APPENDIX 9
DILUTION FACTOR AND EFFLUENT LIMITATION CALCULATIONS FOR NEW HAMPSHIRE

Prior to completing the Notice of Intent (NOI) requirements for the AQUAGP, the applicant must contact the State to confirm the critical low flow (7Q10) of the receiving water, dilution factor (DF), other appropriate hydrologic conditions, and to confirm site-specific limiting factors, including additional water quality-based effluent limitations (WQBELs). See Part I.C.2 of Appendix 4 (Suggested NOI Format and Instructions) for contact information.

I. Dilution Factor

A DF for sites that discharge to freshwater receiving waters in New Hampshire is calculated using a 10% reserve of the receiving water's assimilative capacity according to Env-Wq 1705.01 (or as revised) as specified below. Alternate calculation methods for DFs may be acceptable if approved by the State. A DF for sites that discharge to saltwater receiving waters in New Hampshire is assumed to be 1:1, unless otherwise approved on a case-by-case basis by the State.

A. Determine 7Q10:

Facility's discharging in New Hampshire must use the Dingman method to calculate 7Q10 values[1]. The applicant may contact New Hampshire Department of Environmental Services (NHDES) for this calculation or provide their own calculations for review. Resources to assist in calculations of the 7Q10 flow include:

1. SWToolbox: SWToolbox is a desktop application that builds upon past tools, such as SWSTAT and DFLOW, which have historically been used to estimate low flow statistics from stream gage data. SWToolbox allows users to compute n-day frequency analyses (i.e., 1Q10 or 7Q10) and biologically based flows. It also facilitates the use of USGS National Water Information System (NWIS) streamflow data, as well as user-provided data files. The SWToolbox desktop application can be downloaded at: https://water.usgs.gov/osw/swtoolbox/.

2. StreamStats: StreamStats is a web application that provides access to an assortment of geographic information system (GIS) analytical tools that are useful for water resources planning and management, as well as engineering and design purposes. StreamStats can be used for mapping and exploring the drainage area and stream gages near a discharge location of interest. StreamStats is available at: https://www.usgs.gov/mission-areas/water-resources/science/streamstats-streamflow-statistics-and-spatial-analysis-tools.

B. Calculate Dilution Factor:

1. The equation used to calculate the dilution factor is:

[1] Dingman, S.L., and Lawlor, S.C. 1995. *Estimating Low-Flow Quantiles from Drainage-Basin Characteristics in New Hampshire and Vermont*. American Water Resources Association, Water Resources Bulletin: pp 243-256.

$$Dilution\ Factor = \frac{Q_R + Q_P}{Q_P} \times 0.9$$

Where:

Q_R = 7Q10 in million gallons per day (MGD)
Q_P = Discharge flow in MGD
0.9 = Factor to reserve 10 percent of the receiving water's assimilative capacity

When the 7Q10 value (Q_R) is determined to be a downstream value based on the Dingman method, the discharge flow (Q_p) should not be added in the numerator.

II. Effluent Limitation Calculations

Applicants applying to discharge to receiving waters in New Hampshire shall utilize the calculation instructions provided below to calculate effluent limitations for formaldehyde and hydrogen peroxide, as specified in Part 2.1 of the AQUAGP. WQBELs are calculated using a 10% reserve of the receiving water's assimilative capacity according to ENV-Wq 1705.01 (or as revised) as specified below. A suggested electronic format for the calculations required in this appendix can be downloaded from EPA's website available at: https://www.epa.gov/npdes-permits/draft-aquaculture-general-permit.

A. Calculate WQBELs:

If no dilution applies, the WQBELs specified in Part 2.1 of the AQUAGP for formaldehyde and hydrogen peroxide shall be applied directly, without credit for dilution. Therefore, if no dilution applies, skip this step.

Note that if the discharge concentration (C_d below) is calculated to be lower than the criterion multiplied by 0.9, then the WQBEL is set at the criterion. Calculate the WQBEL as follows:

1. Calculate the freshwater WQBEL for a parameter detected in the receiving water or for saltwater receiving waters for which NHDES has approved a dilution factor on a case-by-case basis as:

$$C_d = \frac{Q_r(C_r \times 0.9) - Q_s C_s}{Q_d}$$

Where:

C_d = Discharge concentration (i.e., WQBEL) in µg/L
Q_r = Downstream receiving water flow in MGD[2]
C_r = Downstream concentration (i.e., water quality criterion) in µg/L[3]
0.9 = Factor to reserve 10 percent of the receiving water's assimilative capacity
Q_s = Upstream flow (i.e., 7Q10) in MGD

[2] Equal to the sum of the upstream 7Q10 and the discharge flow. If available, a downstream 7Q10 may be used.
[3] Use the water quality criterion as calculated in Part II.A of this appendix for copper or the water quality criterion listed in Part 2.1 of the AQUAGP for formaldehyde and hydrogen peroxide.

C_s = Upstream concentration in µg/L[4]
Q_d = Discharge flow in MGD[5]

When the 7Q10 value (Q_s) is determined to be a downstream value based on the Dingman method, Q_s is adjusted by subtracting the discharge flow (Q_d) from the calculated 7Q10 value.

2. Calculate the WQBEL for a parameter either not detected in the receiving water, or for which receiving water sampling is not required as:

$$C_d = \frac{C_r Q_r}{Q_d} \times 0.9$$

[4] If the sample size is greater than 1, the median value may be used.
[5] Equal to the effluent flow limitation.