ANALYSIS OF THE JOSEPH M. FARLEY NUCLEAR PLANT'S CONTRIBUTION TO INCREASES IN THE TEMPERATURE OF THE CHATTAHOOCHEE RIVER UNIT NUMBER ONE REPORT

7903060284

SUMMARY

The Joseph M. Farley Environmental Technical Specifications (ETS), Section 3.1.1(a)-2, require a thermal study of the Chattahoochee River in the vicinity of the Farley Nuclear Plant. A standard "T" test was performed upon the data for the various sample points. Based upon this statistical analysis, the Farley Nuclear Plant does not contribute to increases in the temperature of the Chattahoochee River.

INTRODUCTION

The Joseph M. Farley Environmental Technical Specifications (ETS), Section 3.1.1(a)-2, require a thermal study to be conducted to assess any significant adverse impact on the aquatic biota of the Chattahoochee River by thermal discharges. The assessment of any impact on the aquatic biota by the Joseph M. Farley Nuclear Plant will be addressed in a separate report entitled Environmental Non-Radiological Monitoring of Aquatic Communities in the Chattahoochee River. The objective of this report is to determine if the plant contributes to a rise in the river's temperature. For comparison purposes, pre-operational data were obtained for 1976. The post-operational phase began with commercial operation of Unit One and lasted for a period of one year. Unit One began commercial operation on December 1, 1977. Because of difficulties associated with thermograph operations, data for the post-operational period began on December 13, 1977.

Figure 3.1.1 of the ETS specified certain locations in which the thermographs were to be located. Figure 3.1-1 is reproduced as the Figure in this report. The names which were used in this report for the sample points are given in the Figure. To help ensure valid data, two thermographs were installed at the upstream and downstream locations. The data were averaged at a sample point when both thermographs were operational. The data for the pre-operational and post-operational phase are given in Appendices I and II, respectively.

Regrettably, the data for the discharge proved to be unacceptable. The river level changed drastically from day to day. This changing level caused the instrument to be out of the water a significant portion of the time. The problem is now being studied and hopefully acceptable data will be available for the two unit report. Initial studies indicated that the five foot depth requirement for the thermograph could not be followed and still ensure valid data. Therefore, in the future this depth will be increased to the level necessary to ensure valid data. Additonally, vandalism has caused the loss of approximately 25% of the post-operational data.

DATA ANALYSIS

To assist in the analysis of the data, a statistical comparison of the thermograph data at the Upstream, Intake, and Downstream Sample Points was performed for both the pre-operational and post-operational periods. Standard "T" tests on the sample means were performed to test the thpothesis that there was no difference in the means of the sample points.

It can be inferred that if this hypothesis is true, then the sample points would experience the same thermal regime. The analysis was performed upon the means of the temperatures at the various sample points. The means include data which were available at both sample points for the same time interval. If there were no data available at one sample point, no calculation was made for that specific time interval. This was necessary to ensure that the seasonal and climatic effects are equal at all sample points within a single year.

For comparisons between pre-operational and post-operational data, the same type analysis as the above was conducted but identical climatic conditions cannot be ensured. The comparison of pre-operational and post-operational data would be meaningless unless the sample points were identical.

The results of the statistical comparisons are presented in the Table.

TABLE

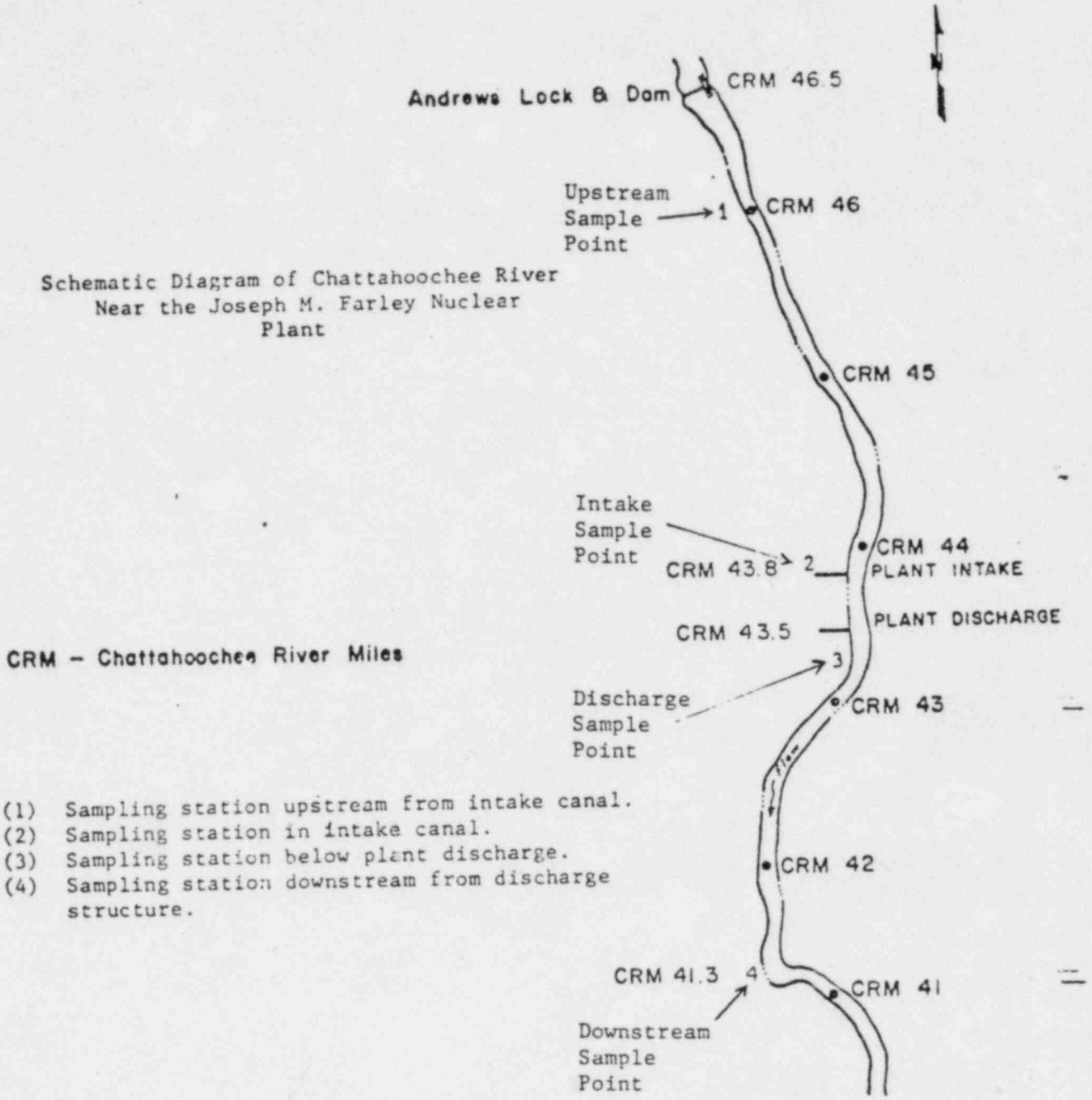
	Mean Temperature	Difference in Means Statistically Significant at 90% Confidence Level
Pre-op Upstream	63.66°F	No
Pre-op Downstream	65.12	
Post-op Upstream	68.93	No
Post-op Downstream	70.08	
Post-op Upstream	66.80	Significant at 96.7%
Post-op Intake	69.16	Confidence Level
Post-op Downstream	68.25	No
Post-op Intake	68.97	
Pre-op Upstream	65.21	No
Post-op Upstream	66.26	
Pre-op Downstream	69.02	No
Post-op Downstream	69.85	

From the above, it may be seen that there is only one case where the temperature difference is statistically significant (post-operational intake and post-operational upstream). Since no difference is observed comparing post-operational upstream to downstream or post-operational downstream to intake, and since the difference is only 2.36°F, and since the thermographs are only accurate to within ± 2°F, it is reasonable to assume that this difference is due to a difference in calibration.

CONCLUSION

Based upon the data available, the Joseph M. Farley Nuclear Plant does not contribute to increases in the temperature of the Chattahoochee River.

FIGURE



Schematic Diagram of Chattahoochee River Near the Joseph M. Farley Nuclear Plant

CRM - Chattahoochee River Miles

(1) Sampling station upstream from intake canal.
(2) Sampling station in intake canal.
(3) Sampling station below plant discharge.
(4) Sampling station downstream from discharge structure.

ALABAMA POWER COMPANY
JOSEPH M FARLEY NUCLEAR PLANT
ENVIRONMENTAL TECHNICAL SPECIFICATIONS

THERMAL MONITORING & NON-RADIOLOGICAL WATER SAMPLING STATIONS
FIGURE 3.1-1

APPENDIX I

PRE-OPERATIONAL
THERMOGRAPH DATA

PRE-OPERATIONAL THERMOGRAPH DATA

YR	MO	DA	UPSTREAM TEMPERATURE (DEGREES F)	DOWNSTREAM TEMPERATURE (DEGREES F)
76	1	15	46.0	•
76	1	16	46.0	•
76	1	17	46.0	•
76	1	18	46.0	•
76	1	19	43.8	•
76	1	20	43.8	•
76	1	21	44.0	•
76	1	22	44.0	•
76	1	23	44.5	•
76	1	24	46.3	•
76	1	25	47.3	•
76	1	26	47.5	•
76	1	27	46.8	•
76	1	28	46.0	•
76	1	29	44.8	•
76	1	30	45.0	•
76	1	31	46.0	•
76	2	1	46.0	•
76	2	2	46.0	•
76	2	3	46.0	•
76	2	4	47.0	•
76	2	5	48.0	•
76	2	6	48.0	•
76	2	7	48.0	•
76	2	8	48.8	•
76	2	9	48.5	•
76	2	10	48.3	•
76	2	11	48.3	52.0
76	2	12	50.0	50.8
76	2	13	50.0	51.0
76	2	14	50.8	51.8
76	2	15	52.0	53.3
76	2	16	52.5	54.3
76	2	17	52.3	54.5
76	2	18	52.0	54.0
76	2	19	52.0	54.0
76	2	20	52.0	54.0
76	2	21	53.5	54.8
76	2	22	54.8	56.3
76	2	23	55.0	57.0
76	2	24	55.0	57.0
76	2	25	55.0	57.0
76	2	26	55.0	57.0
76	2	27	55.0	57.0
76	2	28	55.8	57.8
76	2	29	57.5	59.0
76	3	1	58.0	59.0
76	3	2	57.8	59.0
76	3	3	57.0	59.0
76	3	4	57.0	59.0
76	3	5	57.0	59.7
76	3	6	59.0	60.5
76	3	7	60.3	61.0
76	3	8	61.0	61.0

PRE-OPERATIONAL THERMOGRAPH DATA

YR	MO	DA	UPSTREAM	DOWNSTRM
76	3	9	61.8	61.0
76	3	10	61.3	61.0
76	3	11	62.0	61.8
76	3	12	62.0	62.0
76	3	13	62.0	62.0
76	3	14	62.0	62.0
76	3	15	61.5	62.0
76	3	16	62.0	62.0
76	3	17	62.0	62.0
76	3	18	60.8	62.0
76	3	19	60.5	61.5
76	3	20	61.5	61.0
76	3	21	62.0	62.0
76	3	22	62.0	62.0
76	3	23	62.0	62.5
76	3	24	61.8	63.0
76	3	25	61.8	63.0
76	3	26	.	63.0
76	3	27	.	63.0
76	3	28	.	63.0
76	3	29	.	63.0
76	3	30	.	63.0
76	3	31	.	64.0
76	4	1	.	65.0
76	4	2	.	65.0
76	4	3	.	65.0
76	4	4	.	65.0
76	4	5	.	65.0
76	4	6	.	65.0
76	4	7	.	65.0
76	4	8	.	65.0
76	4	9	.	65.3
76	4	10	.	66.0
76	4	11	.	67.0
76	4	12	.	68.0
76	4	13	.	68.0
76	4	14	.	67.0
76	4	15	63.0	67.0
76	4	16	63.0	67.0
76	4	17	63.3	67.0
76	4	18	63.3	67.0
76	4	19	64.0	67.0
76	4	20	64.0	67.0
76	4	21	64.0	67.0
76	4	22	64.0	67.0
76	4	23	64.5	67.0
76	4	24	65.0	67.3
76	4	25	65.0	68.0
76	4	26	65.0	68.0
76	4	27	65.0	68.0
76	4	28	65.0	68.0
76	4	29	65.0	69.0
76	4	30	65.0	69.0
76	5	1	66.0	69.0

PRE-OPERATIONAL THERMOGRAPH DATA

YR	MO	DA	UPSTREAM	DOWNSTRM
76	5	2	66.0	69.0
76	5	3	66.3	69.0
76	5	4	66.8	70.0
76	5	5	67.0	70.0
76	5	6	67.0	70.0
76	5	7	•	72.3
76	5	8	•	72.0
76	5	9	•	71.0
76	5	10	•	71.0
76	5	11	•	71.0
76	5	12	•	71.0
76	5	13	•	72.0
76	5	14	•	72.0
76	5	15	•	72.0
76	5	16	•	72.0
76	5	17	•	72.0
76	5	18	•	72.3
76	5	19	•	73.0
76	5	20	•	73.0
76	5	21	•	73.0
76	5	22	•	73.0
76	5	23	•	73.0
76	5	24	•	73.0
76	5	25	•	73.0
76	5	26	•	73.0
76	5	27	•	73.0
76	5	28	•	73.8
76	5	29	•	74.0
76	5	30	•	74.0
76	5	31	•	74.0
76	6	1	•	74.0
76	6	2	•	75.0
76	6	3	•	75.0
76	6	4	•	75.0
76	6	5	•	75.0
76	6	6	•	75.0
76	6	7	•	75.0
76	6	8	•	75.0
76	6	9	•	75.0
76	6	10	•	76.0
76	6	11	•	76.0
76	6	12	•	76.0
76	6	13	•	76.0
76	6	14	•	76.0
76	6	15	•	76.0
76	6	16	•	76.0
76	6	17	72.0	76.0
76	6	18	72.0	76.0
76	6	19	72.0	76.0
76	6	20	72.0	76.0
76	6	21	72.0	76.0
76	6	22	72.0	76.0
76	6	23	72.0	76.5
76	6	24	72.5	77.0

PRE-OPERATIONAL THERMOGRAPH DATA

YR	MO	DA	UPSTREAM	DOWNSTRM
76	6	25	.	77.0
76	6	26	.	77.3
76	6	27	.	78.0
76	6	28	.	78.0
76	6	29	.	78.0
76	6	30	.	78.0
76	7	1	.	78.0
76	7	2	.	78.0
76	7	3	.	79.5
76	7	4	.	80.3
76	7	5	.	80.0
76	7	6	.	80.0
76	7	7	.	80.0
76	7	8	80.3	80.0
76	7	9	80.0	81.0
76	7	10	80.0	81.0
76	7	11	80.0	81.0
76	7	12	80.0	81.0
76	7	13	80.0	81.0
76	7	14	80.8	81.0
76	7	15	80.8	81.0
76	7	16	80.8	81.0
76	7	17	81.3	82.3
76	7	18	82.0	82.3
76	7	19	81.3	82.3
76	7	20	81.0	82.3
76	7	21	81.0	82.3
76	7	22	81.0	82.3
76	7	23	82.0	82.3
76	7	24	82.0	82.3
76	7	25	82.5	82.3
76	7	26	83.0	83.0
76	7	27	82.8	82.5
76	7	28	81.0	81.5
76	7	29	81.5	81.5
76	7	30	82.0	81.5
76	7	31	82.3	82.0
76	8	1	.	82.0
76	8	2	.	83.0
76	8	3	.	83.0
76	8	4	.	83.0
76	8	5	.	83.0
76	8	6	.	83.0
76	8	7	.	83.8
76	8	8	.	84.0
76	8	9	.	84.0
76	8	10	.	84.0
76	8	11	.	85.0
76	8	12	.	83.3
76	8	13	.	83.3
76	8	14	.	83.3
76	8	15	.	83.3
76	8	16	.	83.3
76	8	17	.	83.3

PRE-OPERATIONAL THERMOGRAPH DATA

YR	MO	DA	UPSTREAM	DOWNSTRM
76	8	18	.	82.5
76	8	19	.	82.0
76	8	20	.	82.0
76	8	21	.	82.0
76	8	22	.	82.0
76	8	23	.	82.0
76	8	24	.	82.0
76	8	25	.	82.0
76	8	26	.	82.0
76	8	27	.	81.8
76	8	28	.	81.0
76	8	29	.	81.0
76	8	30	.	81.0
76	8	31	.	81.0
76	9	1	.	81.0
76	9	2	.	81.0
76	9	3	.	81.0
76	9	4	.	81.0
76	9	15	78.7	74.7
76	9	16	78.0	75.8
76	9	17	77.8	75.8
76	9	18	78.0	75.8
76	9	19	78.0	76.5
76	9	20	78.0	77.0
76	9	21	77.3	77.0
76	9	22	77.0	77.0
76	9	23	77.0	77.0
76	9	24	77.8	77.0
76	9	25	78.0	77.0
76	9	26	78.0	77.0
76	9	27	77.8	77.0
76	9	28	77.5	77.0
76	9	29	78.0	76.3
76	9	30	77.3	76.0
76	10	1	76.5	76.0
76	10	2	76.0	75.3
76	10	3	76.0	75.0
76	10	4	75.3	75.0
76	10	5	75.5	75.0
76	10	6	76.0	75.0
76	10	7	75.0	75.5
76	10	8	75.0	74.8
76	10	9	72.0	73.0
76	10	10	71.0	72.0
76	10	11	69.5	71.0
76	10	12	69.0	71.0
76	10	13	68.8	70.3
76	10	14	70.3	70.5
76	10	15	71.0	71.0
76	10	16	71.0	71.0
76	10	17	70.3	71.0
76	10	18	69.0	71.0
76	10	19	68.3	70.3
76	10	20	68.5	70.0

PRE-OPERATIONAL THERMOGRAPH DATA

YR	MO	DA	UPSTREAM	DOWNSTRM
76	10	21	67.0	69.3
76	10	22	65.5	68.5
76	10	23	65.0	67.0
76	10	24	65.0	67.0
76	10	25	64.8	67.0
76	10	26	65.0	67.0
76	10	27	64.8	67.0
76	10	28	64.5	67.0
76	10	29	63.5	66.0
76	10	30	63.0	65.0
76	10	31	63.0	65.0
76	11	1	62.3	64.0
76	11	2	61.3	63.0
76	11	3	60.5	63.0
76	11	4	60.8	63.0
76	11	5	60.8	63.0
76	11	6	60.0	62.8
76	11	7	59.8	61.8
76	11	8	59.0	61.0
76	11	9	58.0	61.0
76	11	10	57.8	60.0
76	11	11	58.0	.
76	11	12	58.3	.
76	11	13	58.8	.
76	11	14	57.5	.
76	11	15	57.0	.
76	11	16	55.0	.
76	11	17	55.0	.
76	11	18	52.8	56.0
76	11	19	53.0	56.0
76	11	20	54.5	56.0
76	11	21	55.5	56.0
76	11	22	55.8	56.0
76	11	23	54.5	56.0
76	11	24	53.0	55.3
76	11	25	53.0	55.0
76	11	26	53.0	55.0
76	11	27	53.3	55.0
76	11	28	54.8	55.0
76	11	29	54.5	56.0
76	11	30	50.8	55.5
76	11	31	50.0	53.5
76	12	1	49.8	53.0
76	12	2	50.0	52.0
76	12	3	50.0	52.0
76	12	4	50.0	52.0
76	12	5	50.0	52.0
76	12	6	51.0	52.0
76	12	7	51.0	52.0
76	12	8	49.5	52.0
76	12	9	48.0	50.5
76	12	10	48.0	50.0
76	12	11	49.0	50.0
76	12	12	49.0	51.0

PRE-OPERATIONAL THERMOGRAPH DATA

YR	MO	DA	UPSTREAM	DOWNSTRM
76	12	13	50.0	51.0
76	12	14	50.0	51.0
76	12	15	49.0	51.0
76	12	16	49.0	51.0
76	12	17	49.0	56.0
76	12	18	49.0	51.0
76	12	19	49.5	51.0
76	12	20	50.0	51.0
76	12	21	49.0	51.0
76	12	22	49.0	49.8
76	12	23	47.5	49.0
76	12	24	46.3	49.0
76	12	25	46.0	49.0
76	12	26	46.5	49.0
76	12	27	47.0	49.0
76	12	28	47.0	49.0
76	12	29	47.0	49.0
76	12	30	46.5	49.0
76	12	31	46.0	49.0

APPENDIX II

POST-OPERATIONAL THERMOGRAPH DATA

POST-OPERATIONAL THERMOGRAPH DATA

YR	MO	DA	UPSTREAM TEMPERATURE (DEGREES F)	INTAKE TEMPERATURE (DEGREES F)	DOWNSTREAM TEMPERATURE (DEGREES F)
77	12	13	.	.	53.0
77	12	14	.	.	53.5
77	12	15	.	.	53.8
77	12	16	.	.	53.8
77	12	17	.	.	53.5
77	12	18	.	.	54.5
77	12	19	.	.	54.0
77	12	20	.	.	54.0
77	12	21	.	.	53.0
77	12	22	.	.	52.0
77	12	23	.	.	51.0
77	12	24	.	.	51.5
77	12	25	.	.	52.0
77	12	26	.	.	51.0
78	2	15	46.5	46.5	46.3
78	2	16	46.5	46.0	45.5
78	2	17	46.5	46.8	45.5
78	2	18	46.8	47.3	46.0
78	2	19	47.4	49.0	46.0
78	2	20	46.9	48.0	45.9
78	2	21	46.9	49.0	46.1
78	2	22	47.0	47.8	44.6
78	2	23	46.5	47.0	44.5
78	2	24	46.5	47.0	44.5
78	2	25	46.4	47.3	44.8
78	2	26	47.3	48.0	47.9
78	2	27	48.0	49.5	45.1
78	2	28	49.1	50.0	46.0
78	3	1	49.4	50.0	46.0
78	3	2	49.3	50.0	46.3
78	3	3	49.4	50.0	46.5
78	3	4	49.5	50.0	46.5
78	3	5	49.1	50.0	47.0
78	3	6	49.5	50.0	46.5
78	3	7	49.3	49.8	46.5
78	3	8	49.8	49.8	47.3
78	3	9	52.1	52.8	49.4
78	3	10	51.9	52.8	49.5
78	3	11	51.0	51.0	48.1
78	3	12	50.9	51.0	48.4
78	3	13	52.3	52.3	49.5
78	3	14	53.4	53.5	50.3
78	3	15	53.4	53.8	50.6
78	3	16	54.1	54.5	51.3
78	3	17	54.4	55.3	53.0
78	3	18	54.8	56.0	53.5
78	3	19	55.0	56.0	54.0
78	3	20	55.3	56.0	54.5
78	3	21	55.5	56.0	55.0
78	3	22	55.5	56.5	.
78	3	23	55.8	57.5	.
78	3	24	57.3	58.8	.
78	3	25	59.2	59.0	.
78	3	26	59.3	60.0	.

POST-OPERATIONAL THERMOGRAPH DATA

YR	MO	DA	UPSTREAM	INTAKE	DOWNSTRM
78	3	27	59.8	60.0	•
78	3	28	60.8	60.0	•
78	3	29	60.3	60.0	•
78	3	30	60.0	60.3	•
78	3	31	60.0	61.0	•
78	4	1	61.0	61.5	•
78	4	2	62.0	63.0	•
78	4	3	•	64.0	•
78	4	4	•	65.0	•
78	4	5	•	63.8	•
78	4	6	•	63.0	•
78	4	7	•	63.0	•
78	4	8	•	63.0	•
78	4	9	•	64.5	•
78	4	10	•	65.8	•
78	4	11	•	66.3	•
78	4	12	64.0	66.0	58.3
78	4	13	64.3	64.0	58.0
78	4	14	65.1	65.3	58.3
78	4	15	65.6	66.5	59.1
78	4	16	66.0	67.0	61.4
78	4	17	66.9	67.3	60.4
78	4	18	66.5	67.0	59.9
78	4	19	65.8	66.0	59.8
78	4	20	66.5	66.5	60.0
78	4	21	67.0	67.5	61.4
78	4	22	67.0	68.0	62.8
78	4	23	67.0	68.0	62.0
78	4	24	67.0	68.0	62.9
78	4	25	67.0	68.0	62.1
78	4	26	66.9	67.8	61.8
78	4	27	66.6	67.0	62.3
78	4	28	67.0	67.3	64.0
78	4	29	67.0	68.0	66.3
78	4	30	67.3	68.0	67.4
78	5	1	67.9	68.0	68.3
78	5	2	67.5	68.0	67.5
78	5	3	67.5	68.0	66.5
78	5	4	67.5	•	67.6
78	5	5	68.0	•	68.0
78	5	6	69.8	•	•
78	5	7	70.0	•	•
78	5	8	70.0	•	•
78	5	9	70.0	•	•
78	5	10	70.0	•	•
78	5	23	76.5	78.5	78.0
78	5	24	75.3	75.3	76.1
78	5	25	75.0	74.0	75.1
78	5	26	75.0	74.0	75.1
78	5	27	75.0	74.0	75.1
78	5	28	75.0	74.0	76.8
78	5	29	75.0	74.0	75.4
78	5	30	74.8	74.0	75.6
78	5	31	74.0	74.0	77.0

POST-OPERATIONAL THERMOGRAPH DATA

YR	MO	DA	UPSTREAM	INTAKE	DOWNSTRM
78	6	1	74.3	72.0	76.5
78	6	2	75.0	72.0	76.3
78	6	3	74.0	•	77.0
78	6	4	74.0	•	78.0
78	6	5	74.0	•	77.3
78	6	6	•	•	77.0
78	6	7	•	•	77.8
78	6	8	•	•	77.3
78	6	9	•	•	76.0
78	6	10	•	•	77.0
78	6	11	•	•	79.0
78	6	12	•	•	78.0
78	6	13	79.8	77.0	78.3
78	6	14	78.6	77.0	78.0
78	6	15	78.5	77.8	78.3
78	6	16	78.5	79.0	79.3
78	6	17	78.7	79.0	80.8
78	6	18	79.0	79.0	81.8
78	6	19	79.0	79.0	79.5
78	6	20	79.0	79.0	82.8
78	6	21	79.0	79.0	81.0
78	6	22	79.0	79.0	81.5
78	6	23	79.0	79	81.5
78	6	24	79.3	79	82.5
78	6	25	80.8	79.	84.8
78	6	26	83.3	79.0	84.8
78	6	27	82.0	79.0	84.8
78	6	28	82.0	•	83.3
78	6	29	•	•	83.0
78	6	30	•	•	83.5
78	7	1	•	•	84.0
78	7	2	•	•	85.5
78	7	3	•	•	85.5
78	7	4	•	•	85.8
78	7	5	•	•	85.0
78	7	6	•	•	85.8
78	7	7	•	•	83.8
78	7	8	•	•	83.5
78	7	9	•	•	84.5
78	7	10	•	•	82.0
78	7	12	80.5	81.0	84.3
78	7	13	80.6	82.0	83.6
78	7	14	81.0	82.0	83.8
78	7	15	81.1	82.0	85.4
78	7	16	81.9	82.0	85.8
78	7	17	82.8	•	84.9
78	7	18	82.6	•	85.1
78	7	19	82.4	•	84.9
78	7	20	81.9	•	84.0
78	7	21	82.0	•	84.6
78	7	22	81.5	•	85.6
78	7	23	81.5	•	86.1
78	7	24	82.5	•	85.4
78	7	25	82.4	•	86.2

POST-OPERATIONAL THERMOGRAPH DATA

YR	MO	DA	UPSTREAM	INTAKE	DOWNSTRM
78	7	26	82.0	•	84.8
78	7	27	81.6	•	84.3
78	7	28	81.5	•	84.5
78	7	29	81.8	•	86.5
78	7	30	82.0	•	86.0
78	7	31	79.6	•	80.5
78	8	1	78.5	•	83.0
78	8	2	79.0	•	•
78	8	3	79.5	•	•
78	8	4	80.0	•	•
78	8	5	80.0	•	•
78	8	6	80.0	•	•
78	8	7	79.3	•	•
78	8	8	79.0	•	•
78	8	9	78.8	•	•
78	8	10	77.5	•	•
78	8	11	77.0	•	•
78	8	12	77.0	•	•
78	8	13	77.0	•	•
78	8	14	77.0	•	•
78	8	15	78.0	•	•
78	8	16	78.8	•	•
78	8	17	78.0	•	•
78	8	18	78.3	•	•
78	8	19	79.0	•	•
78	8	20	79.5	•	•
78	8	21	80.3	•	•
78	8	22	80.9	84.0	86.0
78	8	23	82.0	84.0	85.1
78	8	24	81.8	83.3	83.9
78	8	25	81.9	83.0	84.3
78	8	26	82.3	83.0	85.6
78	8	27	82.9	83.0	86.4
78	8	28	83.0	83.0	84.4
78	8	29	83.0	83.0	84.0
78	8	30	83.0	83.0	84.9
78	8	31	83.0	83.0	84.9
78	9	1	83.0	83.0	84.6
78	9	2	83.4	83.0	85.6
78	9	3	82.8	83.0	83.0
78	9	4	82.6	83.0	82.5
78	9	5	82.6	83.0	84.0
78	9	6	82.6	•	85.0
78	9	7	82.5	•	•
78	9	8	81.3	•	•
78	9	9	81.0	•	•
78	9	10	81.0	•	•
78	9	11	81.0	•	•
78	9	12	81.0	•	•
78	9	13	81.0	•	•
78	9	14	80.5	•	•
78	9	15	80.8	•	•
78	9	16	80.3	•	•
78	9	17	80.0	•	•

POST-OPERATIONAL THERMOGRAPH DATA

YR	MO	DA	UPSTREAM	INTAKE	DOWNSTRM
78	9	18	80.5	.	.
78	9	19	80.7	83.0	85.5
78	9	20	80.3	83.0	85.0
78	9	21	80.0	83.0	84.5
78	9	22	80.0	83.0	84.0
78	9	23	80.0	83.5	84.0
78	9	24	80.0	83.8	84.0
78	9	25	79.5	81.5	84.0
78	9	26	79.0	81.0	83.0
78	9	27	79.0	81.0	83.3
78	9	28	79.0	80.8	83.8
78	9	29	78.5	80.0	83.0
78	9	30	78.0	80.0	83.0
78	10	1	77.0	79.3	82.5
78	10	2	76.3	79.0	81.0
78	10	3	75.3	78.8	80.3
78	10	4	76.0	78.0	81.0
78	10	5	75.5	78.0	.
78	10	6	75.0	78.0	.
78	10	7	74.3	78.0	.
78	10	8	73.0	77.3	.
78	10	9	71.3	76.0	.
78	10	10	71.0	75.0	.
78	10	11	71.0	75.0	.
78	10	12	71.0	75.0	.
78	10	13	71.0	75.0	.
78	10	14	71.0	75.0	.
78	10	15	69.5	73.0	.
78	10	16	68.8	71.0	.
78	10	17	69.1	72.0	73.0
78	10	18	68.3	72.6	72.0
78	10	19	66.0	73.0	71.3
78	10	20	65.8	73.0	71.0
78	10	21	65.8	74.0	71.0
78	10	22	65.0	74.0	70.3
78	10	23	65.5	74.0	70.0
78	10	24	66.0	73.3	70.0
78	10	25	66.0	73.0	70.0
78	10	26	66.5	73.0	70.0
78	10	27	67.0	73.0	70.0
78	10	28	66.0	73.0	70.0
78	10	29	66.0	73.0	70.0
78	10	30	66.3	73.0	70.0
78	10	31	66.0	73.0	70.0
78	11	1	66.3	73.0	70.0
78	11	2	65.8	73.0	70.3
78	11	3	65.0	73.0	71.0
78	11	4	65.0	73.0	70.8
78	11	5	65.0	73.0	71.0
78	11	6	64.8	73.0	.
78	11	7	64.3	73.0	.
78	11	8	64.0	73.0	.
78	11	9	64.0	73.0	.
78	11	10	64.0	73.0	.

POST-OPERATIONAL THERMOGRAPH DATA

YR	MO	DA	UPSTREAM	INTAKE	DOWNSTRM
78	11	11	64.0	73.0	•
78	11	12	63.3	73.0	•
78	11	13	63.0	73.0	•
78	11	14	63.0	73.0	•
78	11	15	63.5	73.0	•
78	11	16	64.3	73.0	•
78	11	17	64.3	73.0	•
78	11	18	64.3	73.0	•
78	11	19	64.3	73.0	•
78	11	20	64.0	73.0	•
78	11	21	63.8	73.0	•
78	11	22	62.9	73.0	•
78	11	23	63.0	•	•
78	11	24	63.0	•	•
78	11	25	63.0	•	•
78	11	26	62.9	•	•
78	11	27	63.0	•	•
78	11	28	61.6	63.0	64.0
78	11	29	61.0	63.0	64.0
78	11	30	61.9	63.5	64.8
78	12	1	62.0	64.0	65.0
78	12	2	61.0	64.0	65.0
78	12	3	61.0	64.0	65.0
78	12	4	61.8	64.0	66.0
78	12	5	61.0	64.0	66.0
78	12	6	60.5	64.0	65.0
78	12	7	60.8	64.0	65.0
78	12	8	60.5	64.0	64.3
78	12	9	60.3	64.0	64.0
78	12	10	59.0	64.0	63.5
78	12	11	58.0	64.0	62.5