15.0	4.9	48	8	15.0	4.9	48	8	15	4.9	48
				12	15.0	4.9	48	12	15.0	4.9	48	12	15	4.9	48
				16	15.0	5.0	49	16	15.0	5.0	49	16	15	4.9	48
				20	15.0	5.0	49	--	15.0	--	--	--	--	--	--
			Sub Mean	--	15.0	5.0	49	--	15.0	5.0	50	--	15	5.0	50
			Mean	--	15.0	5.2	51	--	15.0	5.3	52	--	15	5.3	52

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-4, CONTINUED

AUGUST 18-19, 1976 DISSOLVED OXYGEN DATA - 24 HOUR RUN

Station	Date Aug 1976	Time mil.	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-6	19	0050 to 0100	none	0	15.5	6.6	66	0	15.5	6.7	67	0	16	6.6	66
				4	15.5	6.5	65	4	15.5	6.6	66	4	16	6.6	66
				8	15.5	6.5	65	8	15.5	6.6	66	8	16	6.6	66
				12	15.5	6.4	64	12	15.5	6.6	66	12	16	6.5	65
				16	15.5	6.5	65	16	15.5	6.6	66	16	16	6.6	66
				20	15.5	6.5	65	20	15.5	6.6	66	--	--	--	--
				24	15.5	6.5	65	24	15.5	6.6	66	--	--	--	--
				27	15.5	6.7	67	28	15.5	6.6	66	--	--	--	--
				--	--	--	--	30	15.5	6.7	67	--	--	--	--
			Sub Mean	--	15.5	6.5	65	--	15.5	6.6	66	--	16	6.6	66
		0944 to 0958	3000	0	16	6.6	66	0	16	6.6	66	0	16	6.6	66
				4	16	6.5	65	4	16	6.5	65	4	15.5	6.5	65
				8	16	6.5	65	8	15.5	6.5	65	8	15.5	6.5	65
				12	16	6.6	66	12	15.5	6.5	65	12	15.5	6.5	65
				16	16	6.6	66	16	15.5	6.6	66	16	15.5	6.6	66
				20	15.5	6.6	66	20	15.5	6.6	66	20	15.5	6.6	66
				24	15.5	6.6	66	24	15.5	6.6	66	--	--	--	--
				26	15.5	6.6	66	28	15.5	6.6	66	--	--	--	--
			Sub Mean	--	16	6.6	66	--	15.5	6.6	66	--	15.5	6.6	66

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-4, CONTINUED

AUGUST 18-19, 1976 DISSOLVED OXYGEN DATA - 24 HOUR RUN

Station	Date Aug 1976	Time mil.	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft**	Temp °C	Dissolved Oxygen		Depth Ft**	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-6 (contd)	19	1437 to 1451	3700	0	17	6.4	66	0	17.5	6.4	67	0	18	6.6	66
				4	16	6.0	60	4	16.5	6.1	63	4	16	6.6	69
				8	16	6.0	60	8	15.5	5.9	59	8	15.5	6.1	61
				12	16	6.0	60	12	15.5	5.9	59	12	15.5	5.9	59
				16	15.5	6.0	60	16	15.5	6.0	60	--	15.5	5.9	59
				20	15.5	6.0	60	20	15.5	6.0	60	--	15.5	5.9	59
				24	15.5	6.0	60	24	15.5	6.0	60	--	15.5	5.9	59
				28	15.5	6.0	60	28	15.5	6.0	60	--	15.5	5.9	59
			Sub Mean	--	16	6.0	61	--	16	6.0	61	--	16	6.1	59
			Mean	--	16	6.4	64	--	16	6.4	64	--	16	6.5	64

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-4, CONTINUED

AUGUST 18-19, 1976 DISSOLVED OXYGEN DATA - 24 HOUR RUN

Station	Date Aug 1976	Time mil.	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft**	Temp °C	Dissolved Oxygen		Depth Ft**	Temp °C	Dissolved Oxygen		Depth Ft**	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-7	18	2345 to 2400	3050	0	19	11.2	119	0	19	7.6	81	0	19.5	6.6	72
				4	16.5	10.8	111	4	16.5	5.7	59	4	17	6.0	62
				8	16	9.5	95	8	11	5.7	59	8	16.5	5.7	59
				--	--	--	--	12	16	5.6	56	12	16	5.6	56
				--	--	--	--	16	11	5.6	56	16	16	5.6	56
				--	--	--	--	--	--	--	--	20	16	5.6	56
			Sub Mean	--	17	10.5	108	--	--	6.0	62	--	17	5.8	60
	19	0844 to 0856	3700	0	17	6.7	69	0	17	6.6	68	0	17	5.6	69
				4	16.5	5.8	60	4	16.5	5.9	61	4	17	6.7	64
				8	16	5.7	57	8	16	5.8	58	8	16	6.2	58
				12	16	5.8	58	12	16	5.7	57	12	16	5.8	57
				--	--	--	--	16	16	5.6	56	16	16	5.7	57
				--	--	--	--	--	--	--	--	20	16	5.7	59
			Sub Mean	--	16	6.0	61	--	16	6.0	60	--	16	5.9	60
		1335 to 1345	1700	0	20.5	6.5	72	0	20	6.3	68	0	19	6.2	66
				4	17	5.7	59	4	17.5	5.9	62	4	17	5.7	59
				8	16	5.3	53	8	16	5.4	54	8	16.5	5.5	57
				12	16	5.2	52	12	16	5.3	53	12	16	5.5	55
				--	--	--	--	16	16	5.2	52	16	16	5.3	53
				--	--	--	--	--	--	--	--	20	16	5.2	52
			Sub Mean	--	17	5.6	59	--	17	5.6	58	--	17	5.6	57
			Mean	--	17	7.1	73	--	17	5.9	60	--	17	5.8	59

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-4, CONTINUED

AUGUST 18-19, 1976 DISSOLVED OXYGEN DATA - 24 HOUR RUN

Station	Date Aug 1976	Time mil.	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-8	18	2230 to 2245	4500	0	26	10.8	132	0	25	10.4	124	--	--	--	--
				4	23.5	11.2	132	4	25	10.4	124	--	--	--	--
				8	21	8.4	93	8	20	7.6	83	--	--	--	--
				12	19	6.3	67	12	19	6.2	66	--	--	--	--
				--	--	--	--	16	18.5	5.8	62	--	--	--	--
				--	--	--	--	20	18.5	5.6	60	--	--	--	--
				--	--	--	--	24	18.5	5.6	60	--	--	--	--
				--	--	--	--	28	18	5.4	57	--	--	--	--
				--	--	--	--	32	18	4.2	44	--	--	--	--
				--	--	--	--	36	18	5.2	55	--	--	--	--
				--	--	--	--	40	18	5.1	54	--	--	--	--
				--	--	--	--	44	18	5.0	53	--	--	--	--
				--	--	--	--	48	18	4.8	51	--	--	--	--
			Sub Mean	--	22	9.1	110	--	19	6.2	69	--	--	--	--

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-4, CONTINUED

AUGUST 18-19, 1976 DISSOLVED OXYGEN DATA - 24 HOUR RUN

Station	Date Aug 1976	Time mil.	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-8 (contd)	19	0806 to 0831	none	0	22	10.6	120	0	23	10.4	120	0	23	10.4	119
				4	21	9.4	104	4	22	9.8	111	4	21	10.0	111
				8	19	6.4	68	8	19	6.6	70	8	19	6.7	71
				--	--	--	--	12	18	5.9	62	12	18	6.0	63
				--	--	--	--	16	18	5.4	57	16	18	5.4	57
				--	--	--	--	20	17.5	5.3	56	20	17.5	5.4	57
				--	--	--	--	24	17.5	5.3	56	24	17.5	5.3	58
				--	--	--	--	28	17.5	5.3	56	28	17.5	5.5	58
				--	--	--	--	--	--	--	--	32	17.5	5.5	58
				--	--	--	--	--	--	--	--	36	17	5.6	58
				--	--	--	--	--	--	--	--	40	17	5.4	56
			Sub Mean	--	21	8.8	97	--	19	6.7	74	--	18	5.4	75

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-4, CONTINUED

AUGUST 18-19, 1976 DISSOLVED OXYGEN DATA - 24 HOUR RUN

Station	Date Aug 1976	Time mil.	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft**	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-8 (contd)	19	1304 to 1322	3800	0	26.5	9.9	122	0	25.5	9.9	121	0	26	9.9	121
				4	22.5	9.6	110	4	21	8.8	98	4	24	9.5	112
				8	19	6.7	71	8	19	6.6	70	8	19	7.2	77
				--	--	--	--	12	18.5	6.2	66	12	18.5	6.2	66
				--	--	--	--	16	18	5.9	62	16	18.5	5.8	62
				--	--	--	--	20	18	5.7	60	20	18	5.8	61
				--	--	--	--	24	18	5.4	57	24	17.5	5.6	59
				--	--	--	--	28	17	5.3	55	28	17.5	5.6	59
				--	--	--	--	--	--	--	--	32	17.5	5.5	58
				--	--	--	--	--	--	--	--	36	17	5.5	58
				--	--	--	--	--	--	--	--	40	17	5.4	56
			Sub Mean	--	23	8.7	101	--	19	6.7	74	--	19	6.5	72
			Mean	--	22	8.9	103	--	19	6.5	72	--	18	6.0	74

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-5

SEPTEMBER 8, 1976 DISSOLVED OXYGEN DATA - MORNING RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-1	08	0748 to 0749	None					0	13.4	1.5	14				
								2	13.4	1.5	14				
								4	13.4	1.5	14				
			Mean					--	13.4	1.5	14				
T-2	08	0712 to 0713	None					0	13.7	4.2	40				
								2	13.7	4.2	40				
								3	13.6	3.8	37				
			Mean					--	13.7	4.1	39				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-5, CONTINUED

SEPTEMBER 8, 1976 DISSOLVED OXYGEN DATA - MORNING RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-3	08	0654 to 0655	None					0	13.8	4.0	38				
								2	13.8	4.0	38				
								4	13.9	4.0	38				
								6	13.9	4.0	38				
								8	13.7	4.0	38				
			Mean						13.9	4.0	38				
T-4	08	0637 to 0640	None					0	13.8	4.4	42				
								2	13.8	4.4	42				
								4	13.8	4.4	42				
								6	13.9	4.4	42				
								8	13.9	4.4	42				
								10	13.9	4.4	42				
								11	13.9	4.4	42				
			Mean					--	13.9	4.4	42				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-5, CONTINUED

SEPTEMBER 8, 1976 DISSOLVED OXYGEN DATA - MORNING RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-5	08	0618 to 0620	None					0	160	6.8	68				
								4	16.0	6.8	68				
								8	15.5	6.7	67				
								12	15.5	6.7	67				
								16	15.5	6.5	65				
								20	15.5	6.5	65				
			Mean					--	15.6	6.6	66				
T-6	08	0629 to 0634	None					0	16	6.7	67				
								4	16	6.7	67				
								8	16	6.6	66				
								12	16	6.5	65				
								16	16	6.5	65				
								20	16	6.5	65				
								24	16	6.4	64				
								28	16	6.4	64				
			Mean					--	16	6.5	65				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-5, CONTINUED

SEPTEMBER 8, 1976 DISSOLVED OXYGEN DATA - MORNING RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-7	08	0647 to 0650	None					0	18.5	7.8					
								4	18	7.8	82				
								8	17.5	7.2	82				
								12	17	7.0	75				
								16	17	7.0	72				
								20	17	6.8	72				
			Mean					--	17.5	7.3	76				
T-8	08	0703 to 0708	None					0	22	10.6	120				
								4	22	10.6	120				
								8	20	9.1	99				
								12	18.5	8.0	85				
								16	18	7.4	78				
								20	17.5	7.2	76				
								24	17.5	6.8	72				
								28	17.0	6.7	69				
								32	17.0	6.6	68				
			Mean					--	19	8.1	87				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-6

SEPTEMBER 8, 1976 DISSOLVED OXYGEN DATA - EVENING RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-1	08	1723 to 1725	6050					0	14	4.0	38				
								2	14	4.0	38				
								4	14	4.0	38				
								6	14	4.2	40				
								8	14	4.2	40				
			Mean					--	14	4.1	39				
T-2	08	1731 to 1732	6050					0	14	4.2	40				
								2	14	4.2	40				
								4	14	4.2	40				
								6	14	4.3	41				
								8	14	4.3	41				
			Mean					--	14	4.2	40				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-6, CONTINUED

SEPTEMBER 8, 1976 DISSOLVED OXYGEN DATA - EVENING RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft**	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-3	08	1742 to 1743	6050					0	14.2	4.8	46				
								2	14.2	4.8	46				
								4	14.2	4.8	46				
								6	14.2	4.8	46				
								8	14.2	4.8	46				
			Mean					--	14.2	4.8	46				
T-4	08	1754 to 1755	6050					0	14.5	5.2	51				
								4	14.5	5.2	51				
								8	14.5	5.3	52				
								11	14.5	5.3	52				
			Mean					--	14.5	5.2	52				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-6, CONTINUED

SEPTEMBER 8, 1976 DISSOLVED OXYGEN DATA - EVENING RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-5	08	1857 to 1859	6100					0	16.0	7.0	70				
								4	16.0	6.9	69				
								8	16.0	6.8	68				
								12	16.0	6.7	67				
								16	16.0	6.6	66				
								20	15.5	6.6	66				
			Mean					--	15.9	6.7	68				
T-6	08	1848 to 1850	6100					0	17	7.4	76				
								4	17	7.3	75				
								8	16.5	7.1	73				
								12	16.5	7.1	73				
								16	16.5	7.0	72				
								20	16.5	6.9	71				
								24	16.5	6.9	71				
								28	16.5	6.8	68				
			Mean					--	16.5	7.0	72				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-6, CONTINUED

SEPTEMBER 8, 1976 DISSOLVED OXYGEN DATA - EVENING RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-7	08	1834 to 1836	6050					0	22	8.2	93				
								4	20	7.8	85				
								8	18.5	7.4	79				
								12	18	7.1	75				
								16	17.5	7.0	74				
								20	17	7.0	72				
			Mean					--	19	7.4	79				
T-8	08	1819 to 1823	6050					0	24	11.4	132				
								4	23	11.2	129				
								8	20	9.2	100				
								12	19	8.4	89				
								16	18	7.7	81				
								20	18	7.4	78				
								24	17.5	7.2	76				
								28	17.5	7.0	74				
								32	17.5	6.9	73				
			Mean					--	19	8.4	92				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7

SEPTEMBER 8-9, 1976 Dissolved OXYGEN DATA - 24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-1								NO D A T A							
T-2	08	1945 to 1946	None					0	15	7.0	69				
								2	15	6.8	67				
								3	15	6.7	66				
			Sub Mean					--	15	6.8	67				
	09	0018 to 0020	None					0	14	7.2	69				
								2	14	6.8	65				
			Sub Mean					--	14	7.0	67				
		0736	None					0	14	5.0	48				
								2	14	4.9	47				
			Sub Mean					--	14	5.0	48				
		1017 to 1018	None					0	14	6.2	60				
								2	14	6.1	59				
								4	14	5.9	57				
			Sub Mean					--	14	6.1	59				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA -24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-2 (contd)	09	1316	None					0	15	7.8	76				
								4	15	8.3	81				
			Sub Mean					--	15	8.0	78				
		1357 to 1359	None					0	16	8.8	88				
								2	16	8.8	88				
								4	16	8.8	88				
			Sub Mean					--	16	8.8	88				
			Mean					--	15	7.0	68				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA - 24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-3	08	1955 to 1956	None					0	15	6.8	67				
								2	15	6.7	66				
								4	15	6.7	66				
								6	15	6.7	65				
			Sub Mean					--	15	6.7	66				
	09	0102 to 0103	None					0	15	5.4	53				
								2	15	5.3	52				
								4	15	5.2	51				
			Sub Mean					--	15	5.3	52				
		0804	None					0	15	5.0	49				
								4	15	5.0	49				
								8	15	5.2	51				
			Sub Mean					--	15	5.1	50				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA -24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-3 (contd)	09	1045	None					0	15	5.7	59				
								4	15	5.4	53				
								8	15	5.2	51				
			Sub Mean					--	15	5.4	54				
		1343	None					0	16	5.8	58				
								4	16	5.7	57				
								8	16	5.6	56				
			Sub Mean					--	16	5.7	57				
		1625	None					0	18	7.2	76				
								4	18	7.1	75				
								8	18	6.9	73				
			Sub Mean					--	18	7.1	75				
			Mean					--	15	6.7	66				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA -24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-4	08	2004 to 2006	6100					0	15.5	7.0	70				
								4	15.5	7.0	70				
								8	15.0	6.7	66				
								12	15.0	6.6	65				
			Sub Mean					--	15.2	6.8	68				
	09	0134 to 0135	None					0	15.0	5.8	57				
								4	15.0	5.7	56				
								8	15.0	5.5	54				
			Sub Mean					--	15	5.6	56				
		0812 to 0814	None					0	15	6.4	63				
								4	15	6.2	61				
								8	15	6.0	59				
								12	15	5.8	57				
								16	15	5.6	55				
			Sub Mean					--	15	6.0	59				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA - 24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-4 (contd)	09	1053 to 1054	None					0	15	5.9	58				
								4	15	5.7	56				
								8	15	5.5	54				
								12	15	5.3	52				
								16	15	5.1	50				
			Sub Mean					--	15	5.5	54				
		1351 to 1353	None					0	16	6.2	62				
								4	16	6.0	60				
								8	16	5.8	58				
								12	16	5.6	56				
								16	16	5.5	55				
			Sub Mean					--	16	5.8	58				
		1633 to 1634	None					0	17.5	6.7	71				
								4	17.5	6.5	68				
								8	17.5	6.2	65				
								12	17.0	6.0	62				
								16	17.0	5.8	60				
			Sub Mean					--	17	6.2	65				
			Mean					--	16	6.0	60				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA - 24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-5	08	2021 to 2023	6100					0	16	7.8	78				
								4	16	7.8	78				
								8	16	7.6	76				
								12	16	7.5	75				
								16	16	7.4	74				
			Sub Mean					--	16	7.6	76				
	09	0209 to 0212	None					0	16	6.5	65				
								4	16	6.4	64				
								8	16	6.3	63				
								12	16	6.3	63				
								16	16	6.3	63				
			Sub Mean					--	16	6.3	63				
		0832 to 0834	None					0	16	7.5	75				
								4	16	7.3	73				
								8	16	7.2	72				
								12	16	7.0	70				
								16	16	6.8	68				
								20	16	6.6	66				
			Sub Mean					--	16	7.0	70				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA - 24- HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-5 (contd)	09	1105 to 1107	None					0	16	6.9	69				
								4	16	6.8	68				
								8	16	6.6	66				
								12	16	6.5	65				
								16	16	6.4	64				
								20	16	6.1	61				
			Sub Mean					--	16	6.5	65				
		1404 to 1406	None					0	17.0	7.3	75				
								4	17.0	7.1	73				
								8	17.0	7.0	72				
								12	17.0	6.9	71				
								16	16.5	6.6	68				
								20	16.5	6.4	66				
			Sub Mean					--	16.8	6.8	71				
		1645 to 1646	None					0	17	7.4	76				
								4	17	7.2	74				
								8	17	7.1	73				
								12	17	6.9	71				
								16	17	6.8	70				
								20	17	6.5	67				
			Sub Mean					--	17	7.1	72				
			Mean					--	16	6.8	68				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA -24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-6	08	2036 to 2039	6100					0	16	7.6	76				
								4	16	7.5	75				
								8	16	7.3	73				
								12	16	7.2	72				
								16	16	7.0	70				
								20	16	6.9	69				
								24	16	6.8	68				
								28	16	6.7	67				
								29	16	6.6	66				
			Sub Mean					--	16	7.0	70				
	09	0227 to 0230	None					0	16	6.1	61				
								4	16	5.9	59				
								8	16	5.8	58				
								12	16	5.8	58				
								16	16	5.7	57				
								20	16	5.6	56				
								24	16	5.6	56				
								28	16	5.5	55				
			Sub Mean					--	16	5.7	57				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA -24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft **	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat	Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen %Sat
T-6 (contd)	09	0841 to 0844	None					0	16	7.1	71				
								4	16	6.8	69				
								8	16	6.6	66				
								12	16	6.5	65				
								16	16	6.3	63				
								20	16	6.1	61				
								24	16	6.0	60				
								28	16	5.9	59				
			Sub Mean					--	16	6.4	64				
		1114 to 1116	None					0	16	6.9	69				
								4	16	6.7	67				
								8	16	6.5	65				
								12	16	6.3	63				
								16	16	6.1	61				
								20	16	5.9	59				
								24	16	5.6	56				
								28	16	5.4	54				
			Sub Mean					--	16	6.2	62				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA -24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-6 (contd)	09	1413 to 1416	None					0	17	7.0	72				
								4	17	6.7	69				
								8	17	6.5	68				
								12	17	6.3	65				
								16	16.5	6.0	62				
								20	16.5	5.9	61				
								24	16.5	5.7	59				
								28	16.0	5.5	55				
			Sub Mean					--	16.5	6.2	64				
		1654 to 1656	None					0	18	7.1	75				
								4	18	6.9	73				
								8	17.5	6.7	71				
								12	17.5	6.5	68				
								16	17.0	6.2	64				
								20	17.0	5.9	61				
								24	17.0	5.8	60				
								28	17.0	5.6	58				
			Sub Mean					--	17.5	6.3	66				
			Mean					--	16	6.3	64				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA - 24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-7	08	2058 to 2100	6100					0	21	8.4	93				
								4	18	7.5	79				
								8	17.5	7.3	77				
								12	17	7.1	73				
								16	17	7.0	72				
			Sub Mean					--	18	7.5	78				
	09	0303 to 0307	None					0	20.5	7.7	86				
								4	18.0	6.5	68				
								8	17.5	6.3	66				
								12	17.0	6.2	64				
								14	17.0	5.8	60				
			Sub Mean					--	18	6.5	69				
		0856 to 0859	None					0	20	8.5	92				
								4	20	8.2	89				
								8	17.3	7.1	75				
								12	17	6.9	71				
								16	17	6.8	70				
								20	17	6.5	67				
			Sub Mean					--	18	7.3	77				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA -24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-7 (contd)	09	1130 to 1132	None					0	19	7.8	83				
								4	19	7.6	81				
								8	18	7.0	74				
								12	17.5	6.7	70				
								16	17	6.3	65				
								20	17	6.0	62				
			Sub Mean					--	18	6.9	72				
		1429 to 1430	None					0	18.5	7.4	79				
								4	18.5	7.2	77				
								8	18.5	7.1	76				
								12	18	6.8	72				
								16	18	6.6	69				
								20	17.5	6.3	66				
			Sub Mean					--	18	6.9	73				
		1709 to 1710	None					0	19	7.6	81				
								4	19	7.5	80				
								8	19	7.3	78				
								12	18.5	6.9	73				
								16	18	6.7	71				
								20	18	6.3	71				
			Sub Mean					--	18	7.0	75				
			Mean					--	18	7.0	74				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA -24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-8	08	2118 to 2130	6100					0	23.5	11.6	136				
								4	22.0	11.7	134				
								8	18.5	8.7	93				
								12	18.0	8.0	84				
								16	18.0	7.3	77				
								20	17.5	7.0	74				
								24	17.5	6.5	68				
								28	17.5	6.3	66				
								32	17.5	5.9	62				
								36	17.5	5.8	61				
								40	17.5	5.7	60				
								42	17.5	5.6	59				
			Sub Mean					--	18.5	7.5	81				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED-

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA -24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-8 (contd)	09	0347 to 0355	None					0	23.0	9.8	113				
								4	22.5	9.8	113				
								8	19.5	7.4	80				
								12	18.0	6.5	68				
								16	18.0	6.2	65				
								20	18.0	6.1	64				
								24	18.0	6.0	63				
								28	17.5	5.9	62				
								32	17.5	5.9	60				
								35	17.5	5.5	58				
			Sub Mean					--	19	6.9	75				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA -24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-8 (contd)	09	0910 to 0914	None					0	22	10.2	116				
								4	22	10.2	116				
								8	20	9.0	98				
								12	18	7.6	80				
								16	18	6.9	73				
								20	17.5	6.7	71				
								24	17.5	6.5	68				
								28	17.0	6.4	66				
								32	17.0	6.2	64				
			Sub Mean					--	19	7.7	84				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA -24-HOUR RUN

Station	Date Sept. 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-8 (contd)	09	1143 to 1146	None					0	23	10	115				
								4	23	10	115				
								8	23	9.8	113				
								12	20	7.8	85				
								16	19	7.0	74				
								20	18	6.5	68				
								24	18	6.2	65				
								28	18	6.0	63				
								32	18	5.8	61				
			Sub Mean					--	20	7.7	84				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-7, CONTINUED

SEPTEMBER 8-9, 1976 DISSOLVED OXYGEN DATA -24-HOUR RUN

Station	Date Sept 1976	Time mil	Power Generation cfs *	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft **	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	%Sat			mg/l	%Sat
T-8 (contd)	09	1441 to 1444	None					0	23	10.2	117				
								4	23	10.3	117				
								8	21	8.8	97				
								12	19	7.6	81				
								16	18.5	6.9	73				
								20	18.5	6.7	71				
								24	18.0	6.4	67				
								28	18.0	6.2	65				
								32	18.0	6.0	62				
			Sub Mean					--	19.5	7.7	85				
		1722 to 1725	None					0	22.5	10.2	117				
								4	22.5	10.2	117				
								8	22.0	9.5	108				
								12	20.0	7.7	84				
								16	18.5	6.7	71				
								20	18.5	6.3	67				
								24	18.0	6.0	63				
								28	18.0	5.6	59				
								32	18.0	5.3	56				
			Sub Mean					--	20	7.5	82				
			Mean					--	19	7.5	81				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE A-8

TABLE ROCK DAM POWER GENERATION RELEASE, cfs*

AUGUST 16-20, 1976

Time	Date, August				
	16	17	18	19	20
0100	--	--	--	--	--
0200	--	--	--	--	--
0300	--	--	--	--	--
0400	--	--	--	--	--
0500	--	--	--	--	--
0600	--	--	--	--	--
0700	--	--	--	--	--
0800	--	--	2981	--	--
0900	--	--	2908	1763	--
1000	--	4439	2908	3085	--
1100	--	7160	3053	3019	--
1200	--	7160	5598	3746	--
1300	--	7232	5961	3820	3515
1400	--	7160	7343	3673	3735
1500	--	7232	7197	3746	3588
1600	2349	7232	7415	7546	7593
1700	5360	7160	7270	7346	7323
1800	7489	7160	7270	7346	7177
1900	7342	7232	7270	6464	7103
2000	7709	7160	7270	1469	1538
2100	7269	7232	7415	--	--
2200	4478	7160	7052	--	--
2300	--	5298	3053	--	--
2400	--	2864	3053	--	--

* Multiply by 0.02832 to obtain cu m/sec. Data supplied by Corps of Engineers.

-- No generation.

TABLE A-9

TABLE ROCK DAM POWER GENERATION RELEASE, cfs*

SEPTEMBER 6-10, 1976

Time	Date, September				
	6	7	8	9	10
0100	--	--	--	--	--
0200	--	--	--	--	--
0300	--	--	--	--	--
0400	--	--	--	--	--
0500	--	--	--	--	--
0600	--	--	--	--	--
0700	--	--	--	--	--
0800	--	--	--	--	--
0900	--	--	--	--	--
1000	--	--	--	--	--
1100	--	1527	3025	--	--
1200	228	6108	3025	--	--
1300	3041	6108	6050	--	--
1400	3041	6108	6050	--	--
1500	6082	6108	6050	--	--
1600	6082	6032	6050	--	--
1700	6082	6108	6050	--	--
1800	6082	6108	6050	--	--
1900	3041	6108	6126	--	--
2000	--	6108	--	--	--
2100	--	6108	--	--	--
2200	--	6108	--	--	--
2300	--	--	--	--	--
2400	--	--	--	--	--

* Multiply by 0.02832 to obtain cu m/sec. Data supplied by Corps of Engineers.

-- No generation.

APPENDIX B

TABLE ROCK RESERVOIR NUTRIENT, pH, TEMPERATURE, AND DO DATA

SEPTEMBER, 1976

TABLE B-1
TABLE ROCK RESERVOIR
pH AND NUTRIENT DATA
SEPTEMBER 7, 1976

Distance From North Bank Ft *	Depth Ft*	pH	NO_2NO_3-N mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l
50	8	8.3	.02	0.2	0.04	0.10
100	8	8.1	.02	0.2	0.04	0.10
150	10	8.4	.02	0.2	0.04	0.10
200	11	8.3	.02	0.2	0.04	0.10
250	13	8.1	.02	0.2	0.04	0.10
300	19	7.9	.02	0.2	0.04	0.11
350	22	8.0	.02	0.2	0.04	0.10
400	25	8.3	.02	0.2	0.04	0.10
450	21	8.4	.02	0.2	0.04	0.10
500	20	8.4	.02	0.2	0.04	0.10
550	21	8.3	.02	0.2	0.04	0.10
600	24	8.2	.02	0.2	0.04	0.10
650	26	8.1	.02	0.2	0.04	0.10
700	31	7.6	.02	0.2	0.04	0.10
750	37	7.5	.02	0.2	0.04	0.10
800	41	7.5	.02	0.2	0.04	0.10
850	42	7.4	.02	0.2	0.04	0.10
900	46	7.5	.02	0.2	0.04	0.10
1000	45	7.5	.02	0.2	0.04	0.14
1050	75	7.2	.14	0.2	0.04	0.10
1100	75	7.5	.14	0.2	0.04	0.10
1150	75	7.4	.16	0.2	0.11	0.10
1200	75	7.4	.19	0.2	0.04	0.10
1250	75	7.6	.16	0.2	0.04	0.10
1300	75	7.4	.15	0.2	0.04	0.10
1350	75	7.5	.15	0.2	0.04	0.10
1400	75	7.5	.17	0.2	0.04	0.10
1450	75	7.5	.15	0.2	0.04	0.10
1500	75	7.5	.18	0.2	0.04	0.10
1550	75	7.4	.17	0.2	0.04	0.30
1600	75	7.4	.19	0.2	0.04	0.10
1650	75	7.4	.17	0.2	0.04	0.10
1700	75	7.4	.17	0.2	0.04	0.10
1750	75	7.3	.18	0.2	0.04	0.10

* Multiply by 0.305 to obtain meters

TABLE B-1, CONTINUED
TABLE ROCK RESERVOIR
pH AND NUTRIENT DATA
SEPTEMBER 7, 1976

Distance From North Bank Ft *	Depth Ft*	pH	NO_2NO_3-N mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l
1800	75	7.5	.16	0.3	0.04	0.10
1850	75	7.4	.17	0.4	0.04	0.10
1900	75	7.5	.16	0.3	0.04	0.70
1950	75	7.5	.18	0.4	0.04	0.10
2000	75	7.4	.18	0.4	0.04	0.10
2050	75	7.4	.17	0.2	0.04	0.10
2100	75	7.4	.15	0.2	0.04	0.10
2150	75	7.4	.15	0.2	0.04	0.10
2200	75	7.4	.16	0.2	0.04	0.20
2250	75	7.6	.15	0.2	0.04	0.10
2300	75	7.7	.14	0.2	0.04	0.10
2350	75	7.4	.13	0.2	0.04	0.10
2400	75	7.4	.14	0.2	0.04	0.20
2450	75	7.5	.15	0.2	0.04	0.10
2500	75	7.4	.16	0.2	0.04	0.20
2550	75	7.5	.16	0.2	0.04	0.20
2600	75	8.3	.02	0.2	0.04	0.20
2650	75	7.4	.14	0.2	0.04	0.10
2700	75	8.2	.02	0.2	0.04	0.10
2750	75	7.3	.11	0.2	0.04	0.10
2800	75	7.4	.15	0.2	0.04	0.10
2850	75	7.4	.11	0.2	0.04	0.20
2900	75	7.3	.14	0.2	0.04	0.10
2950	75	7.5	.09	0.2	0.04	0.10
3000	75	7.3	.12	0.2	0.04	0.10
3050	31	7.6	.02	0.2	0.04	0.30
3100	15	8.4	.02	0.2	0.04	0.10
3150	9	7.9	.02	0.2	0.04	0.10
3200	4	8.2	.02	0.2	0.04	0.10
No. of Sample	--	63	63	63	63	63
Mean	--	7.6 **	0.10	0.2	0.04	0.10
s	--	--	0.07	0.05	0.009	0.09
Min	--	7.2	0.02	0.2	0.04	0.1
Max	--	8.4	0.18	0.4	0.11	0.7

* Multiply by 0.305 to obtain meters
** Based upon average hydrogen ion concentration

TABLE B-2
TABLE ROCK RESERVOIR
DISSOLVED OXYGEN CONCENTRATIONS, mg/l
SEPTEMBER 8, 1976

Depth	Distance From North Bank, Ft*							
	50	150	250	350	450	550	650	750
	Approximate Time of Measurement, Hour							
Ft *	0940	0945	0955	1000	1015	1020	1030	1040
0	7.2	7.2	7.3	7.3	7.8	7.3	7.3	7.3
4	7.1	7.2	7.3	7.3	7.6	7.3	--	7.3
8	7.2	7.2	7.3	7.3	7.4	7.3	--	7.3
12	7.2	7.2	7.3	7.3	7.4	7.3	--	7.3
16	6.8	7.1	7.3	7.3	7.4	7.3	--	7.3
20		7.0	7.3	7.3	7.2	7.3	--	7.3
24		6.9	7.1	7.2	7.2	7.2	--	7.2
28		6.9	4.4	1.7	1.6	1.2	--	3.0
32				0.2	0.2	0.3	--	--
36				0.2	0.2	0.2	--	--
40				0.2	0.2	0.1	--	--
44						0.2	--	0.1
48							--	--
52							--	0.1
56							--	--
60							--	
64							0.1	0.1
68							--	--
72								--
76								0.1
80								
84								
88								
92								
96								
100								
Mean**	7.1	7.1	7.3	7.3	7.4	7.3	7.3	7.3

* Multiply by 0.305 to obtain meters
** Mean down to beginning of thermocline

TABLE B-2, CONTINUED
TABLE ROCK RESERVOIR
DISSOLVED OXYGEN CONCENTRATIONS, mg/l
SEPTEMBER 8, 1976

Depth	Distance From North Bank, Ft*							
	850	950	1050	1150	1250	1350	1450	1550
	Approximate Time of Measurement, Hour							
Ft *	1050	1055	1105	1110	1115	1120	1130	1135
0	7.0	7.0	7.0	7.0	7.0	7.0	6.9	6.9
4	--	7.0	7.0	7.0	7.0	7.0	6.9	6.9
8	--	7.1	7.1	7.1	7.2	7.1	7.0	7.0
12		7.1	7.3	7.1	7.2	7.1	7.2	7.1
16	--	7.1	7.3	7.1	7.2	7.1	7.3	7.1
20	--	7.1	7.0	7.2	7.2	7.1	7.2	7.0
24	--	7.1	1.2	7.1	7.0	7.1	7.0	6.9
28	0.5	2.2	0.2	1.8	1.2	2.2	0.5	2.2
32	0.1	0.6	0.2	0.5	0.2	0.5	0.2	0.4
36	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
40	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
44	--	0.2	--	0.2	0.2	0.2	0.2	0.2
48	--	0.2	--	0.1	0.2	0.2	0.2	0.2
52	0.1	--	--				0.2	
56	--	0.2	0.2				--	
60	--	--	--				--	
64	0.1	--	--				--	
68	--	--	0.2				--	
72	--	--	--				--	
76	0.1						--	
80	--						--	
84	--						--	
88	0.1						0.2	
92							--	
96	--						--	
100	0.1						0.3	
Mean**	7.0	7.1	7.1	7.1	7.1	7.1	7.1	7.0

* Multiply by 0.305 to obtain meters
** Mean down to beginning of thermocline

TABLE B-2, CONTINUED
TABLE ROCK RESERVOIR
DISSOLVED OXYGEN CONCENTRATIONS, mg/l
SEPTEMBER 8, 1976

Depth	Distance From North Bank, Ft*							
	1650	1750	1850	1950	2050	2150	2250	2350
	Approximate Time of Measurement, Hour							
Ft *	1145	1145	1150	1155	1205	1210	1215	1220
0	6.9	6.8	6.9	6.8	6.8	6.8	6.8	6.8
4	6.9	6.9	6.9	6.9	--	6.9	6.9	6.9
8	7.0	6.9	7.1	7.0	--	6.9	7.0	7.0
12	7.1	7.	7.1	7.1	--	7.0	7.2	7.0
16	7.1	7	7.1	7.1	--	7.0	7.2	7.1
20	7.1	7.1	7.1	7.0	--	7.0	7.2	7.1
24	6.9	7.1	6.9	7.0	7.0	7.1	7.0	7.1
28	1.2	2.2	.3	1.7	.6	3.3	6.3	6.8
32	0.2	.3	.2	.3	.2	.3	.2	.6
36	0.2	.2	.2	.2	.2	.2	.2	.2
40	0.2	.2	.2	.2	.2	.2	.2	.2
44	0.2	.2	.2	.2	.2	.2	.2	.2
48	0.2	.2	.2	.2	.2	.2	.2	.2
52								
56								
60					.2			
64								
68								
72								
76								
80								
84								
88								
92								
96								
100								
Mean**	7.0	6.9	7.0	7.0	6.9	7.0	7.0	7.0

* Multiply by 0.305 to obtain meters
** Mean down to beginning of thermocline

TABLE B-2, CONTINUED
TABLE ROCK RESERVOIR
DISSOLVED OXYGEN CONCENTRATIONS, mg/l
SEPTEMBER 8, 1976

Depth	Distance From North Bank, Ft*							
	2450	2550	2650	2750	2850	2950	3050	3150
	Approximate Time of Measurement, Hour							
Ft *	1220	1225	1230	1235	1240		1250	1255
0	6.8	6.8	6.8	6.8	6.8	--	6.8	6.8
4	6.9	6.8	6.8	6.9	6.8	--	6.8	6.9
8	7.0	7.0	7.0	7.0	7.0	--	6.9	7.0
12	7.1	7.1	7.1	7.0	7.1	--	7.0	
16	7.1	7.1	7.2	7.1	7.2	--	7.1	
20	7.1	7.1	7.2	7.1	7.2	--	7.1	
24	6.9	7.1	7.1	7.1	7.0	--	7.1	
28	2.2	5.5	2.8	4.5	2.5	--	2.6	
32	0.2	.3	.2	.4	.2	--	.4	
36	.2	.2	.2	.2	.2	--	.4	
40	.2	.2	.2	.2	.2	--	.2	
44	.2	.2	.2	.2	.2	--		
48	.2	.2	.2	.2	.2	--		
52			.2			--		
56						--		
60		.2			.2	--		
64						--		
68						--		
72						--		
76						--		
80	.1					--		
84						--		
88						--		
92						--		
96						--		
100						--		
						--		
Mean**	7.0	6.8	7.0	7.0	7.0		6.9	7.0

* Multiply by 0.305 to obtain meters
** Mean down to beginning of thermocline
-- Data Missing

TABLE B-3
TABLE ROCK RESERVOIR
TEMPERATURE, °C
SEPTEMBER 8, 1976

Depth	Distance From North Bank, Ft*							
	50	150	250	350	450	550	650	750
	Approximate Time of Measurement, Hour							
Ft *	0940	0945	0955	1000	1015	1020	1030	1040
0	26.4	26.2	26.2	26.1	26	26	26	26
4	26.6	26.2	26.2	26.1	26	26	--	26
8	26.6	26.2	26.0	26.1	26	26	--	26
12	25.5	26.2	26.0	26.1	26	26	--	26
16	25.5	26.2	26.0	26	26	26	--	26
20		26.0	26.0	26	26	26	--	26
24		26.0	25.9	25.8	25.2	25.5	--	25.5
28		26.0	24.8	24.1	24	24	--	24.5
32				22	22	22	--	--
36				21	20.5	20.5	--	--
40				20	20.5	20	--	--
44						19.5	--	19
48							--	--
52							--	--
56							--	--
60							--	--
64							--	--
68								--
72								--
76								--
80								
84								
88								
92								
96								
100								
Mean**	26.1	26.1	26.0	26.0	25.9	25.9	26	25.9

* Multiply by 0.305 to obtain meters
** Mean down to beginning of thermocline

TABLE B-3, CONTINUED
TABLE ROCK RESERVOIR
TEMPERATURE, °C
SEPTEMBER 8, 1976

Depth	Distance From North Bank, Ft*							
	850	950	1050	1150	1250	1350	1450	1550
	Approximate Time of Measurement, Hour							
Ft *	1050	1055	1105	1110	1115	1120	1130	1135
0	26	26	26	26	26	26	26.5	26
4	--	26	26	26	26	26	26	26
8	--	26	26	26	26	26	26	26
12	--	26	26	26	26	26	26	26
16	--	26	26	26	26	26	26	26
20	--	25.5	25.5	25.5	26	26	26	25.5
24	--	25.5	25.5	25.5	25.5	25.5	25.5	25.5
28	23.5	24.5	24	24	24	24	23.5	24
32	22	22	22	22	22	22	22	22
36	21	21	21	21	20.5	21	21	20.5
40	20	20	20	20	20	20	20	20
44	19	19.5	--	19	19.5	19.5	19.5	19.5
48	--	19	--	18.5	18.5	18.5	19	19
52	--	--	--				--	
56	--	--	--				--	
60	--	--	--				--	
64	--	--	--				--	
68	--	--	--				--	
72	--	--	--				--	
76	--						--	
80	--						--	
84	--						--	
88	--						--	
92	--						--	
96	--						--	
100	--						16	
Mean**	26	26	26	26	26	26	26	26

* Multiply by 0.305 to obtain meters
** Mean down to beginning of thermocline

TABLE B-3, CONTINUED
TABLE ROCK RESERVOIR
TEMPERATURE, °C
SEPTEMBER 8, 1976

Depth	Distance From North Bank, Ft*							
	1650	1750	1850	1950	2050	2150	2250	2350
	Approximate Time of Measurement, Hour							
Ft *	1145	1145	1150	1155	1205	1210	1215	1220
0	26.5	26.5	26	26.5	26.5	26.5	26.5	26.5
4	26	26.5	26	26	--	26	26	26
8	26	26	26	26	--	26	26	26
12	26	26	26	26	--	26	26	26
16	26	26	26	26	--	26	26	26
20	26	26	26	25.5	--	26	26	26
24	25.5	25.5	25.5	25.5	25.5	25.5	25.5	26
28	24	24.5	23.5	24.5	23.5	25.5	25	25.5
32	22	22	22	22	22	22	22	22
36	20.5	21	21	22	21	21	21	21
40	20	20	20	20	20	20	20	20
44	19.5	19	19.5	19.5	19.5	19.5	19.5	19.5
48	19	19	19	19	19	19	19	19
52								
56								
60								
64								
68								
72								
76								
80								
84								
88								
92								
96								
100								
Mean**	26.	26	26	26	26	26	26	26

* Multiply by 0.305 to obtain meters
** Mean down to beginning of thermocline

TABLE B-3, CONTINUED
TABLE ROCK RESERVOIR
TEMPERATURE, °C
SEPTEMBER 8, 1976

Depth	Distance From North Bank, Ft*							
	2450	2550	2650	2750	2850	2950	3050	3150
	Approximate Time of Measurement, Hour							
Ft *	1220	1225	1230	1235	1240		1250	1255
0	26.5	26.5	26.5	26.5	26.5	--	26.5	26.5
4	26	26.5	26	26	26	--	26	26
8	26	26	26	26	26	--	26	26
12	26	26	26	26	26	--	26	
16	26	26	26	26	26	--	26	
20	26	26	26	26	25.5	--	26	
24	25.5	25.5	25.5	26	25.5	--	26	
28	24	25	24.5	25	24.5	--	24.5	
32	22.5	22	22	22.5	22	--	22.5	
36	21	20.5	20.5	21	20.5	--	21	
40	20	20	20	20	20	--	20.5	
44	19.5	19.5	19.5	19.5	19.5	--		
48	19	19	19	19	19	--		
52		18				--		
56						--		
60					18	--		
64						--		
68						--		
72						--		
76						--		
80		16.5				--		
84						--		
88						--		
92						--		
96						--		
100		16				--		
						--		
Mean**	26	26	26	26	26		26	26

* Multiply by 0.305 to obtain meters
** Mean down to beginning of thermocline
-- Data Missing

TABLE B-4
TABLE ROCK RESERVOIR
DISSOLVED OXYGEN PERCENT SATURATION
SEPTEMBER 8, 1976

Depth	Distance From North Bank, Ft*							
	50	150	250	350	450	550	650	750
	Approximate Time of Measurement, Hour							
Ft *	0940	0945	0955	1000	1015	1020	1030	1040
0	88	88	89	89	95	89	89	89
4	88	88	89	89	93	89	--	89
8	89	88	89	89	90	89	--	89
12	88	88	89	89	90	89	--	89
16	83	87	89	89	90	89	--	89
20		85	89	89	88	89	--	89
24		84	87	88	86	88	--	88
28		84	512	20	19	14	--	36
32				2	2	3	--	--
36				2	2	2	--	--
40				2	2	1	--	--
44						1	--	--
48							--	--
52							--	--
56							--	--
60							--	--
64							--	--
68								--
72								--
76								--
80								
84								
88								
92								
96								
100								
Mean**	87.	86.	89	89	90	89	89	89

* Multiply by 0.305 to obtain meters
** Mean down to beginning of thermocline

TABLE B-4, CONTINUED
TABLE ROCK RESERVOIR
DISSOLVED OXYGEN PERCENT SATURATION
SEPTEMBER 8, 1976

Depth	Distance From North Bank, Ft*							
	850	950	1050	1150	1250	1350	1450	1550
	Approximate Time of Measurement, Hour							
Ft *	1050	1055	1105	1110	1115	1120	1130	1135
0	85	85	85	85	85	85	85	84
4	--	85	85	85	85	85	84	84
8	--	87	87	87	88	87	85	85
12	--	87	89	87	88	87	88	87
16	--	87	89	87	88	87	89	87
20	--	87	89	88	88	87	88	85
24	--	87	85	87	85	87	85	84
28	6	26	14	21	14	26	6	26
32	1	7	2	6	2	6	2	5
36	1	2	2	2	2	2	2	2
40	1	2	2	2	2	2	2	2
44	1	2	--	2	2	2	2	2
48	--	2	--	1	2	2	2	2
52	--	--	--				--	
56	--	--	--				--	
60	--	--	--				--	
64	--	--	--				--	
68	--	--	--				--	
72	--	--	--				--	
76	--						--	
80	--						--	
84	--						--	
88	--						--	
92	--						--	
96	--						--	
100	--						3	
	--							
Mean**	85	86	87	86	87	86	86	85

* Multiply by 0.305 to obtain meters
** Mean down to beginning of thermocline

TABLE B-4, CONTINUED
TABLE ROCK RESERVOIR
DISSOLVED OXYGEN PERCENT SATURATION
SEPTEMBER 8, 1976

Depth	Distance From North Bank, Ft*							
	1650	1750	1850	1950	2050	2150	2250	2350
	Approximate Time of Measurement, Hour							
Ft *	1145	1145	1150	1155	1205	1210	1215	1220
0	85	84	84	84	84	84	84	84
4	84	85	84	84	--	84	84	84
8	85	84	87	85	--	84	85	85
12	87	85	87	87	--	85	88	85
16	87	85	87	87	--	85	88	87
20	87	87	87	85	--	85	88	87
24	84	87	84	85	85	87	85	87
28	14	26	4	2	7	40	75	83
32	2	3	2	3	2	3	2	7
36	2	2	2	2	2	2	2	2
40	2	2	2	2	2	2	2	2
44	2	2	2	2	2	2	2	2
48	2	2	2	2	2	2	2	2
52								
56								
60								
64								
68								
72								
76								
80								
84								
88								
92								
96								
100								
Mean**	86	85	86	85	85	85	85	85

* Multiply by 0.305 to obtain meters.
** Mean down to beginning of thermocline

TABLE B-4, CONTINUED
TABLE ROCK RESERVOIR
DISSOLVED OXYGEN PERCENT SATURATION
SEPTEMBER 8, 1976

Depth	Distance From North Bank, Ft*							
	2450	2550	2650	2750	2850	2950	3050	3150
	Approximate Time of Measurement, Hour							
Ft *	1220	1225	1230	1235	1240		1250	1255
0	84	84	84	84	84	--	84	84
4	84	84	83	84	83	--	83	84
8	85	85	85	85	85	--	84	85
12	87	87	87	85	87	--	85	--
16	87	87	88	87	88	--	87	
20	87	87	88	87	88	--	87	
24	84	87	87	87	85	--	87	
28	26	65	33	54	30	--	31	
32	2	3	2	5	2	--	5	
36	2	2	2	2	2	--	2	
40	2	2	2	2	2	--	2	
44	2	2	2	2	2	--		
48	2	2	2	2	2	--		
52			2			--		
56						--		
60					2	--		
64						--		
68						--		
72						--		
76						--		
80						--		
84						--		
88						--		
92						--		
96						--		
100						--		
Mean**	85	83.	86	86	86		85	84

* Multiply by 0.305 to obtain meters
** Mean down to beginning of thermocline
-- Data Missing

APPENDIX C

LAKE TANEYCOMO
BIOLOGICAL DATA

OCTOBER, 1976

TABLE C-1
PERIPHYTON TAXA IDENTIFIED FROM LAKE TANEYCOMO
OCTOBER 16, 1976

Taxa	Location and Percentage of Sample	
	300' downstream Hatcher Effluent	Trout Creek
Anabaena	X	X
Lyngbya	X	
Oscillatoria	X	X
Phormidium	X	
Percentage Filamentous Blue Greens	33%	23%
Actinastrum		X
Ankistrodesmus	X	
Chlorella		X
Golenkinia		X
Staurastrum		X
Percentage Coccoid Green	<1%	2%
Cladophora	X	
Draparnaldia	X	
Stigeoclonium	X	X
Percentage Filamentous Greens	13%	<1%
Chlamydomonas	X	X
Euglena		X
Percentage Green Flagellates	1%	9%
Cyclotella		X
Melosira	X	X
Percentage Centric Diatoms	1%	2%

TABLE C-1, CONTINUED

Achnanthes	X	X
Cocconeis		X
Cymbella	X	X
Diatoma		X
Gomphonema	X	X
Navicula	X	X
Nitzschia	X	X
Synedra		X
Percentage Pennate Diatoms	52%	64%
Total number of Taxa	15	19

TABLE C-2
PHYTOPLANKTON IDENTIFIED FROM LAKE TANEYCOMO
300 FEET DOWNSTREAM FROM HATCHERY EFFLUENT
OCTOBER 16, 1976

Anabaena	847	
Phormidium	77	
Total & Percentage Filamentous Blue Greens	924	39%
Chlamydomonas	847	
Total & Percentage Green Flagellates	847	35%
Cyclotella	154	
Melosira	154	
Total & Percentage Centric Diatoms	308	13%
Diatoma	77	
Gomphonema	154	
Navicula	77	
Total & Percentage Pennate Diatoms	308	13%
Total number of Organisms	2,387	100%
Total number of Taxa	8	

TABLE C-3
MACROINVETERBRATES IDENTIFIED FROM LAKE TANEYCOMO
300 FEET DOWNSTREAM FROM HATCHERY EFFLUENT
OCTOBER 16, 1976

	Number	Percentage
Cricotopus sp.	235	31%
Orthocladius sp.	75	10%
Total & Percentage Diptera	310	41%
Gammarus sp	396	53%
Total & Percentage Crustacea	396	53%
Aelosoma sp	12	
Total & Percentage Oligochaeta	12	2
Hydra sp	14	2
Total & Percentage Coelenterata	14	2
Turbellaria	15	2
Total & Percentage Turbellaria	15	2
Total number of Organisms	747	100%
Total number of Taxa	6	
Shannon-Weaver Diversity Indices	1.66	
Equitability Factor	0.67	

APPENDIX D

LAKE TANEYCOMO
DO AND FLOW RATE DATA

JANUARY, 1977

TABLE D-1

January 7, 1977 Dissolved Oxygen Data

Station	Date Jan 7 1977	Time mil	Power Generation cfs*	Left Bank				Mid-Stream				Right Bank			
				Depth Ft.	Temp °C	Dissolved Oxygen		Depth Ft**	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	%Sat			mg/l	% Sat			mg/l	% Sat
T-1		0923 to 0928	14,220					0	8	9.6	81				
								5	8	9.6	81				
								10	8	9.6	81				
			Mean					--	8	9.6	81				
T-2		0934 to 0940	14,220					0	8	9.7	82				
								5	8	9.6	81				
								10	8	9.7	82				
								13	8	9.7	82				
			Mean					--	8	9.7	82				
T-3		0949 to 0954	14,220					0	8	9.8	82				
								5	8	9.8	82				
								10	8	9.8	82				
								12	8	9.8	82				
			Mean					--	8	9.8	82				

* Multiply by 0.0283 to obtain cu m/sec
** Multiply by 0.305 to obtain meters

TABLE D-1, CONTINUED

January 7, 1977 Dissolved Oxygen Data

Station	Data Jan 7 1977	Time mil	Power Generation cfs*	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft**	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	% Sat			mg/l	% Sat			mg/l	% Sat
T-4		1005 to 1007	13,680					0	8	9.8	82				
								5	8	9.8	82				
								10	8	9.8	82				
								15	8	9.8	82				
								17	8	9.8	82				
			Mean					--	8	9.8	82				
T-5		1026 to 1028	13,680					0	9	10.1	85				
								5	8	10.0	84				
								10	8	10.0	84				
								15	8	10.0	84				
								19	8	10.0	84				
			Mean					--	8	10.0	84				

* Multiply by 0.0283 to obtain cu m/sec

** Multiply by 0.305 to obtain meters

TABLE D-1, CONTINUED

January 7, 1977 Dissolved Oxygen Date

Station	Date Jan 7 1977	Time mil	Power Generation cfs*	Left Bank				Mid Stream				Right Bank			
				Depth Ft	Temp °C	Dissolved Oxygen		Depth Ft**	Temp °C	Dissolved Oxygen		Depth Ft	Temp °C	Dissolved Oxygen	
						mg/l	% Sat			mg/l	% Sat			mg/l	% Sat
T-6		1039 to 1041	13,680					0	8	10.0	84				
								5	8	10.0	84				
								10	8	10.0	84				
								15	8	10.0	84				
								20	8	10.0	84				
								25	8	10.0	84				
								30	8	10.0	84				
								35	8	10.0	84				
			Mean					--	8	10.0	84				

* Multiply by 0.0283 to obtain cu m/sec
** Multiply by 0.305 to obtain meters

TABLE D-1, CONTINUED

January 7, 1977 Dissolved Oxygen Data

Station	Date Jan 7 1977	Time mil	Power Generation cfs*											
				Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen % Sat	Depth Ft**	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen % Sat	Depth Ft	Temp °C	Dissolved Oxygen mg/l	Dissolved Oxygen % Sat
T-7		1150 to 1152	11,090					0	8.5	9.8	83				
								5	8.5	9.6	82				
								10	8.5	9.6	82				
								15	8.5	9.7	83				
								20	8.5	9.8	83				
			Mean					---	8.5	9.7	83				
T-8		1212 to 1215	8,570					0	8	10.0	84				
								5	8	9.9	83				
								10	8	9.9	83				
								15	8	9.8	82				
								20	7.5	9.8	83				
								25	7.5	9.8	83				
								30	7.5	9.8	83				
								35	7.5	9.8	83				
								38	7.5	9.5	81				
			Mean					--	7.7	9.8	83				

* Multiply by 0.0283 to obtain cu m/sec
** Multiply by 0.305 to obtain meters

TABLE D-2
TABLE ROCK DAM POWER GENERATION RELEASE
January 7, 1977

Time	Flow Rate, cfs*
0600	3270
0700	6800
0800	13740
0900	14220
1000	13680
1100	11090
1200	8570
1300	6806
1400	6800
1500	6060
1600	5440
1700	5580
1800	7490
1900	9530
2000	9460
2100	6060
2200	3400
2300	0
2400	0

* Data supplied by Corps of Engineers, Multiply by 0.0283 to obtain cu m/sec.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SUBJECT: Supplement to "Report of Investigation-Lake Taneycomo Dissolved Oxygen Study", US EPA, Region VII, Surveillance and Analysis Division, January 14, 1977

DATE: February 16, 1977

FROM: Robert L. Markey
Director, Surveillance and Analysis Division, Region VII

TO: Mr. Arlein T. Wicks
Director, Office of Intermedia Programs, Region VII

This memorandum reports the results of field investigation activities conducted at Lake Taneycomo which were not available in time for inclusion in the subject report. This information includes the analytical data resulting from samples collected for pH and nutrient analysis at station T-1 on January 7, 1977. Also included is a description and resulting data of field work conducted during January 15, 1977.

This information tends to confirm our previous findings and does not significantly impact the subject report. We shall leave it up to you to make distribution of this report to other involved agencies.

January 7, 1977

The pH and nutrient data resulting from the January 7, 1977 sampling effort may be found in Table 1.

January 15, 1977

On January 15, 1977, a follow-up to the October 23, 1976, Lake Taneycomo investigation was completed by Mr. Thomas Lorenz, Mr. Charles Hensley and Mr. Roy Crossland. Dissolved Oxygen (DO) levels were measured in the upstream 2 miles (3 kilometers) of the lake and found to be greater than 10 mg/l (in excess of 80 percent saturation). The data resulting from this DO monitoring is presented graphically in Figure 1.

Only two dead trout were observed between the powerhouse and the state maintained launching ramp. Both were in the 9 to 10 inch (23-to 25-centimeter) range. No conclusions were drawn from this data because of the scarcity of fisherman in the upstream area.

The light-dark bottle test was repeated to get data on oxygen production and consumption by the periphytic and planktonic communities.

The results indicated that, under the prevailing conditions, the periphytic community was a very active oxygen producer in the light and a very active oxygen consumer in the dark. In the light, the periphytic material super saturated the water around it. In the dark, the periphytic material stripped out 8.6 mg/l DO in four hours. The containers with plain lake water in them did not change either in the light or dark. These results indicated that the differences in the DO levels of the bottles containing periphytic material were due entirely to the periphytic material. The results are presented below:

Time	Periphyton Light	DO mg/l Dark	Phytoplankton Light	DO mg/l Dark
1200 hours	16.4	15.8	10.2	10.1
1617 hours	17.0	7.2	10.2	10.1

In addition to the preceeding data, two saturometer readings were taken in the upstream reaches of Lake Taneycomo. One reading was taken in the powerhouse stilling basin of Table Rock Dam and the other reading was taken about 600 yards (550 meters) downstream from the powerhouse. The resulting data are presented below:

	% Saturation Total Gases	% Saturation Nitrogen Argon	% Saturation Oxygen
In powerhouse Stilling Basin	97.5%	101%	81.2%
600 yds. downstream of powerhouse	98.6%	101%	85.3%

These saturation data did not indicate any apparent cause for concern with fish gas bubble disease.

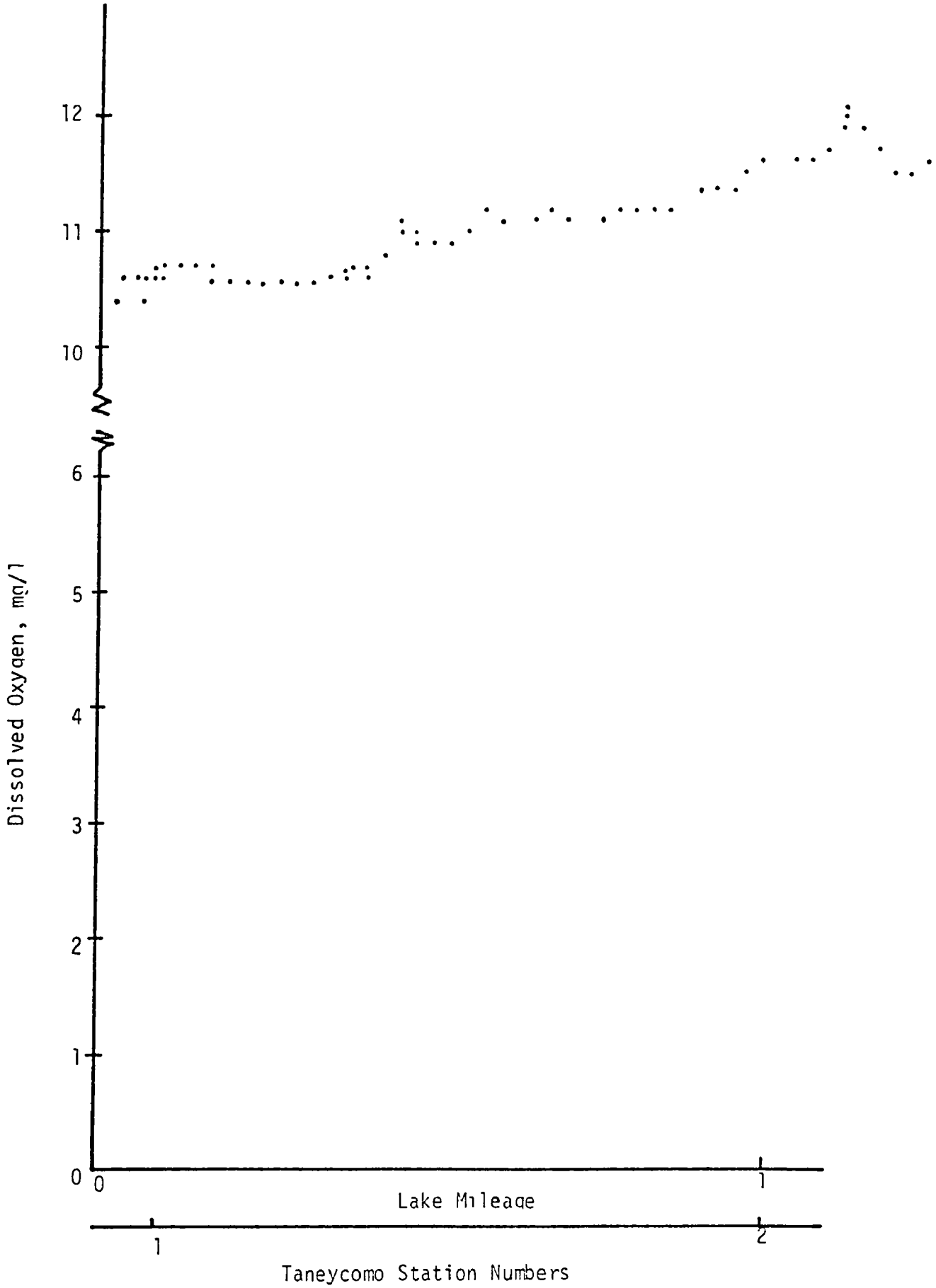

Figure 1- Dissolved Oxygen Levels in Upper Reaches of Lake Taneycomo January 15, 1977

TABLE I
NUTRIENT AND pH LEVELS AT STATION T-1
JANUARY 7, 1977

Time mil	Vertical location	Left Bank*					Mid-Stream					Right Bank*				
		pH	NO_2 NO_3 + mg/l	TKN mg/l	NH_3-N mg/l	Total P mg/l	pH	NO_2- NO_3+ mg/l	TKN mg/l	NH_3- N mg/l	Total P mg/l	pH	NO_2- NO_3+ mg/l	TKN mg/l	NH_3- N mg/l	Total P mg/l
1455 to 1510	Surface	8.1	0.12	0.4	0.05	<0.2	8.3	0.12	0.2	0.09	<0.2	7.9	0.13	1.0	0.03	<0.2
	Mid-Depth	8.0	0.12	0.2	0.06	<0.2	8.3	0.12	1.0	<0.02	<0.2	7.7	0.12	0.8	0.04	<0.2
	Bottom	8.0	0.12	0.5	0.5	<0.2	8.2	0.12	0.9	<0.02	<0.2	7.8	0.12	0.4	0.02	<0.2
	Mean **	8.0	0.12	0.3	0.5	<0.2	8.3	0.12	0.7	<0.04	<0.2	7.8	0.12	0.7	0.03	<0.2

ing Downstream
n pH levels are based upon averaged hydrogen ion concentrations
ite plus Nitrate Nitrogen as Nitrogen