Ammonia (mg/l as N) is compared to the NYS water quality standard through a series of required calculations that first determine the amount of Unionized Ammonia (UIA) from Total Ammonia (mg/l as N). Subsequent calculations are performed to compare UIA to an interpolated standard value, which is driven by water pH and Temperature (°C). Described below are the ammonia calculations performed by the Surface Water Exceedance Value Identifier (SWEVI) scripting tool developed in R.

1. Calculate freshwater UIA from Total Ammonia (mg/l as N)

**Definitions used in calculation:**

UIA – Unionized Ammonia (NH3)

F\_NH3 – Fraction of Unionized Ammonia

pH – potential Hydrogen (standard units; moles per liter)

T – Temperature (°C)

**Formula used in calculation:**

F\_NH3 = (1 / (1 + 10 ^ (pK - pH)))

where pK = 0.09018 + (2729.92 / 273.2 + T)

UIA = F\_NH3 \* Total Ammonia (mg/L as N)

1. Determine Standard Value

**Description:**

Standard table has Temperature along the x axis and pH on the Y axis. Measured water Temperature and pH are used to isolate the next closest preceding and following values along respective axis. The corresponding values are then used to interpolate the standard value that would be at their nexus.

**Formulas:**

interpolation formula

**pH value based** y = y1+(((x-x1)/(x2-x1)) \* (y2 - y1))

**water Temperature based** x = x1 + (((y-y1) / (y2-y1)) \* (x2-x1))

where x & y represent values taken from the respective axis in the standards table based on the measured pH and water Temperature.

1. Compare UIA to standard value

**Exceedance value determination:**

Exceedance – UIA > Standard Value

Non-exceedance – UIA < Standard Value

Sources:

**Unionized Ammonia Calculation:**

Engle, Diana. Larry Walker Associates. 2010. Attachment 2. Formulas Used to Derive Un-ionized Ammonia Fraction and USEPA Ammonia Criteria. Taken from web: <https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/cmnt081712/srcsd/engleatt2.pdf>

Florida Department of Environmental Protection Chemistry Laboratory Methods Manual, Tallahassee. 2001. Calculation of Un-Ionized Ammonia in Fresh Water STORET Parameter Code 00619. Taken from web: <https://floridadep.gov/sites/default/files/5-Unionized-Ammonia-SOP_1.pdf>

**Standard Table:**

New York State Department of Environmental Conservation. OFFICIAL COMPILATION OF CODES, RULES AND REGULATIONS OF THE STATE OF NEW YORK; TITLE 6. DEPARTMENT OF ENVIRONMENTAL CONSERVATION CHAPTER X. DIVISION OF WATER RESOURCES; SUBCHAPTER A. GENERAL; ARTICLE 2. CLASSIFICATIONS AND STANDARDS OF QUALITY AND PURITY; PART 703. SURFACE WATER AND GROUNDWATER QUALITY STANDARDS AND GROUNDWATER; EFFLUENT LIMITATIONS. Taken from web: <https://govt.westlaw.com/nycrr/Document/I4ed90418cd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)&bhcp=1>