

Facility Name: \_\_\_\_\_ NPDES #: NC \_\_\_\_\_

Biocide/Chemical Treatment Worksheet – Form 101

The following calculations are to be performed on any biocidal or chemical products ultimately discharged to the surface waters of North Carolina through NPDES permits that aren't required to routinely perform Whole Effluent Toxicity (WET) tests. This worksheet must be completed separately for each product in use. This worksheet is to be returned with all appropriate data entered into the designated areas with calculations performed as indicated.

- I. Facility Name \_\_\_\_\_  
NPDES # NC \_\_\_\_\_ Outfall # \_\_\_\_\_  
County \_\_\_\_\_  
Receiving Stream \_\_\_\_\_ 7Q10 \_\_\_\_\_ (cfs)

(All above information supplied by the Division of Water Quality)

What is the Average Daily Discharge (A.D.D.) volume of the water handling systems to the receiving water body?

A.D.D. = \_\_\_\_\_ (in M.G.D.)

Please calculate the Instream Waste Concentration (IWC in percent) of this discharge using the data entered above.

$$IWC = \frac{(A.D.D.) \times 100}{(7Q10)(0.646) + (A.D.D.)} = \frac{( ) \times 100}{( ) (0.646) + ( )} = \text{_____} \%$$

This value (IWC) represents the waste concentration to the receiving stream during low flow conditions.

- II. What is the name of the whole product chemical treatment proposed for use in the discharge identified in Part I?

\_\_\_\_\_

Please list the active ingredients and percent composition:

\_\_\_\_\_ %  
\_\_\_\_\_ %  
\_\_\_\_\_ %

What feed or dosage rate (D.R.) is used in this application? The units must be converted to maximum grams of whole product used in a 24hr period.

D.R.= \_\_\_\_\_ grams/24hr period

**Please note**, fluid ounces (a volume) must be converted to grams (a mass). The formula for this conversion is:

$$\text{Grams of product} = \text{fluid oz. of product} \times \frac{1 \text{ gal. water}}{128 \text{ fl. oz.}} \times \frac{8.34 \text{ lbs.}}{1 \text{ gal. water}} \times \text{specific gravity of product} \times \frac{453.59\text{g.}}{1 \text{ lb.}}$$

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Estimate total volume of the water handling system between entry of biocidal product and NPDES discharge point. On an attached sheet please provide justification for this estimate (system volume, average cycles per blowdown, holding lagoon size, etc.)

Volume= \_\_\_\_\_ million gallons

What is the pH of the handling system prior to biocide addition? If unknown, enter N/A. \_\_\_\_\_

What is the decay rate (D.K.) of the product? If unknown, assume no decay (D.K.=0) and proceed to asterisk. The degradation must be stated at pH level within 1/2 pH standard unit within handling system. Enter the half-life (half-life is the time required for the initial product to degrade to half of its original concentration). **Please provide copies of the sources of this data.**

H.L. = \_\_\_\_\_ Days

The decay rate is equal to  $\frac{1}{H.L.} \times 0.69 = \text{_____} = \text{Decay Rate (D.K.)}$

Calculate degradation factor (D.F.). This is the first order loss coefficient.

\* D.F. =  $\frac{(A.D.D.)}{(Volume)} + (D.K.) = \left( \frac{\text{_____}}{\text{_____}} \right) + \left( \text{_____} \right) = \text{_____}$

Calculate Steady State Discharge Concentration:

Dischg Conc. =  $\frac{(D.R.)}{(D.F.)(Volume)(3785)} = \frac{\left( \frac{\text{_____}}{\text{_____}} \right)}{\left( \text{_____} \right) \left( \text{_____} \right) (3785)} = \text{_____ mg/l}$

Calculate concentration of biocide instream during low flow conditions.

(Receiving Stream Concentration)

$\frac{(Dischg. Conc.) \times (IWC\%)}{100} = \frac{\left( \frac{\text{_____}}{\text{_____}} \right) \times \left( \frac{\text{_____}}{\text{_____}} \right)}{100} = \text{_____ mg/l}$   
Receiving Stream Concentration

III. Calculate regulated limitation.

List all LC50 and EC50 data available for the whole product according to the following columns. (Note that units should be in mg/l). **Please provide copies of the sources of this data.**

| <u>Organism</u> | <u>Test Duration</u> | <u>LC50/EC50 (mg/l)</u> |
|-----------------|----------------------|-------------------------|
| _____           | _____                | _____                   |
| _____           | _____                | _____                   |
| _____           | _____                | _____                   |
| _____           | _____                | _____                   |
| _____           | _____                | _____                   |
| _____           | _____                | _____                   |

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Choose the lowest LC50/EC50 listed above:

Enter the LC50/EC50: \_\_\_\_\_

If the half-life (H.L.) is less than 4 days, perform the following calculation.

Regulated Limitation =  $0.05 \times \text{LC50}$  = \_\_\_\_\_ mg/l

If the half-life (H.L.) is greater than or equal to 4 days or unknown, perform the following calculation.

Regulated Limitation =  $0.01 \times \text{LC50}$  = \_\_\_\_\_ mg/l

Choose the appropriate regulated limitation from the calculations immediately above and place in this blank:

\_\_\_\_\_ mg/liter

From Part II, enter the receiving stream concentration:

\_\_\_\_\_ mg/liter

IV. Analysis.

If the receiving stream concentration is greater than the calculated regulated limitation, then this biocide is unacceptable for use.

Person in Responsible Charge

|              |                              |
|--------------|------------------------------|
| _____        | _____                        |
| Name (Print) | Email Address & Phone Number |
| _____        | _____                        |
| Signature    | Date                         |
|              | Physical Address of Facility |

Person Completing This Worksheet (If different from above)

|              |                              |
|--------------|------------------------------|
| _____        | _____                        |
| Name (Print) | Email Address & Phone Number |
| _____        | _____                        |
| Signature    | Date                         |

**Please submit to:** *Division of Water Quality  
Aquatic Toxicology Branch  
1621 Mail Service Center  
Raleigh, NC 27699-1621*

Contact Info: Molly Nicholson (molly.nicholson@deq.nc.gov)

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**Supplemental Metals Analysis**

If copper, zinc, or chromium are present in the proposed biocidal compound, complete this worksheet. A separate form must be used for each metal and/or metal compound present in the biocide. List the metal, its chemical formula, molecular weight (MW), formula weight (FW), and the concentration of the metal compound in the biocide (MCC). Complete a separate form for every metal present in the biocide.

| <u>Metal</u>      | <u>Chemical Formula</u> | <u>Molecular Weight of Metal</u> | <u>Formula Weight</u> | <u>Concentration in Biocide</u> |
|-------------------|-------------------------|----------------------------------|-----------------------|---------------------------------|
| EXAMPLE<br>Copper | $CuSO_4 \cdot 5H_2O$    | 63.546 g/mole                    | 249.680 g/mole        | 0.2 %                           |
| _____             | _____                   | _____                            | _____                 | _____                           |

**Dosage rate of Biocide (DR) (from page 1):**

DR = \_\_\_\_\_ grams/day

**Average Daily Discharge (ADD) (from page 1):**

ADD = \_\_\_\_\_ million gallons/day

**Discharge Concentration (DC) of Biocide:**

DC =  $\frac{DR}{ADD} = \frac{(\text{_____ grams/day})}{(\text{_____ million gallons/day})} = \text{_____ grams/million gallons}$

**Convert DC to micrograms/liter (ppb):**

DC (µg/l) = \_\_\_\_\_ DC (grams/million gal) x  $\frac{1 \times 10^6 \mu\text{g/g}}{3.785 \times 10^6 \text{ liters/million gal.}}$  = \_\_\_\_\_ µg/l

**Calculate the fraction of metal in the metal-containing compound (MF):**

MF =  $\frac{MW}{FW} = \frac{(\text{_____ grams/mole})}{(\text{_____ grams/mole})} = \text{_____}$

**Calculate the fraction of metal in the biocidal compound (BF):**

BF = MF x  $\frac{MCC (\%)}{100} = \text{_____} \times \frac{\text{_____} \%}{(100)} = \text{_____}$

**Calculate the concentration of metal in the discharge (M):**

M = DC x BF = \_\_\_\_\_ µg/l x \_\_\_\_\_ = \_\_\_\_\_ µg/l

**Calculate the instream metal concentration (IMC) at low-flow conditions:**

IMC = M x  $\frac{IWC (\%)}{100} = \text{_____} \mu\text{g/l} \times \frac{\text{_____} \%}{100} = \text{_____} \mu\text{g/l}$

**Regulated limitation of metal (from below): \_\_\_\_\_ µg/l**

NC General Statutes 15A NCAC 2B.0211 define:  
**Copper- 7 µg/l** water quality action level\*      **Zinc- 50 µg/l** water quality action level\*  
**Chromium- 50 µg/l** water quality standard  
 (\*Values which exceed action levels must be addressed directly by aquatic toxicity testing.)