Great Lakes and Environmental Assessment Section

PROCEDURE NO 34

Temperature Calculations

The following procedure is to be used as guidance in screening and developing temperature limit recommendations for NPDES permits. Review recommended temperature limits with the WQA Unit Supervisor as appropriate.

1. Determine if the discharge has an approved demonstration submitted under Section 316(a) of the Clean Water Act. If yes, use the approved demonstration to determine thermal limits. If no, proceed to Step 2.

2. Compare the average temperature reported for the discharge to the appropriate Water Quality Standard. Usually only winter and summer temperatures are given in the permit applications. Professional judgment should be used in determining which monthly standard to compare with winter and summer temperatures.

   a. If the average temperature reported in the permit application is less than the Water Quality Standard (WQS), no average limit is needed. Proceed to (3).

   b. If the average temperature reported is greater than the Water Quality Standard, calculate a theoretical discharge limit (Te) for each month using the following formula:

$$Te = \frac{WQS\ (Qr+Qe) - TR(Qr)}{Qe}$$

   where: Te = effluent temperature (°F) to meet WQS at edge of mixing zone
   WQS = monthly WQS temperature (°F)
   Qr = 95% river flow in cubic feet per second (cfs) by month
   Qe = effluent flow (cfs)
   TR = design river temperature (°F) which is the monthly WQS minus 5°F (warm water), 2°F (cold water), or 3°F (Great Lakes)

   c. Compare the theoretical discharge limit (Te) to the average effluent temperature in the permit application to determine if permit limits are necessary.

3. For monthly maximum temperatures, compare the permit application maximum temperature to either 70°F or the appropriate monthly Water Quality Standard plus 10°F, whichever is greater. If the permit application maximum temperature is greater, consideration should be given to recommending a daily maximum temperature limit. The maximum temperature limit should be developed after consideration of affected species and their thermal tolerances, discharge location and mixing characteristics. The recommendations contained in the Water Quality Criteria (1972) section “Short-term exposure to extreme temperatures” (p. 161) should be used as a starting point.

4. For the period November through March, consideration should be given to requirements to prevent cold shock, which may require temperature and/or shutdown requirements to prevent important species from dying when elevated temperatures suddenly drop to the normal ambient temperature. The recommendations contained in Water Quality Criteria (1972) section “Winter Maxima” should be used as a starting point.

For more complex modeling calculations of temperature beyond this procedure, assistance from the Water Quality Studies Unit should be requested.

Approved: _____

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