

Attachment D  
Caritas Southwood Hospital  
NPDES No. 0102288

Treatment Plant Design Flow - 0.055 MGD = (0.055mgd \* 1.547 cfs/mgd) = 0.085 cfs

Receiving water - Stop River

7 day 10 year low flow (7Q10) of the river - 0 cfs

**Dilution Factor**

$$\text{dilution factor} = \frac{7Q10 + \text{design flow}}{\text{design flow}} = \frac{0 \text{ cfs} + 0.085 \text{ cfs}}{0.085 \text{ cfs}} = 1.0 \text{ cfs}$$

**Dilution Ratio**

$$\text{dilution ratio} = \frac{7Q10}{\text{treatment plant design flow}} = \frac{0 \text{ cfs}}{0.085 \text{ cfs}} = 0 \text{ cfs}$$

The permittee is required to conduct four chronic toxicity tests per year, since the dilution ratio is less than 10:1.

**Toxicity**

The chronic (C-NOEC) whole effluent toxicity limit is calculated using the instream waste concentration (IWC) of the WWTP effluent. The IWC is the inverse of the dilution.

$$\text{C-NOEC} = 1/\text{dilution factor} = 1/1 * 100 = 100\%$$

**Total Chlorine Residual (TRC)**<sup>1,2</sup>

EPA suggested Instream Chronic Chlorine Criteria is 11.0 ug/l

EPA suggested Instream Acute Chlorine Criteria is 19.0 ug/l

$$\begin{aligned} \text{total residual chlorine} &= \text{dilution factor} * \text{acute chlorine criteria} \\ &= 1.0 * 19 \text{ ug/l} \\ &= 19 \text{ ug/l} \\ &= 0.019 \text{ mg/l} \end{aligned}$$

$$\begin{aligned} \text{total residual chlorine} &= \text{dilution factor} * \text{chronic chlorine criteria} \\ &= 1.0 * 11 \text{ ug/l} \\ &= 11 \text{ ug/l} \\ &= 0.011 \text{ mg/l} \end{aligned}$$

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Copper

The copper limit is dependent on the hardness of the receiving water. The hardness used is 35 and is based on data in the toxicity test.

$$\ln 35 = 3.56$$

chronic copper limit: criterion continuous concentration

$$\begin{aligned} e^{[(0.8545*3.56)+(-1.702)]} * 1.0 &= 3.82 \times 1.0 \\ &= 3.8 \text{ ug/l} \\ &= 4.0 \text{ ug/l} \\ &= 0.004 \text{ mg/l} \end{aligned}$$

acute copper limit

$$\begin{aligned} e^{[(0.9422*3.56)+(-1.700)]} * 1.0 &= 5.23 \times 1.0 \\ &= 5.23 \text{ ug/l} \\ &= 5 \text{ ug/l} \\ &= 0.005 \text{ mg/l} \end{aligned}$$

Footnotes

1. Based on National Recommended Water Quality Criteria, 63 FR 68354, December 10, 1998.
2. The suggested chronic instream criteria multiplied by the dilution yield the average monthly limit, and the suggested instream acute criteria multiplied by the dilution yield the maximum daily limit found in the draft permit.

Ammonia calculation for Southwood Hospital

Charles River Basin-estimation of 30Q10 for period of November 1 to April 30.

30Q10 ungaged sites

Base flow = 60.3 cfs

Base flow factor = 60.3cfs/183 sq.miles = 0.33 cfs/sq.miles

$$30Q10 = 0.33 \text{ cfs/sq.miles} (1.08 \text{ sq.miles}) = 0.356 \text{ cfs}$$

Treatment Plant Design flow is 0.055 MGD = 0.085 cfs

Design flow dilution =  $\frac{\text{design flow of treatment plant} + 30Q10}{\text{design flow of treatment plant}}$

$$\text{design flow dilution} = \frac{0.085 \text{ cfs} + 0.356 \text{ cfs}}{0.085 \text{ cfs}} = 5.18$$

Design flow dilution \* instream criteria

$$5.18 * (x) = \text{mg/l}$$