“The Sky is Falling”
A changing regulatory climate for drinking water

Tyson Ingels CWP, PE
Lead Drinking Water Engineer
CDPHE-Water Quality
Lead and Copper in Drinking Water

- Regulated by the lead and copper rule - effects all community water systems and non-transient, non-community water systems
  - Roughly 1000 water systems in Colorado.
- Regulated since early 1990’s
- 12 year record retention - many records don’t exist
- Different requirements based on population
  - Large systems > 50,000 more stringent
General Rule Requirements

  - Tiered sites for sampling
- Raw water monitoring
- Tap sampling
- 90th Percentile Action levels for lead and copper
  - 15 ppb lead - begins action
  - Education
  - Installation of treatment
What happened in Flint, MI?

NOT A COMPLETE HISTORY, BUT....

- City changed sources of water.
- State allowed for feedback monitoring to see affects.
- State allowed invalidation of some samples.
- Once magnitude of the problem was realized - too late.
- Kids had elevated blood lead levels.
EPA statement about Flint:

- “In hindsight, we should not have been so trusting of the state for so long.” - Gina McCarthy - USEPA
- Result - direct inquest by USEPA into state activities related to the Lead and Copper Rule
Not the first time CDPHE thought about Lead and Copper...... (cerca 2012)
What Colorado thought.....

- L&C rule is a feedback rule - action level triggers activity
- System has 2 consecutive monitoring periods less than action level - optimized
  - Reduced to once per three year monitoring
- Generally, treatment changes didn’t affect monitoring frequency
Colorado had focused on lead action level exceedences....

- Implement business process to track and enforce deadlines in the rule.
- Small-medium systems have an opportunity to ‘pause’ the process
- EPA Database doesn’t support tracking
- Get the lead level down in the water where it was too high - reduce public exposure.
The items we didn’t emphasize....

- Sampling locations - were the Tiers correct? Did the system maintain the list? Do they know why those homes?
- Predictive modeling - will the proposed change affect lead levels?
  - Would we make someone do a study pre-emptively?
- Increased monitoring for changes. When should a system monitor more often.
Case study = Aluminum Sulfate to Ferric Chloride change..

- Colorado utility changed coagulants - same tanks and feed equipment.
- Little-to-no raw water changes - reservoir source.
- System started to see elevated lead levels and exceeded the action level - implemented OCCT orthophosphate.
- We didn’t review it.
- We didn’t anticipate it.
New Requirements for 2017 and Beyond....

- Everyone goes to 1X Year monitoring - period.
  - Reductions not being considered at this time - Why?
- Re-evaluation of all sampling sites by CDPHE -
  - Roughly 70% of water systems are not sampling lead and copper at the right sites.
  - Can we trust the history of samples?
- Treatment changes -
  - Most changes will result in increased monitoring to every 6 months at double the sites (standard monitoring)
  - Possibility to reduce to 1 X Year
###表：项目类型和分类

<table>
<thead>
<tr>
<th>项目类型</th>
<th>分类</th>
<th>项目描述</th>
<th>PE</th>
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<tbody>
<tr>
<td>WTP - 新建</td>
<td>NC</td>
<td>新建设备的物理水处理厂，包括建筑、处理和附属设施。</td>
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<td>WTP - 新建</td>
<td>NC</td>
<td>向未被氯化并直接用于饮用水的井中加氯化。</td>
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<tr>
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<td>NC</td>
<td>增加分布供水出的补氯化。</td>
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<tr>
<td>WTP - 新建</td>
<td>SM</td>
<td>提高处理设施的“工作能力（日供量）” - 包括提高冷却。</td>
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<tr>
<td>WTP - 新建</td>
<td>SM</td>
<td>增加处理无新水。</td>
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<tr>
<td>WTP - 新建</td>
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<td>增加处理新水。</td>
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<tr>
<td>WTP - 新建</td>
<td>SM</td>
<td>更换(e.g. 焊接)。</td>
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<tr>
<td>WTP - 新建</td>
<td>SM</td>
<td>加强处理新水。</td>
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<tr>
<td>WTP - 新建</td>
<td>SL</td>
<td>更换旧的设备。</td>
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<td>WTP - 新建</td>
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<td>更换设备。</td>
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<td>更换类似。</td>
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32. 当水源或处理工艺发生变更时，需要进行铅和铜的规则审查，供应商需要采取什么步骤？

一般而言，水源或长期的处理工艺变更需要增加采样。但是，也有例外情况，需要额外的行动。如果需要审查，参考下方步骤:

- **步骤1**: 系统是否已经对现有铅和铜的处理限值（例如pH, 碱度, 磷酸盐水平）进行了设定 - 也称为FANLs - 或者人口超过50,000。
  - 是，则转至步骤2
  - 否，则转至步骤3
- **步骤2**: 作为设计批准申请的一部分 - 系统需要提交对变化的分析和如何影响分配的腐蚀以及发展控制（例如模板）。一旦相关部门完成评估，部门将根据需要决定：
  - 需要进行合理的腐蚀控制研究
  - 调整最优腐蚀控制技术（OCCT）的授权
- **步骤3**: 部门将增加检测，每6个月一次
  - 系统检测
  - 水质参数（WQP）监测

有效日期: 2016年7月1日 - 增加铅和铜的合规问题。
Helpful Documents

Optimal Corrosion Control
Treatment Evaluation Technical
Recommendations for Primacy
Agencies and Public Water Systems

Managing Change and Unintended Consequences:
Lead and Copper Rule Corrosion Control Treatment
Beyond 2017....

- Guidance on how to do a desktop study
- Guidance on how to do a corrosion control study
- New Lead and Copper Rule
  - Possibly broken out to two rules
  - Possibly more frequent sampling
    - Quarterly? Monthly?
What can you do?

- Be aware!
- Comment, comment, comment.
- Some ideas for an improved rule - off the record.
There are many stories to tell about the recent public notices and outrage around contaminated water...
CDPHE realized that we are entering a different world of ‘risk communication’ for drinking water.

Toxic Algae Bloom Leaves 500,000 Without Drinking Water in Ohio

Codi Yeager-Kozacek, Circle of Blue | August 3, 2014 2:15 pm | Comments

1.2k SHARES


ENTER YOUR EMAIL    SIGN UP

The City of Toledo has issued a “Do Not Drink” advisory for residents served by Toledo Water after chemical tests confirmed the presence of unsafe levels of the algal toxin Microcystin in the drinking water plant’s finished water. The advisory, spanning three counties in Ohio and one in Michigan, leaves more than 400,000 people in the Toledo area without drinking water.
Colorado convened a group of utilities and professionals to devise a plan for Harmful Algal Blooms
The team generated guidance on best practices and a blueprint for what we will do if an incident occurs.

### Harmful Algal Bloom Monitoring Guidance

*For Colorado drinking water providers with surface water sources*

*From the Colorado Harmful Algal Bloom Workgroup*

#### Step 1: Observe and prepare

Visually inspect source waters for algae blooms at least weekly during bloom season (typically late summer through early fall). Taste and odor events, shorter filter runs, and changes in source water quality may indicate the presence of a bloom. Before bloom season starts, be prepared and order cyanotoxin (microcystins and cylindrospermopsin) field tests, evaluate source and treatment options, and develop a monitoring, response, and communication plan.

*If bloom observed continue to step 2*

#### Step 2: Field screen for blue-green algae

Immediately after observing bloom use microscopic examination or phycocyanin analyzers if available or use jar and stick tests\(^1\) and field identification guide\(^2\) for presence of blue-green algae which could produce cyanotoxins. Continue examinations at least weekly during presence of bloom.

*If blue-green algae are present continue to step 3*

#### Step 3: Field screen for toxin presence in raw water

Monitor raw water intake for presence of cyanotoxins using a field test for source drinking water (e.g., Abraxis Strip Test) immediately after identifying blue-green algae and then at least weekly during presence of blue-green algae. You can use a field test for finished drinking water if you freeze then thaw sample 3 times to release toxins within cells prior to analysis. Evaluate source and treatment options. Identify and contact lab\(^3\) in advance about sampling procedures and sample turnaround time in case toxins are detected in finished water.

*If microcystins and/or cylindrospermopsin are present in raw water continue to step 4*

#### Step 4: Field

Monitor finished water at entry point for presence of the cyanotoxin(s) detected in raw water using...
But we are talking about PFCs, not HABs - so what is the difference?

- We didn’t see the PFC issue coming until the media asked us about it.....
Perfluorooctane Sulfonate (PFOS)

Fluorocarbon tail – repels both oil and water

Multiple fluorocarbon “tail” lengths

Sulfonate headgroup – water “loving”
Why are PFCs an issue?

• The carbon-fluorine bond is the shortest and strongest chemical bond in nature
• Poly- and perfluoroalkyl substances (PFASs) used in a wide variety of products
  – Somewhat ubiquitous* in the environment
• PFCs persist *indefinitely* and are difficult to remove from water

*Ubiquitous ≠ homogenous
Sources of PFCs

- In production since 1940s
- PFC-based chemical precursors used in coatings for textiles and paper packaging products, aqueous fire-fighting foam (AFFF), etc.
- Used in making Teflon™ and high performance plastics
Human Exposure to PFCs

- Inhalation
- Ingestion (dust/fibre)

Adapted from Oliaei 2013, Environmental and Pollution Research
What are the health risks and advice from public health?

- Possible developmental effects:
  - Low birth weight and accelerated puberty

- Other effects
  - May increase the risk of
    - changes in blood cholesterol, liver enzymes, and uric acid levels, which may be linked with an elevated risk of heart disease, liver disease or high blood pressure.

- If PFC levels are above the health advisory - you should consider other sources of water. This especially is important for women who are pregnant, planning to become pregnant, or breastfeeding as well as bottle-fed infants.
Timeline of PFC events affecting the water systems in the Widefield Aquifer

2013-2015 UCMR
- PFCs detected
- Reported to PWSs/EPA

Feb - April
- Operations
- Sampling – EPA Grant

June-August
- Outreach
- USAF assists

January ‘16
- Media inquiry
- Mobilize team

May
- New Advisory
- Water is above limit
Area near Colorado Springs
Security, Widefield, Fountain =

- 3 cities each with ~20K people
- Bordered by
  - Co Springs (N)
  - Ft. Carson (W)
  - Peterson Air Force/ Airport (NW)
Sampling focused on drinking water - understand drinking water exposure

- Massive aquifer
- Major water resource for the area
- Nearly ALL wells are contaminated.
Prior to May 19th, the data show that the water is likely below the health advisories. All that changed when the advisory changed.

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>PFBS</th>
<th>PFHxS</th>
<th>PFNA</th>
<th>PFHpA</th>
<th>PFOA</th>
<th>PFOS</th>
<th>PFOS + PFOA + PFHpA</th>
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<td>40</td>
<td>&lt; 20</td>
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<td>40</td>
<td>60</td>
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<td>7/17/2013</td>
<td>&lt; 90</td>
<td>50</td>
<td>&lt; 20</td>
<td>&lt; 10</td>
<td>30</td>
<td>&lt; 40</td>
<td>30</td>
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<tr>
<td>2/8/2016</td>
<td>&lt; 90</td>
<td>40</td>
<td>&lt; 20</td>
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<td>5/4/2016</td>
<td>&lt; 90</td>
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<td>&lt; 20</td>
<td>&lt; 10</td>
<td>23</td>
<td>50</td>
<td>73</td>
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<td>1/15/2013</td>
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<td>80</td>
<td>&lt; 20</td>
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<td>7/17/2013</td>
<td>&lt; 90</td>
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<td>&lt; 10</td>
<td>40</td>
<td>&lt; 40</td>
<td>40</td>
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<tr>
<td>2/8/2016</td>
<td>&lt; 90</td>
<td>60</td>
<td>&lt; 20</td>
<td>10</td>
<td>40</td>
<td>50</td>
<td>100</td>
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<td>5/4/2016</td>
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<td>&lt; 20</td>
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<td>4/27/2016</td>
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<td>&lt; 2.5</td>
<td>20</td>
<td>46</td>
<td>96</td>
<td>162</td>
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<tr>
<td>5/17/2016</td>
<td>150</td>
<td>510</td>
<td>5.6</td>
<td>42</td>
<td>73</td>
<td>140</td>
<td>255</td>
</tr>
</tbody>
</table>
State/Local Agencies combined to address issue.
Tap Water Distribution Map

- Show the data globally
- Show cooperation
- Capture current status
# PFCs in your tap water

<table>
<thead>
<tr>
<th>Tap water source</th>
<th>Population (approx.)</th>
<th>Tap water status</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Fountain</td>
<td>20,000</td>
<td>No PFCs.</td>
</tr>
<tr>
<td>Widefield Water and Sanitation District</td>
<td>19,000</td>
<td>Possible PFCs above health advisory in certain zones.</td>
</tr>
<tr>
<td>Security Water District</td>
<td>18,000</td>
<td>Possible PFCs above health advisory in certain zones.</td>
</tr>
<tr>
<td>Stratmoor Hills</td>
<td>6,500</td>
<td>No PFCs.</td>
</tr>
<tr>
<td>Garden Valley Mobile Home Park</td>
<td>900</td>
<td>PFCs below health advisory.</td>
</tr>
<tr>
<td>Security Mobile Home Park</td>
<td>150</td>
<td>PFCs above health advisory.</td>
</tr>
<tr>
<td>Private wells</td>
<td>216</td>
<td>Each well must be tested.</td>
</tr>
</tbody>
</table>
Drinking water advisories - public health messaging can cause panic and loss of public trust.....

- State/local public health authorities declare a ‘product’ is not ‘safe’
- Responsible water provider must try to take action and mitigate the problem
- A different model than the Safe Drinking Water Act
  - Compound is not regulated and may never be
Several open-ended questions have arisen from Colorado’s experience....

- Should the USEPA health advisory process be better-linked with the Safe Drinking Water Act?
  - Emergency Rulemakings for Acute Health Risk?
- Should the UCMR only focus on chronic health risks?
- Should the Health Advisory process be peer reviewed with public comments?
- How transparent should the health advisory process be?
Take aways

- **BE PREPARED**
- Practice exactly how you would react to a situation like this -
  - Who is responsible for public health messaging?
    - Environmental Epidemiology
  - Who will sample and who will pay for it?
    - USEPA, State, county, water system, all
  - Who takes lead on tap water quality?
    - Should the water system alone be allowed to discuss the quality of their product
    - “Our product meets all federal regulatory limits” = safe?
Outstanding Issues

- Who all polluted this aquifer?
- How long have I been exposed?
- Who is going to pay?
- What about vegetables and eggs?
- What about the other chemicals??
  - Hex Chrome
  - 1,4 Dioxane
  - Existing VOC Plume
  - Nitrate issues
Acknowledgements