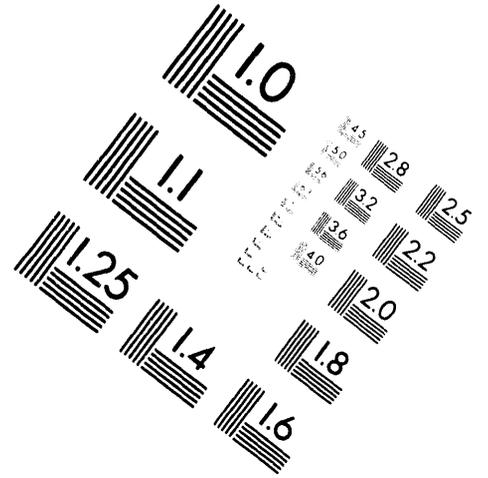
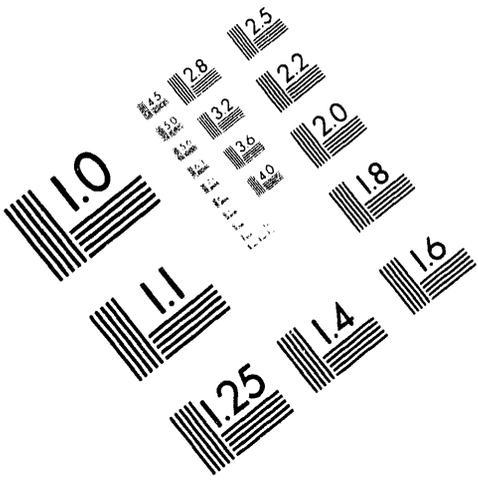




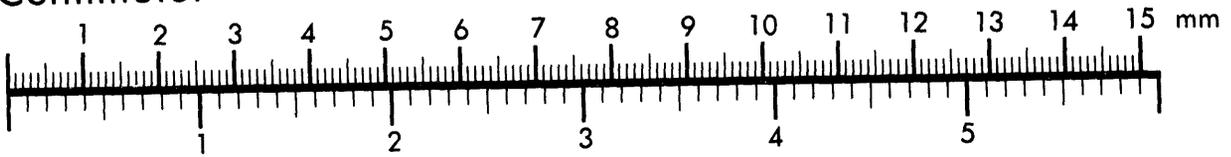
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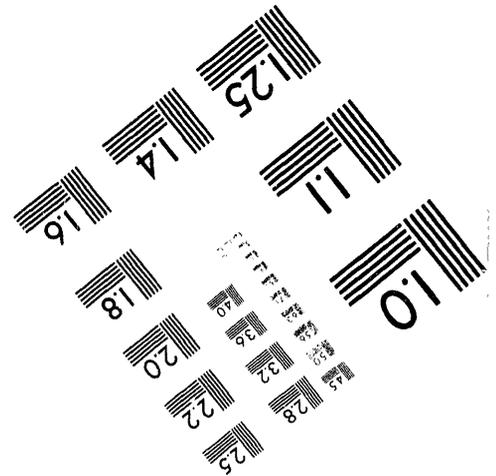
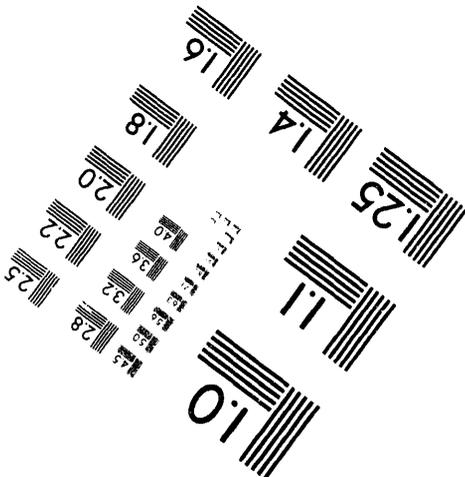
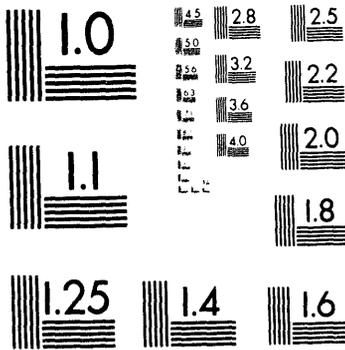
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BNWL-CC-1411 (Addendum)

IMPACT OF PROPOSED WASHINGTON STATE
WATER QUALITY STANDARDS ON HANFORD

By

J. P. Corley and J. M. Selby

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Environmental Studies Section
ENVIRONMENTAL HEALTH DEPARTMENT

November 17, 1967

PACIFIC NORTHWEST LABORATORY
RICHLAND, WASHINGTON
operated by
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UNITED STATES ATOMIC ENERGY COMMISSION UNDER CONTRACT AT(45-1)-1830

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IMPACT OF PROPOSED WASHINGTON STATE
WATER QUALITY STANDARDS ON HANFORD

Subsequent to the issuance of BNWL-CC-1411, the Atomic Energy Commission has prepared a new proposal on the permissible incremental increase in the Hanford reach of the Columbia. The proposal is to limit ΔT to 2.8°C at a natural river temperature of 10°C or lower and 1.1°C at a natural river temperature of 18.9°C . This proposal also includes an absolute maximum temperature T_f of 20°C and a maximum of 15°C during the month of November. This proposal can be expressed in a formula

$$\Delta T = 3.45 - 0.235 (T_f - 10) ^{\circ}\text{C} \text{ (where } T_f = T \text{ natural} + \Delta T \text{).}$$

The impact of this proposed incremental temperature limitation was reviewed as to the permissible thermal loading and the effect on average river temperatures. The new data were added to the figures contained in the original report. Thus the new figures contain some data previously reported. An additional curve for minimum flow rate was added to Figure 1. This curve was produced by shifting the average flow rate curve downward to meet a low flow rate of 36,000 cfs. For further details on the basic assumptions used in this addendum refer to the original report.

The permissible total thermal loading for four different incremental increases are shown in Figure 2. These are calculated utilizing average flow rate and temperature conditions, and the four different incremental increase formulas:

$$(1) \quad \Delta T = 1.1^{\circ}\text{C}$$

$$(2) \quad \Delta T = \frac{28}{T_f + 10} ^{\circ}\text{C}$$

$$(3) \quad \Delta T = \frac{32}{T_f + 8} ^{\circ}\text{C}$$

$$(4) \quad \Delta T = 3.45 - 0.235 (T_f - 10) ^{\circ}\text{C}.$$

The discontinuity on the curve for formula number 4 above demonstrates the temperature restriction of 15°C in November.

Figure 3 was prepared using the same four thermal loading cases as previously discussed in the text, a maximum temperature of 20°C , and an incremental increase of $\Delta T = 3.45 - 0.235 (T_f - 10) ^{\circ}\text{C}$. The drastic reduction in permissible thermal loading during November is a result of the proposed temperature restriction of 15°C , especially for the two cases where the natural temperature cycle is expected to be shifted in time because of Canadian Dam construction.

The effect of thermal loading on the average temperature with a temperature increment of $\Delta T = 3.45 - 0.235 (T - 10)^{\circ}\text{C}$ and an average flow rate is shown in Figure 4. The temperature restriction in November is responsible for the notch in the curve.

Permissible incremental temperatures based on three of the proposed formulas are shown in Figure 5. A maximum of 20° was used with each formula and a maximum incremental temperature of 2.8°C was used with the formula $\Delta T = 3.45 - 0.235 (T - 10)^{\circ}\text{C}$.

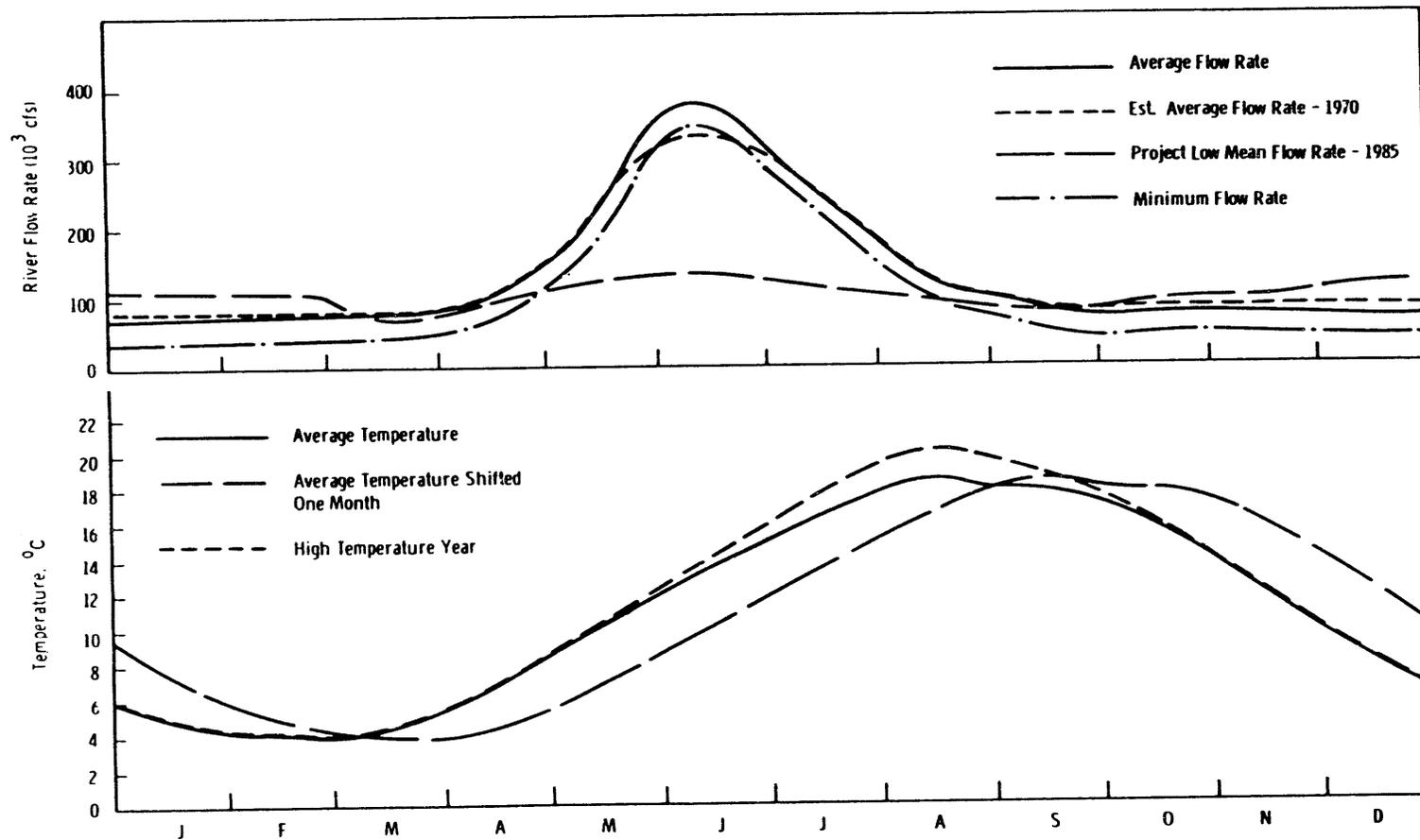


FIGURE 1
 Temperature and Flow Rate Cycles of the Columbia River at Priest Rapids Dam

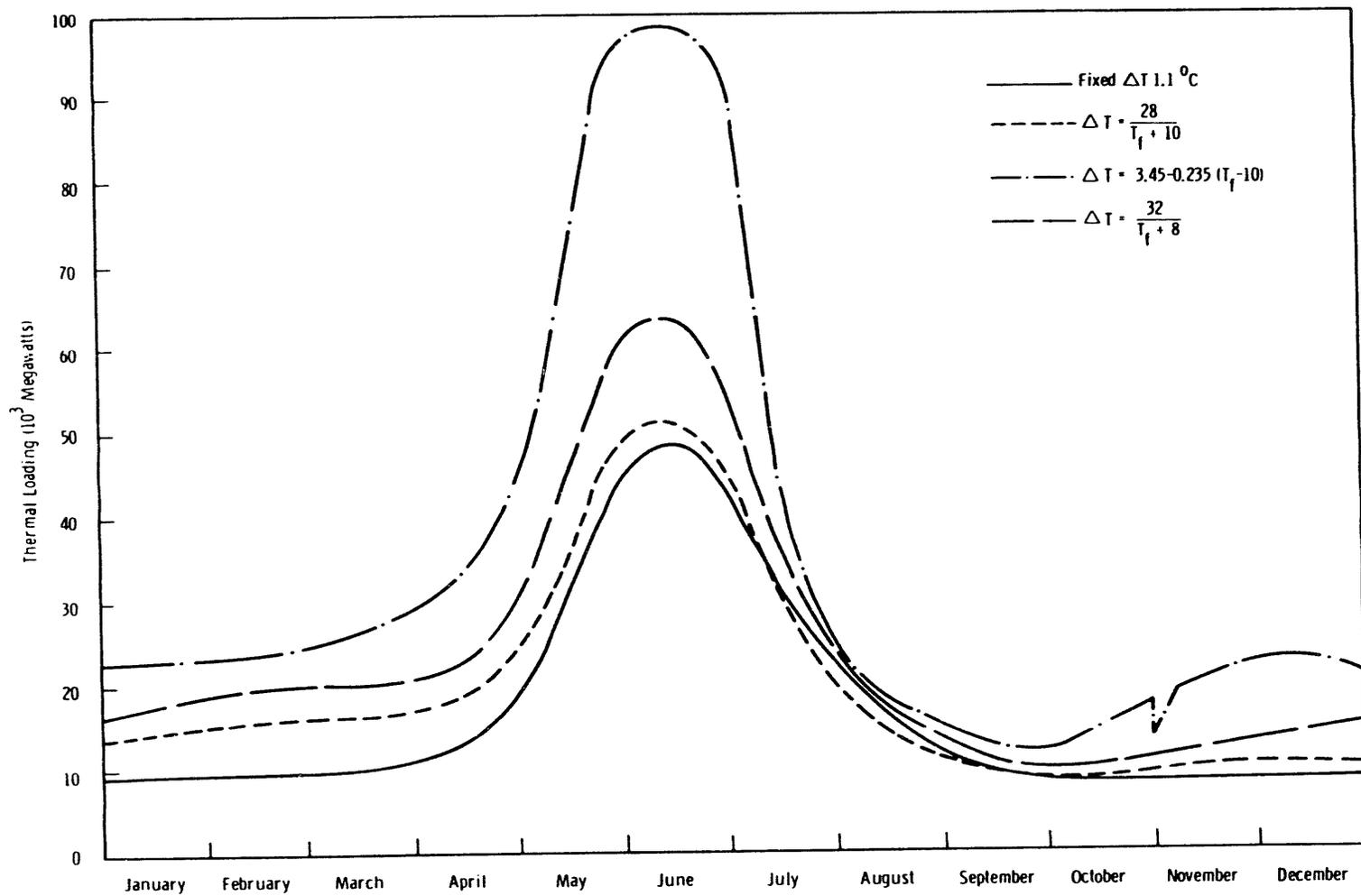


FIGURE 2
 Effect of ΔT Formulas on Available Thermal Loading - Average River Conditions

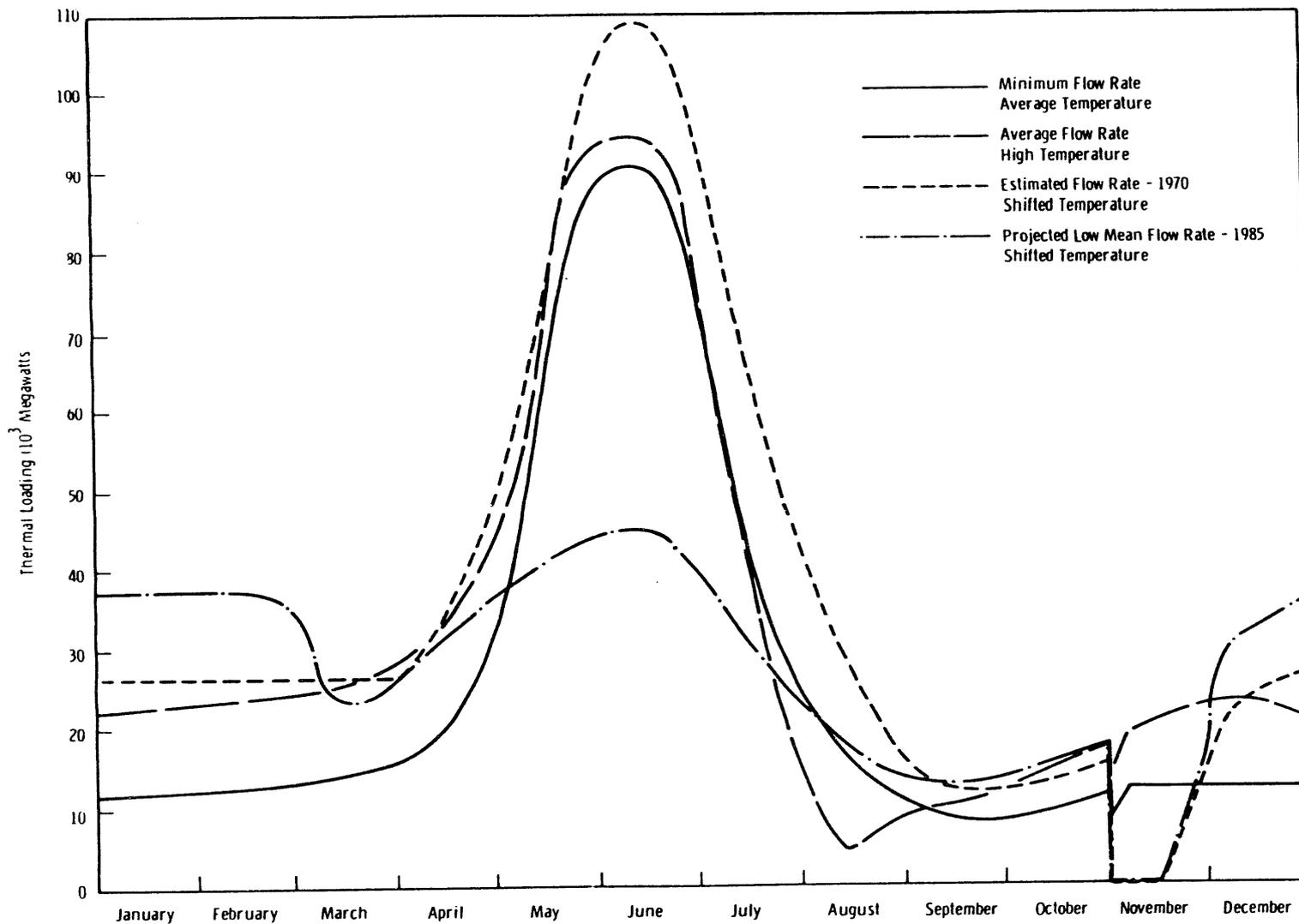


FIGURE 3
 Effect of Adjusted River Conditions on Thermal Loading
 With $\Delta T = 3.45 - 0.235 (T_f - 10)$

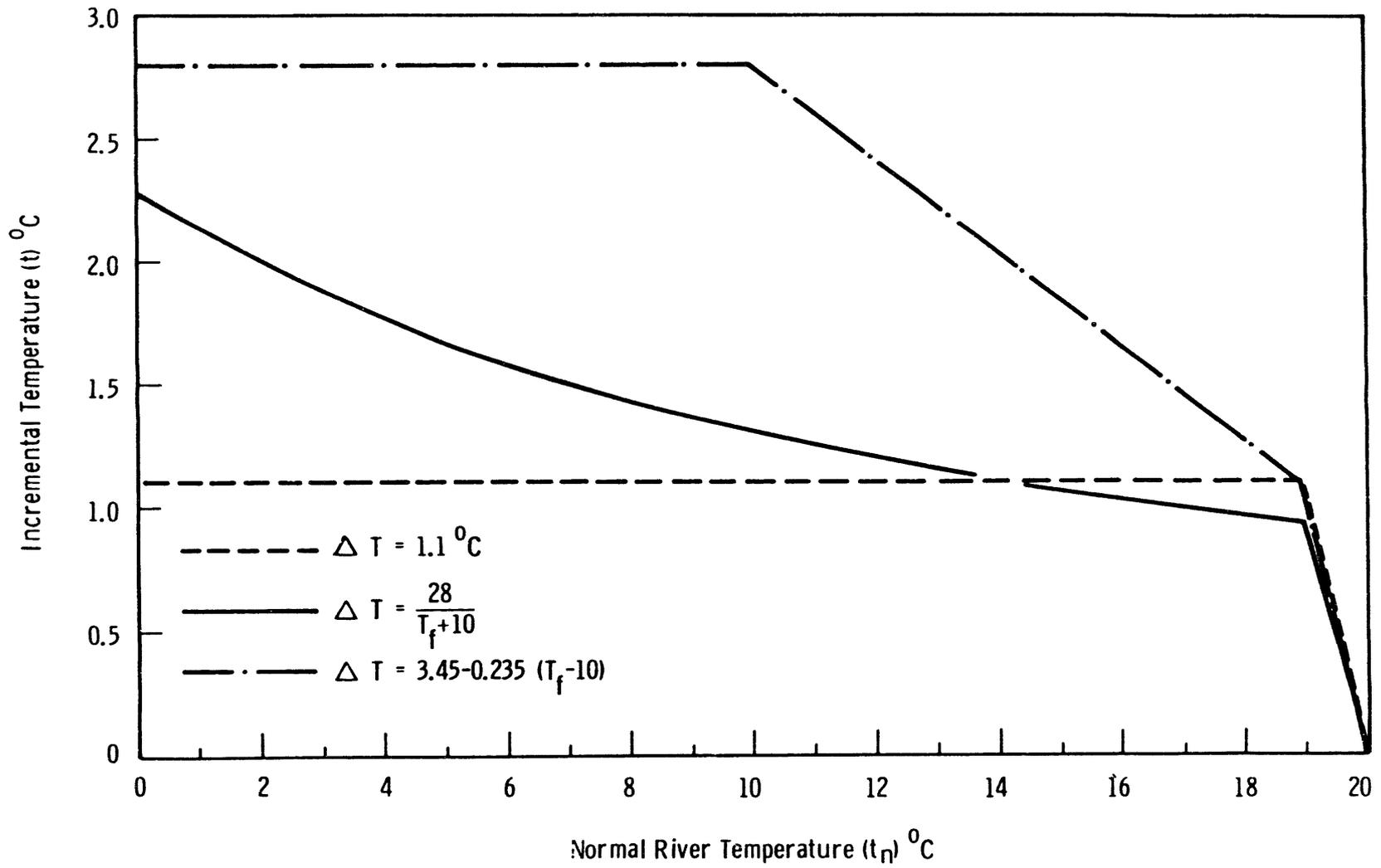


FIGURE 5
Proposed Incremental Temperature

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