A 07/10/78

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)
DISTRIBUTION FOR INCOMING MATERIAL 50-438/439

REC: ~~NRC~~ REGAN W 14 ORG: GILLELAND J E DOCDATE: 07/03/78
NRC TN VALLEY AUTH DATE RCVD: 07/07/78

DOCTYPE: LETTER NOTARIZED: NO COPIES RECEIVED
SUBJECT: LTR 1 ENCL 1
RESPONSE TO NRC LTR DTD 05/23/78...FORWARDING ADDL INFO REQUIRED TO CONTINUE NRC REVIEW OF "REPT ON LARVA FISH ENTRAINMENT FOR THE YEARS 1975-1976", FOR SUBJECT FACILITY.

PLANT NAME: BELLEFONTE -- UNIT 1 REVIEWER INITIAL: XJM
BELLEFONTE - UNIT 2 DISTRIBUTER INITIAL: mc

********** DISTRIBUTION OF THIS MATERIAL IS AS FOLLOWS **********

ENVIRONMENTAL COMMENTS
(DISTRIBUTION CODE C002)

FOR ACTION:	ASST DIR MOORE**LTR ONLY	BR CHIEF EPB#2 BC**W/ENCL
	PROJ MGR R. BOYLE**W/ENCL	LIC ASST DUNCAN**W/ENCL
FOR INFO:	VASSALLO**LTR ONLY(1)	LWR#3 BC**LTR ONLY(1)
FOR INFO:	~~PIKE**LTR ONLY(1)~~	LWR#3 LA**LTR ONLY(1)
INTERNAL:	REG FILE**W/ENCL	NRC PDR**W/ENCL
	I & E**W/2 ENCL	OELD**LTR ONLY
	HANAUER**W/ENCL	DIRECTOR DSE**W/ENCL
	AD FOR ENV TECH**LTR ONLY	ENVIRO SPEC BR**W/ENCL
	COST BENEFIT ANLYS**W/ENCL	AD FOR SITE TECH**W/2 ENCL
	AD FOR SITE ANLYS**LTR ONLY	ACCIDENT ANALYSIS**W/ENCL
	EFFLUENT TREAT SYS**W/ENCL	RAD ASSESSMENT BR**W/ENCL
EXTERNAL:	LPDR'S SCOTTSBORO, AL**W/ENCL	
	NATL LAB ANL**W/6 ENCL	
	NSIC**W/ENCL	
	TIC**W/ENCL	
	ACRS CAT B**W/O ENCL	

DISTRIBUTION: LTR 34 ENCL 26 CONTROL NBR: 781880111
SIZE: 1P+10P

********** THE END **********

encl pl

TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
830 Power Building

JUL 3 1978

Director of Nuclear Reactor Regulation
Attention: Mr. William H. Regan, Jr., Chief
Environmental Projects Branch 2
Division of Site Safety and
Environmental Analysis
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Regan:

In the Matter of the Application of) Docket Nos. STN 50-438
Tennessee Valley Authority) STN 50-439

We are enclosing the additional information required to continue your review of the "Report on Larval Fish Entrainment for the Years 1975-1976" for the Bellefonte Nuclear Plant. This information was requested in your May 23, 1978, letter to N. B. Hughes.

The report was submitted on June 28, 1977, pursuant to environmental conditions 3.D.(1) and (2) of the Bellefonte Nuclear Plant Construction Permits (Nos. CPPR-122 and CPPR-123). Since the final decision on the acceptability of the proposed intake will result from a cost-benefit analysis based on the information given in this report, we request that the review be concluded in a timely manner so as not to impact the construction of the intake facilities.

Very truly yours,

J. E. Gilleland
Assistant Manager of Power

Enclosure

Coo2
ES
1/1

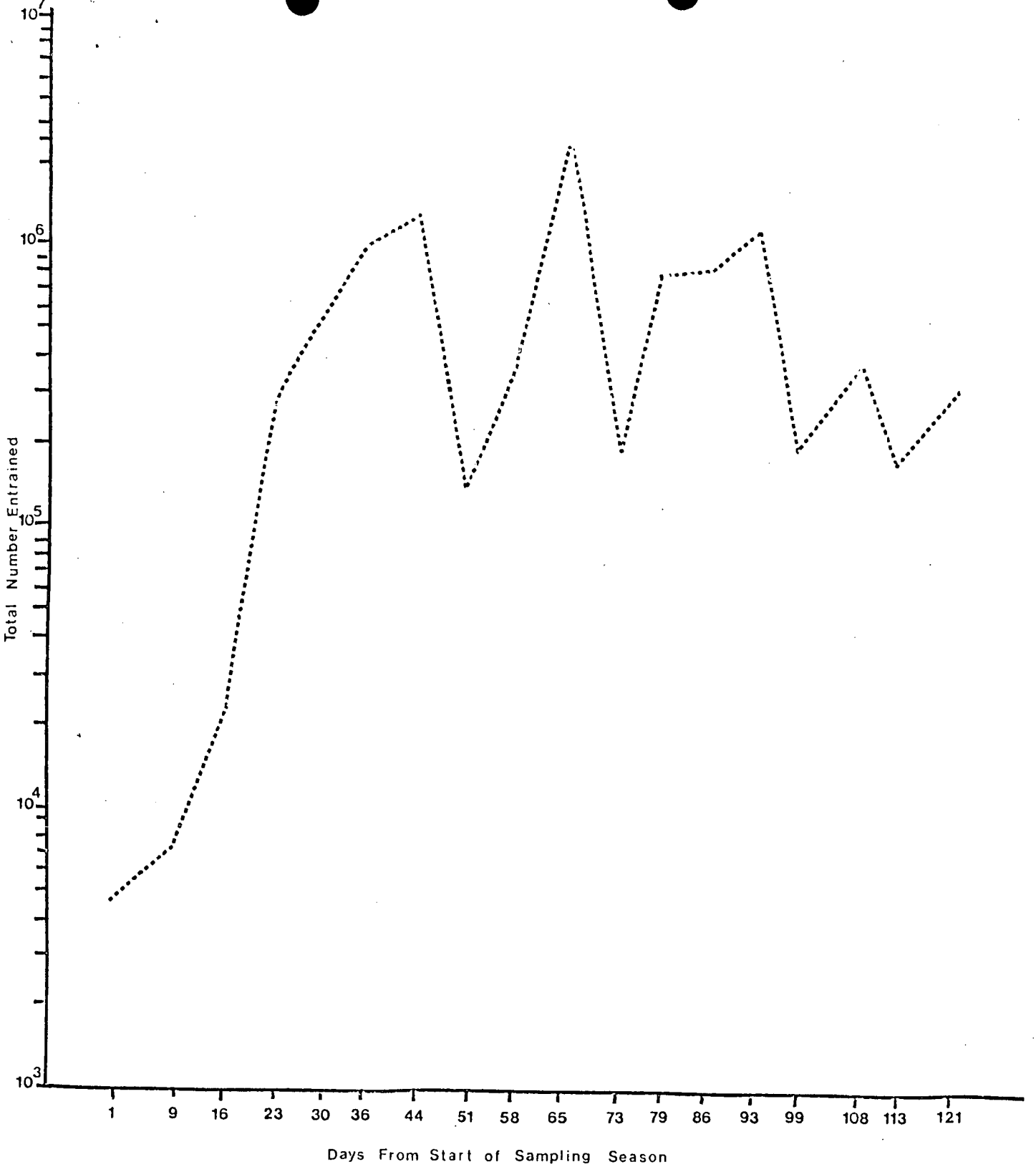


Figure 3. Estimated number of larvae entrained by sample date.

Question:

4. What integration technique is used to obtain estimates of the annual entrainment and river transport?

Answer:

Numbers of ichthyoplankters entrained during a 24-hour period were calculated using the method given in the preceding response for each sample date. These were then plotted (computer modeled) as in Figure 3, and a trapezoidal integration technique employed to determine the area under the curve. This area is an estimate of the total numbers entrained annually.

Computation of the numbers transported past the plant annually was accomplished similarly. Numbers passing the plant during a 24-hour period for each sample date were calculated by the method given in response to question number three. The trapezoidal integration technique was again employed.

Table 1. Potential number of larval fish entrained (estimated) at Bellefonte Nuclear Plant, on June 22, 1976, (Sample period 14).

Stations in zone of intake influence	Station Subscript (j)	Station Weight	Density per m^3	Potential Number Entrained ($\times 10^6$ day^{-1})
8 (shallow; 0-3m)	1	0.5	4.74	0.871
8 (deep; 4-6m)	2	0.5	1.42	0.261
Total		1.0		1.132

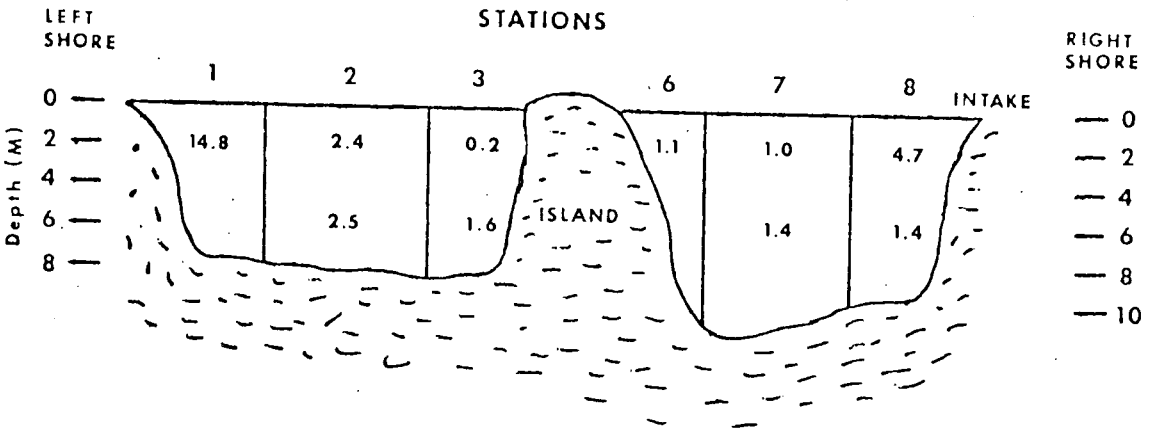


Figure 2. Number of fish larvae (all species combined) per m^3 for each subarea of the cross sectional profile at TRM 392.2. Data are for sample period 14 at the Bellefonte Nuclear Plant site in 1976.

$$N_t = \sum_{i=1}^{11} (S_i D_i) Q_r$$

where

N_t is the estimated number of larvae transported past the plant site in a 24-hour period.

S_i are weights for the stations in the plant transect,

Q_r is the 24-hour reservoir flow past the plant on sample period 14 ($97{,}020{,}000 m^3 day^{-1}$), and

D_i is larval fish density for station i in numbers m^{-3}.

N_t determined using the data in Figures 1 and 2 was $3.909 \times 10^8 day^{-1}$.

Because strata volumes at stations where more than one depth was sampled were similar; the densities (as given in Figure 2) were averaged for computational simplicity.

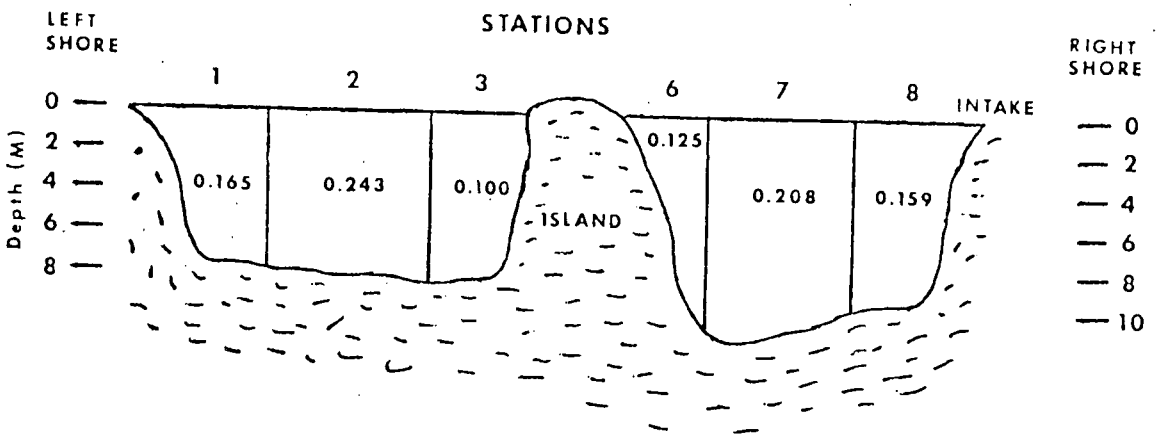
The proportion of those ichthyoplankters passing the plant potentially entrained in 1976, had the plant been operational, was simply

$$P = N_c N_t^{-1}$$

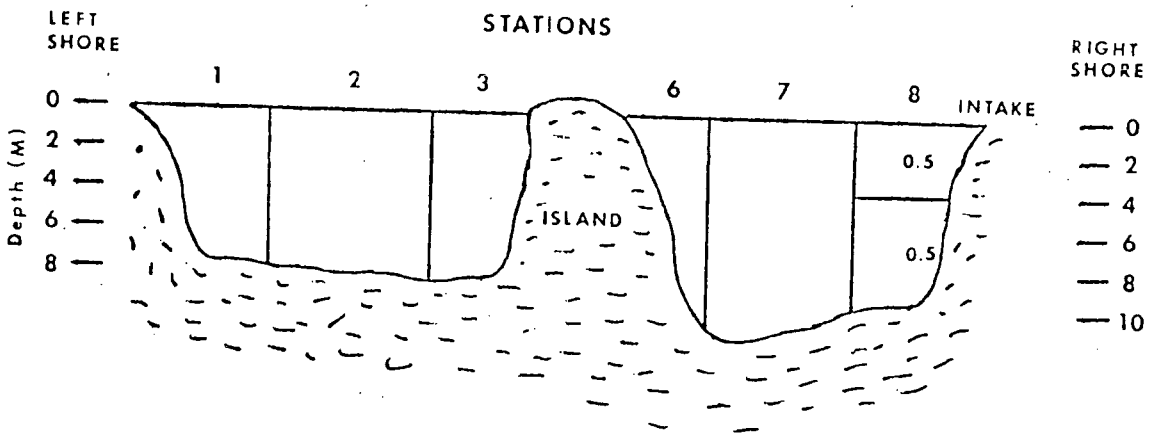
where P is the proportion of the ichthyoplankton community entrained. Thus, potential percent entrained was estimated as

$$P = \frac{1.14 \times 10^6}{3.909 \times 10^8} \times 100 = 0.29\%.$$

Figure 1. Station weights for the Bellefonte Plant transect at TRM 392.2 in 1976, and for the station and strata vulnerable to the intake of the plant.



Stations vulnerable to plant intake



REQUEST FOR ADDITIONAL INFORMATION ON THE
"REPORT ON LARVAL FISH ENTRAINMENT FOR THE YEARS 1975-1976"
FOR THE BELLEFONTE NUCLEAR PLANT

Question:

1. What percent of the Town Creek embayment water travels along the backwater region to the intake area? Will this contribution be increased when Bellefonte begins operation?

Answer:

Water from Town Creek embayment enters Guntersville Reservoir by two routes. The primary means is the original bed of Town Creek. This discharges directly into the deep river channel on the right side of Bellefonte Island and has a cross-sectional area of approximately 450 square feet. The other connection between Guntersville Reservoir and the Town Creek embayment is a narrow opening which connects Town Creek embayment with the shallow overbank area along the right shore. The cross-sectional area is approximately 75 square feet. Field investigations indicate that velocities in each of these connecting channels are comparable. Based on these figures, TVA believes that approximately 15 percent of the flow from Town Creek embayment will enter the shallow overbank area of the reservoir upstream from the Bellefonte Nuclear Plant intake.

A description of the intake design is provided in chapter three of the Bellefonte Operating License Stage Environmental Report. The intake design provides for hydraulic withdrawal of water from the main river channel through a 1200-foot dredge cut to the original riverbed. This design should not measurably affect flows in the backwater region of Town Creek.

Question:

2. Provide the values for the station weights (W_s) used in the analytical procedures. It is unclear whether gear efficiencies are included within the weight.

Answer:

The requested station weights are shown in Figure 1. The values approximate the cross-section component of each station at TRM 392.2. Values for both the entire river width and for the presumed zone of intake influence are shown. They sum to 1.0 in both instances.

All data used for quantitative ichthyoplankton estimates at the Bellefonte Nuclear Plant site in 1976 were collected with the same gear type, a towed net 0.5 m square. Gear efficiencies are therefore presumed to be 100 percent (or at least similar) for all areas and consequently are not included in the weighting factors.

Question:

3. Provide the densities (total number of larvae per m^3) for each subarea of the cross-sectional profile for one sample date (e.g., sample period 14 in 1976). This might be presented in the manner of Figure 2 of the referenced report by Marcy. For this example case, demonstrate the analytical method in arriving at the estimated entrainment of total fish larvae (N and %) as presented for the sample period (No. 14) in Table 5.

Answer:

The number of larvae (all species combined) per m^3 for each subarea of the cross-sectional profile during sample period 14 at the Bellefonte Nuclear Plant site in 1976 is presented in Figure 2.

The potential number of larval fish entrained (N_e) during sample period 14 was estimated from the equation

$$N_e = \sum_{j=1}^{3} (S_j D_j) Q_i$$

where

N_e is the number of ichthyoplankters estimated to be entrained,

S_j are the station weights (one station, two depths) for the station in the presumed zone of intake influence,

D_j are larval densities (number m^{-3}) for the station, and

Q_i is the 24-hour maximum intake demand ($3.675 \times 10^5 m^3 day^{-1}$).

The estimated number potentially entrained was 1.14×10^6.

Relevant data are given in Table 1.

The estimated number of larval fish transported (N_t) past the Bellefonte Nuclear Plant site during sample period 14 in 1976 was calculated in a similar manner; e.g.,

Question:

5. In Figure 3, five of the six comparisons of hydraulic entrainment versus biotic entrainment show the "assumption of equivalence" to be conservative. The exception (bottom middle plot) is of interest because the "assumption" is non-conservative in this one case. Which plant(s) of the six examples, if any, might be considered analogous to the Bellefonte site, intake design, and capacity?

Answer:

Based on intake demand, none of the examples are analogous, since intake demand for the six plants ranges from 40 to 102 m^3 sec^{-1}, but is only about 4 m^3 sec^{-1} for Bellefonte Nuclear Plant. Other factors (site, intake design) lack sufficient specificity to allow an answer to be developed. The six plants are (top row, left to right): Widows Creek, Gallatin, Kingston; (bottom row, l-r): Johnsonville, Shawnee, Cumberland. Further details are in 316(b) reports available from EPA.

The exception of interest is Shawnee Steam Plant, located on the Ohio River. This plant draws water through a 610-m-long intake canal and has a condenser cooling water demand (once-through cooling) of approximately 71 m^3 sec^{-1}. When compared to Bellefonte, which is on the Tennessee River, with no intake canal and a makeup demand of only about 4 m^3 sec^{-1}, it is clear that no analogy exists between the two plants.