



Drinking Water Aesthetics

March 7, 2019



WHY DO WE CARE ABOUT AESTHETICS?

Customer Satisfaction and Consumer Confidence

When your drinking water looks, smells, or tastes unpleasant your customer base will probably focus solely on these issues above all others

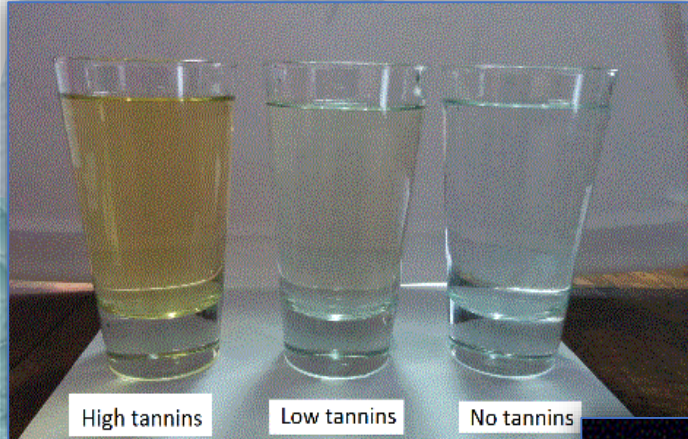
Customers may lose confidence in their drinking water quality if Secondary Standards are not met





WHAT ARE DRINKING WATER AESTHETICS?

General Characteristics



- **Cloudiness/Turbidity/Air**
- **Visible Particulates**
- **Sheen**
- **Residue (ice cubes, glassware, stained fixtures)**
- **Color (red, black, green, brown)**



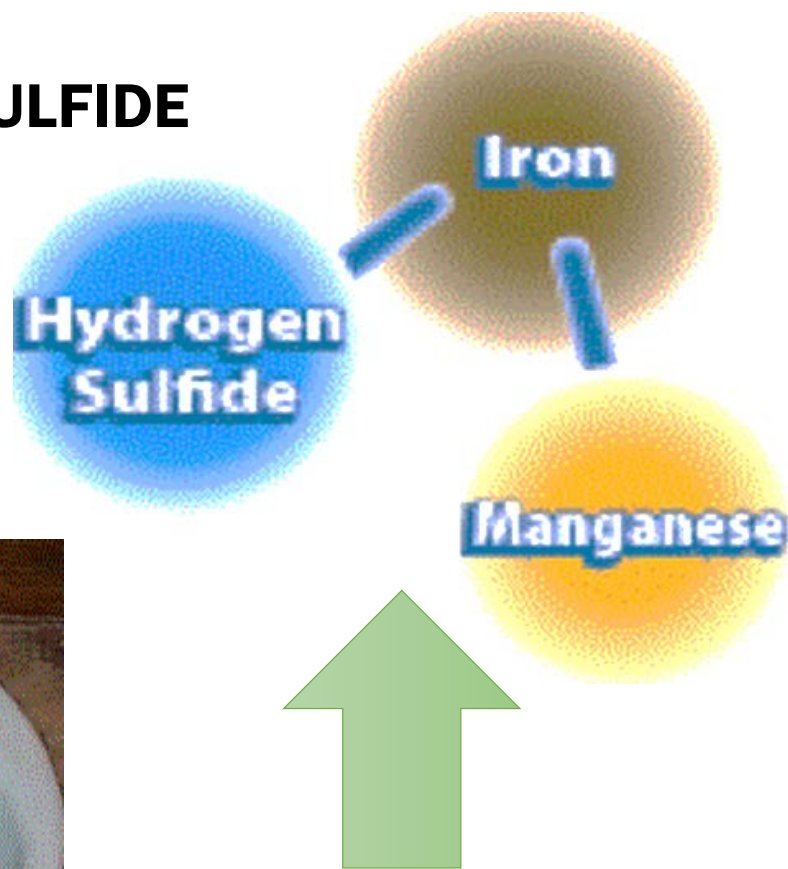
- **Taste (bitter, metallic, medicinal, salty)**
- **Odor (rotten eggs, chlorinous-dichloramine/trichloramine)**





THE MAIN CULPRITS

- IRON
- MANGANESE
- HYDROGEN SULFIDE
- SODIUM
- ORGANICS
- COPPER
- CHLORIDE
- TDS



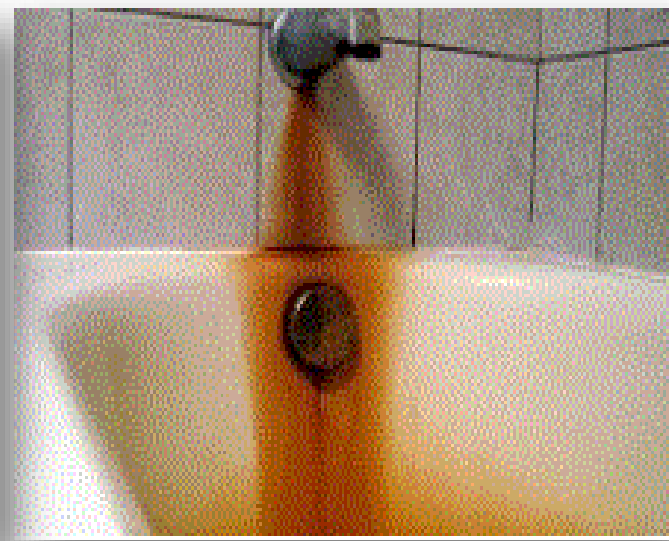
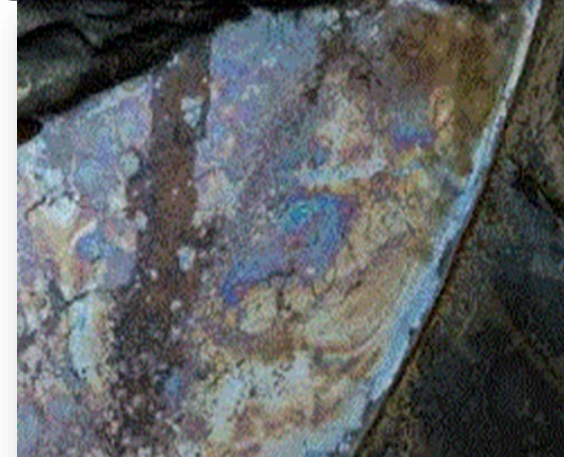
AKA the Troublesome Trio



IRON

AESTHETIC PROBLEMS

- **Color**
- **Fixture Staining (bathtubs, sinks, commodes)**
- **Staining of other surfaces**
- **Iridescent sheen on surface of water**
- **Particles (oxidized iron following disinfection or aeration)**
- **Slime (many forms of iron bacteria are slime forming)**





MANGANESE AESTHETIC PROBLEMS

- **Color** (black water issues, sacrificial anodes in hot water heaters)
- **Particles** (oxidized Manganese following disinfection)
- **Slime** (buildup of black residue)

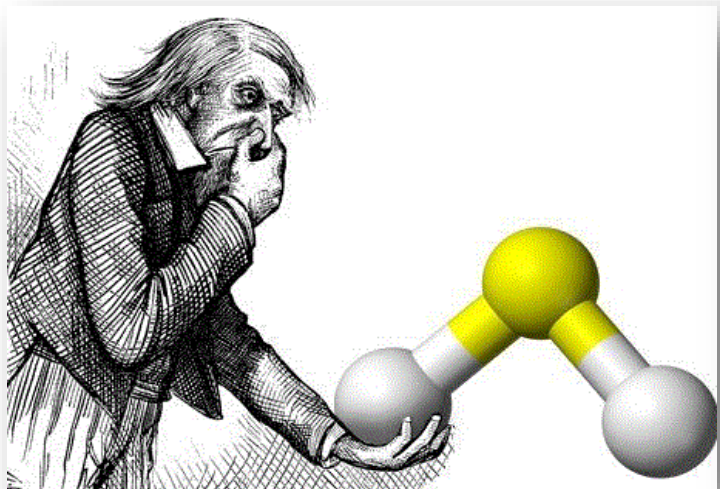




HYDROGEN SULFIDE AESTHETIC PROBLEMS

- **ODOR** **Our #1 drinking water complaint is Odor**
- As little as 0.5 ppm is detectable by most people
 - <1 ppm musty/swampy odor
 - >1ppm rotten egg odor

➤ **BLACK WATER**





HYDROGEN SULFIDE AESTHETIC PROBLEMS





OTHER PROBLEMS CAUSED BY THE TROUBLESOME TRIO

- **Laundry staining**
- **Fixture/porcelain staining**
- **Corrosion (Pb & Cu exceedances, pipe pitting/leaks)**
- **Bad Bacteriologicals (potential)**
- **Flow or pressure problems**
- **Higher costs to utility from additional disinfectant needed to meet chlorine demand**
- **Water losses from flushing**

Water + Air + Copper = Corrosion





Operation and Maintenance of Public Water Systems

F.A.C. Rule 62-555.350 (10)(b)

Suppliers of water shall telephone, and speak directly to a person at, the appropriate DEP District Office or ACHD as soon as possible, but never later than noon of the next business day, in the event of any of the following emergency or abnormal operating conditions:

- 1. The occurrence of any abnormal color, odor, or taste in a public water system's raw or finished water;**
- 2. The failure of a public water system to comply with applicable disinfection requirements; or**
- 3. The breakdown of any water treatment or pumping facilities, or the break of any water main, in a public water system if the breakdown or break is expected to adversely affect finished-water quality, interrupt water service to 150 or more service connections or 350 or more people, interrupt water service to any one service connection for more than eight hours, or necessitate the issuance of a precautionary "boil water" notice in accordance with the Department of Health's "Guidelines for the Issuance of Precautionary Boil Water Notices" as adopted in Rule 62-555.335, F.A.C.**



Secondary Maximum Contaminant Levels

SECONDARY DRINKING WATER STANDARDS

FEDERAL CONTAMINANT ID NUMBER	CONTAMINANT	SMCL (mg/L)*
1002	Aluminum	0.2
1017	Chloride	250
1022	Copper	1
1025	Fluoride	2.0
1028	Iron	0.3
1032	Manganese	0.05
1050	Silver	0.1
1055	Sulfate	250
1095	Zinc	5
1905	Color	15 color units
1920	Odor**	3 (threshold odor number)
1925	pH	6.5 - 8.5
1930	Total Dissolved Solids	500
2905	Foaming Agents	0.5



62-555.315

Public Water System Wells

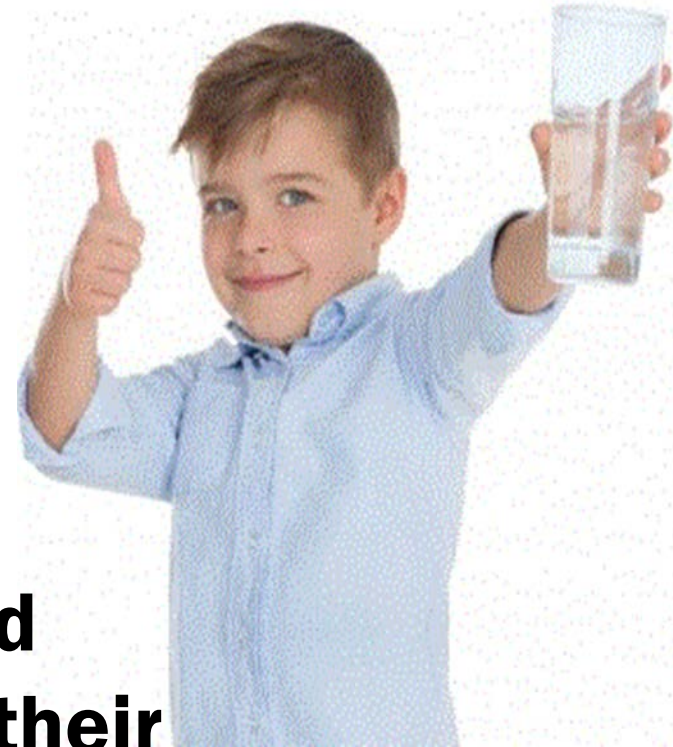
Control of Copper Pipe Corrosion and Black Water

POTENTIAL FOR IMPACTS WITHOUT TOTAL SULFIDE REMOVAL	WATER QUALITY RANGES	POTENTIAL WATER TREATMENT
Low	Total Sulfide < 0.3 mg/L Dissolved Iron < 0.1 mg/L ¹	Direct Chlorination ²
Moderate	0.3 mg/L Total Sulfide 0.6 mg/L @ pH 7.2 or 0.3 mg/L Total Sulfide 0.6 mg/L @ pH > 7.2	Conventional Aeration ³ (maximum removal efficiency 40-50%) or Conventional Aeration with pH Adjustment ^{4,5} (maximum removal efficiency 40-50%)
Significant	0.6 mg/L < Total Sulfide 3.0 mg/L @ pH 7.2 or 0.6 mg/L < Total Sulfide 3.0 mg/L @ pH > 7.2	Forced Draft Aeration ³ (maximum removal efficiency 90%) or Forced Draft Aeration with pH Adjustment ^{4,5} (maximum removal efficiency 90%)
Very Significant	Total Sulfide > 3.0 mg/L	Packed Tower Aeration with pH Adjustment ^{4,5} (maximum removal efficiency > 90%)



Summary

- **Drinking water provided to customers should be BOTH safe and palatable**
- **Customers could have a bad perception of the safety of their drinking water if it looks, smells, or tastes unsatisfactory to them**





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