Reasonable Potential Analysis and Limit Derivation

The following procedures will be used to (1) determine if a facility's discharge has the reasonable potential to cause or contribute to an excursion above State Water Quality Standards and, if it does, (2) to calculate water quality-based effluent limits for the pollutant of concern. While, effluent limitations may vary between facilities covered under the General Permit, the procedures outlined in this appendix will remain consistent. For further information related to this procedure, including the choice of variables for input to the equations, see Parts 3.0 and 4.0 of the Draft PWTF GP fact sheet.

For establishing facility-specific effluent limits, EPA will conduct a reasonable potential analysis and, if necessary, derive effluent limits according to the methodology described below.

A reasonable potential analysis is completed using a single set of critical conditions for flow and pollutant concentration that will ensure the protection of water quality standards. To determine the critical condition of the effluent, EPA projects an upper bound of the effluent concentration based on the observed monitoring data and a selected probability basis. EPA generally applies the quantitative approach found in Appendix E of the *Technical Support Document for Water Quality-based Toxics Control* (TSD)[1] to determine the upper bound of the effluent data. This methodology accounts for effluent variability based on the size of the dataset and the occurrence of non-detects (i.e., samples results in which a parameter is not detected above laboratory detection limits). For datasets of 10 or more samples, EPA uses the upper bound effluent concentration at the 95th percentile of the dataset. For datasets of less than 10 samples, EPA uses the maximum value of the dataset.

For discharges to streams and rivers, the critical condition for flow in the receiving water is set as the 7Q10 flow in Massachusetts and New Hampshire. A 7Q10 flow is defined as the lowest mean flow for seven consecutive days, with a recurrence interval of once in ten years. This methodology distinguishes between discharges where a 7Q10 flow can and cannot be calculated, i.e., discharges to streams and rivers where a 7Q10 flow can be calculated and discharges to lakes, ponds, reservoirs, and tidally influenced waterbodies where a dilution factor based on alternative critical flow conditions is necessary.

For Discharges to Streams and Rivers

For discharges, EPA uses the calculated upper bound of the effluent data, along with a concentration representative of the parameter in the receiving water, the critical effluent flow, and the critical upstream flow to project the downstream concentration after complete mixing using the following simple mass-balance equation:

$$C_s Q_s + C_e Q_e = C_d Q_d$$

Where:

[1] Available at: https://www3.epa.gov/npdes/pubs/owm0264.pdf.

C_s = upstream concentration[2]
Q_s = upstream flow (critical low flow upstream of the outfall: 7Q10)
C_e = effluent concentration[3]
Q_e = effluent flow of the facility (maximum flow reported on the permittee's NOI)
C_d = downstream concentration
Q_d = downstream flow ($Q_s + Q_e$)

Solving for the downstream concentration results in:

$$C_d = \frac{C_s Q_s + C_e Q_e}{Q_d}$$

When both the downstream concentration (C_d) and the effluent concentration (C_e) exceed the applicable criterion (multiplied by 0.9[4] for discharges in New Hampshire), there is reasonable potential for the discharge to cause, or contribute to an excursion above the water quality standard. *See* 40 C.F.R. § 122.44(d). When EPA determines that a discharge causes, has the reasonable potential to cause, or contribute to such an excursion, the permit must contain WQBELs for the parameter. *See* 40 C.F.R. § 122.44(d)(1)(iii). Limits are calculated by using the criterion as the downstream concentration (C_d) (multiplied by 0.9 for discharges in New Hampshire) and rearranging the mass balance equation to solve for the effluent concentration (C_e). Refer to the pollutant-specific section of the Fact Sheet for a detailed discussion of these calculations, any assumptions that must be made and other relevant permit requirements.

For Discharges Where 7Q10 Flow is Inapplicable

A 7Q10 flow is not the applicable critical flow condition for most lakes, ponds, reservoirs, and tidally influenced waterbodies. For those discharges, EPA uses a facility-specific dilution factor, the calculated upper bound of the effluent data and a concentration representative of the parameter in the receiving water outside of the zone of influence of the discharge to project the downstream concentration after complete mixing using the following simple mass-balance equation:

$$C_s(DF - 1) + C_e = C_d(DF)$$

Where:

C_s = upstream concentration[5]
C_e = effluent concentration[6] (95th percentile or maximum of effluent concentration)

[2] Median concentration for the receiving water just upstream of the facility's discharge taken from all available information over the most recent 5-year period, including WET testing data, for each Permittee.
[3] The 95th percentile (for $n \geq 10$) or maximum (for $n < 10$) concentrations from all available date over the most recent 5-year period, including DMR data and/or WET testing data, for each Permittee.
[4] For discharges in New Hampshire, as required by Env-Wq 1705.01, 10% of the assimilative capacity of the receiving water is reserved by using a multiplying factor of 0.9 in this calculation.
[5] Median concentration for the receiving water outside of the zone of influence of the facility's discharge taken from all available information over the most recent 5-year period, including WET testing data, for each Permittee.
[6] The 95th percentile (for $n \geq 10$) or maximum (for $n < 10$) concentrations from all available date over the most recent 5-year period, including DMR data and/or WET testing data, for each Permittee.

C_d = downstream concentration
DF = dilution factor (See Dilution Factor Section of Fact Sheet)

Solving for the downstream concentration results in:

$$C_d = \frac{C_s(DF - 1) + C_e}{DF}$$

When both the downstream concentration (C_d) and the effluent concentration (C_e) exceed the applicable criterion (multiplied by 0.9[7] for discharges in New Hampshire), there is reasonable potential for the discharge to cause, or contribute to an excursion above the water quality standard. *See* 40 C.F.R. § 122.44(d). When EPA determines that a discharge causes, has the reasonable potential to cause, or contribute to such an excursion, the permit must contain WQBELs for the parameter. *See* 40 C.F.R. § 122.44(d)(1)(iii). Limits are calculated by using the criterion as the downstream concentration (C_d) (multiplied by 0.9 for discharges in New Hampshire) and rearranging the mass balance equation to solve for the effluent concentration (C_e). Refer to the pollutant-specific section of the Fact Sheet for a detailed discussion of these calculations, any assumptions that must be made and other relevant permit requirements.

[7] For discharges in New Hampshire, as required by Env-Wq 1705.01, 10% of the assimilative capacity of the receiving water is reserved by using a multiplying factor of 0.9 in this calculation.