Proposed Site-Specific Copper Criteria for the City of Idabel Discharge to Mud Creek

Oklahoma Water Resources Board
October 25, 2017
Aquatic Life Criteria

- Oklahoma’s WQS includes acute and chronic criteria for the protection of fish and wildlife from toxic substances.

- Copper
  - Bioavailability depends on water chemistry
  - Alkalinity, pH, DOC, TSS, and hardness

- Statewide copper criteria are expressed as equations to account for ambient water hardness effects on toxicity.

<table>
<thead>
<tr>
<th></th>
<th>Acute</th>
<th>Chronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>(e(0.9422 \times \ln(\text{hardness})) - 1.3844)</td>
<td>(e(0.8545 \times \ln(\text{hardness})) - 1.386)</td>
</tr>
</tbody>
</table>
Site-Specific Criteria

- OAC 785:45, Appendix E
- Water Effects Ratio (WER)
  - Adjustment factor which accounts for site-specific water chemistry effects on metals toxicity (i.e. difference between toxicity of metal in lab water vs. site water)
  - EPA’s “Streamlined Water-Effect Ratio Procedure for Discharges of Copper” (2001)
Idabel and Mud Creek

- Idabel POTW design flow 2.56 cfs, 1 cfs background
- Mud Creek (410200)
- 32 mg/L (OAC 785:46, Appendix B)
- Not achieving permit copper limits
- Workplan approved 07/07/15
Water Effects Ratio

• General Requirements
  – Two events, min 1 mo apart, stable flow
  – Upstream and effluent, analyzed at permit dilution
  – Plant performing average or better
  – *Ceriodaphnia dubia* or *Daphnia magna*
  – Side-by-side 48-hr LC50, lab and site water spiked with metal salts

• Idabel WER Study
  – Final report approved by OWRB staff Sept 1, 2017
Proposed Criteria

- **WER** = Lesser of Lab Water LC50 or SMAV/Site Water LC50
- **fWER** = \(\exp\left[\frac{\sum\ln(WER_i)}{n}\right]\)
- **Dissolved Translator (f)** = geo mean of (D:T) of 10 paired analyses
- **Criteria Translator (T)** = \(f\text{WER}x\text{f}\)
- **Acute Site-Specific Total Criterion (\(S_{ast}\))** = \(C_{asd}/(fxfWEDRd)\)
- **Chronic Site-Specific Total Criterion (\(S_{cst}\))** = \(C_{csd}/(fxfWEDRd)\)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Current Copper Criteria (@ 32 mg/L hardness)*</th>
<th>WER Adjusted Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Acute ((\mu g/L))</strong></td>
<td><strong>Chronic ((\mu g/L))</strong></td>
</tr>
<tr>
<td>Copper</td>
<td>6.56</td>
<td>4.83</td>
</tr>
</tbody>
</table>

*Calculated using the statewide hardness dependent criteria equations in OAC 785:45, Appendix G*
Contact Information

Monty Porter
Phone: 405-530-8933
Monty.porter@owrb.ok.gov

Rebecca Veiga Nascimento
Phone: 405-530-8952
Rebecca.veiga@owrb.ok.gov

Jade Jones
Phone: 405-530-8934
Jade.jones@owrb.ok.gov

Ceriodaphnia dubia