Water Quality Issues

Have you ever turned on your faucet and a cloudy white liquid spilled out? Or drank from the water fountain only to find unpleasant tasting water? You may wonder, is this water safe to drink? Will I get sick? Water quality is an important aspect of maintaining a healthful environment at a school site. However, most schools and other drinking water customers have limited knowledge of how drinking water is regulated and the quality of the water they drink. It is important for schools to be able to have knowledge of and recognize potential hazards associated with water quality to ensure the health and well being of staff and students.

Drinking Water

Who is responsible?

The United States Environmental Protection Agency (US EPA) is responsible for protecting public health by assessing and protecting drinking water sources: protecting wells and collection systems; making sure water is treated by qualified operators; making information available to the public on the quality of their drinking water; and creating enforceable standards that limit the levels of contaminants in drinking water.

The US EPA provides two categories of drinking water standards: national primary regulations and national secondary regulations. The national primary drinking water regulations (a.k.a. primary standards) are legally enforceable standards that apply to public water systems. The primary standards protect drinking water quality by limiting the levels of specific contaminants that can adversely affect public health and are known or anticipated to occur in water. The categories of contaminants are:

- Microorganisms
- Disinfectants
- Disinfection Byproducts
- Inorganic Chemicals
- Organic Chemicals
- Radionuclides

Each contaminant listed is assigned either a Maximum Contaminant Level (MCL) or Maximum Residual Disinfectant Level (MRDL) value, which is the highest level of a contaminant or disinfectant that is allowed in drinking water. Maximum Contaminant Level Goal (MCLG) or Maximum Residual Disinfectant Level Goal (MRDLG) values are also provided, which are the levels below which there is no known or expected risk to health. The MCLGs and MRDLGs allow for a margin of safety and are non-enforceable public health goals

The national secondary drinking water regulations (a.k.a. secondary standards) are non-enforceable guidelines regarding contaminants that may cause cosmetic effects (such as skin or tooth discoloration)

or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply.

In the state of California the terms MCLs and Public Health Goals (PHGs) are used to describe water quality standards and are similar to the EPA MCLs and MCLGs. California is required to have contaminant levels equal to or less than the US EPAs. For a list of the current standards, go to the California Department of Public Health website at http://www.cdph.ca.gov. A description of selected contaminants and their potential health effects are provided in Appendix A.

How will I be able to recognize water that is above regulatory levels?

The difficulty with determining water quality is that the some contaminants, like the majority of those listed in appendix A, are generally colorless, odorless, tasteless and are unable to be detected with the naked eye. Therefore, it is difficult to assess the composition of the water without collecting and analyzing the water sample. However, some contaminants do have visible signs and characteristics. Appendix B includes some of the most common observational signs of water contamination. Many of these contaminants are the secondary standards recommended by the US EPA.

What can I do to ensure a healthful water supply?

The best advice to give is to be knowledgeable about your local drinking water system. Annual water quality reports are required to be published by your local water treatment facility every year. Reports typically include health related notices, water quality news, treatment systems used and the monitoring results for both primary & secondary contaminants (average levels). In addition to assigned values, a brief amount of information regarding potential health effects from ingestion and the sources of the contaminant are provided.

For a list of the current standards and to locate your local annual water quality report please visit the US EPA website at http://www.epa.gov/safewater/index.html

Lead in Drinking Water

One common contaminant that has recently been the topic of discussion in newspapers and television news is lead. Lead is a toxic metal that can be harmful to human health when ingested or inhaled. Lead poses a significant health concern in children, due to their ability to absorb more lead than the average adult in their still developing bodies. Exposure to lead in drinking water above the action level (0.015 ml/L) can result in delays in mental and physical development.

Lead is distributed in the environment through natural and man-made sources. EPA estimates that 10 to 20 percent of human exposure to lead may come from lead in drinking water. Lead can enter drinking water through the corrosion of lead-based plumbing materials. The most common problems occur in brass or chrome-plated brass faucets. Understanding potential sources on District property is important, because if you rely on your local water treatment plant's annual water quality report regarding lead, it may not accurately provide the actual lead levels of the water supply coming from your faucet.

Sampling for Lead in Water

If you are concerned that your water supply may contain elevated lead levels, water samples may be collected and analyzed to determine lead levels. Because lead is colorless, tasteless and odorless, sampling is the only method for detection. Collection of samples should be performed by trained personnel, as the types of containers used and means of sampling (e.g., early/late draw) can affect the

sample result. Testing of samples should only be performed by a certified laboratory. Lists of certified laboratories are available from your local drinking water authority.

General Control Methods

The following list includes common control methods, both interim and permanent, that can be used to control lead exposures from your drinking water supply:

1. Clean debris from all accessible screens frequently.

2. Use only cold water for food and beverage preparation in cafeterias. Hot water will dissolve lead more quickly than cold water and thus is likely to contain higher lead levels

3. Ensure potentially problematic piping systems are "flushed" regularly on school days. The EPA recommends flushing whenever a faucet has not been used for more than 6 hours. Flushing the system involves opening suspect valves and allowing the water to run for a few minutes to clear any standing water in the pipes.

4. Provide bottled drinking water when feasible.

5. Replace lead plumbing systems or redirect drinking water plumbing systems to lead free plumbing materials only. After 1986, only lead free plumbing materials can be used in new plumbing and repairs. However, the EPA states that even legally "lead free" plumbing may contain up to 8% lead.

6. Install lead removal provisions directly at faucets (e.g., reverse osmosis, distillation units).

7. Install corrosion control provisions on incoming water. The more corrosive the water, the greater the chances that lead in piping components will get into the water.

Important Laws & Regulations

- 1974 - Safe Drinking Water Act (SDWA) enacted. Required EPA to establish regulations for known or potential contaminants in drinking water for the purpose of protecting public health.
- 1986 – SDWA required the use of "lead free" plumbing materials in the installation or repair of all public water systems.
- 1988 – Lead Contamination & Control Act (LCCA). Resulted in the reduction of lead concentrations in drinking water at schools and child care centers. Also established lead monitoring and reporting requirements.
- 1991 – Lead & Copper Rule required public water suppliers to monitor for lead in drinking water and to provide corrosion control methods if lead or copper is measured at unacceptable levels.

For more ideas or support regarding water quality, associated testing or other matters of environmental health, contact Forensic Analytical at 310-668-5600 and ask for a member of the Southern California ReLiEF support team. Best of luck!

APPENDIX A: COMMON DRINKING WATER CONTAMINANTS

Microorganisms

- *Mycobacterium.* This group of organisms can lead to lung disease such as hypersensitivity pneumonitis when mists are inhaled and may also cause skin infections. They tend to flourish in warm water systems such as whirlpools and may require very high chlorine levels to eradicate them.

- *Cryptosporidium.* This parasite typically causes lower intestinal illness (i.e. cryptosporidiosis) which may also be accompanied by nausea, vomiting and fever. It is commonly found in lakes and rivers contaminated with sewage, and is very resistant to disinfection. Even the most well operated water treatment system can not ensure that drinking water will be completely free of this parasite. Individuals with severely weakened immune systems are likely to have more severe and more persistent symptoms than healthy individuals.

- *Legionella.* This organism, when inhaled in a mist, can lead to Legionnaire's disease, a pneumonia-like illness which has a high mortality rate. Naturally occurring in water, it can amplify in building systems. While it can be controlled through diligent prevention practices and disinfection, such actions can be time consuming and costly. Recent changes in the public health arena have made Legionella a reportable disease by the Centers for Disease Control.

Disinfectants & Disinfection Byproducts

- *Chloramines.* This chemical is typically used in low concentrations as an alternative to chlorine as a disinfectant in water treatment. Its use in water treatment is essential in controlling the level of microbes in drinking water. Though it is very beneficial in low concentration, in high concentrations it can be quite toxic. Chloramines may cause eye and nose irritation in addition to stomach discomfort and anemia when ingested. For these reasons, the US EPA regulates the concentration level allowed in public water supplies.

- *Bromate.* This disinfection byproduct, when ingested in high concentrations, typically causes gastrointestinal problems such as nausea, vomiting, diarrhea and abdominal pain. The US EPA also states that individuals who drink water containing bromate in excess of EPA's standard over many years may have an increased risk of developing cancer. Bromate is formed when ozone is used to disinfect drinking water and reacts with naturally occurring bromide.

- *Total Trihalomethanes.* Total Trihalomethanes include the following chemicals: trichloromethane (chloroform), dibromochloromethane, bromodichloromethane and tribromomethane (bromoform). These disinfection byproducts are formed when disinfectant products (i.e. chlorine) react with naturally occurring organic and inorganic matter in treated water. The US EPA regulates the level of total trihalomethanes based on there potential for an increased risk of cancer and other health effects (liver, kidney & central nervous system damage).

Inorganic Chemicals

- *Arsenic.* This naturally occurring semi-metallic element is typically found in rocks, soil, air, plants and water. Long-term exposure to arsenic has been linked to cancer of the bladder, lungs, skin,

kidneys, nasal passages, liver and prostate. Short-term exposure to high doses of arsenic can cause thickening and discoloration of the skin and gastrointestinal problems.

- *Fluoride.* At low concentrations this chemical can be beneficial in preventing tooth decay. However, at concentrations greater than its MCLG, it may cause bone disease or dental fluorosis. Many communities add fluoride to their drinking water to promote dental health. Each community has the ability to make its own decision about whether or not to add fluoride; however they must adhere to the EPAs enforceable drinking water standard levels.

- *Lead.* This naturally occurring metal enters tap water through corrosion of plumbing materials. In babies and children exposure to lead in drinking water above the action level can result in delays in physical and mental development, along with slight deficits in attention span and learning abilities. Adults who drink lead contaminated water over many years could develop kidney problems or high blood pressure.

Organic Chemicals

- *Benzene.* This aromatic liquid is typically used in making plastics, rubber, resins and synthetic fabrics. It is also used as a solvent in printing, paints, dry cleaning and other industries. Its primarily released into the environment from fumes and exhaust connected with its use in gasoline. Temporary nervous system disorders, immune system depression, and anemia are typically observed in individuals exposed to concentrations greater than the MCL, even for short periods of time. Lower concentrations for longer periods of time can cause cancers (i.e. leukemia) in exposed individuals.

- *Carbon Tetrachloride.* This organic chemical is introduced into water systems through industrial wastewater and landfills. Short term exposures to carbon tetrachloride at high concentrations may cause liver, kidney and lung damage. Long term exposures may cause cancer.

- *Vinyl Chloride.* This chemical is widely used in the manufacture of numerous products in the construction, automotive, rubber, paper, and glass industries. Short-term exposures can cause damage to the nervous system. Long-term exposures to vinyl chloride may cause damage or cancer of the liver.

Radionuclides

- *Alpha Particles.* Erosion of natural deposits of certain minerals that are radioactive may emit a form of radiation known as alpha radiation. Individuals that drink water containing alpha emitters in excess of EPA's standard over many years may have an increased risk of developing cancer.

- *Radium (226 & 228).* Radium is a radioactive metal that occurs naturally in small amounts in rocks, soils and ground water. As radium decays, it continually releases energy into the environment until a non-radioactive substance is formed. Individuals that drink water containing radium 226 or 228 in excess of EPA's standard over many years may have an increased risk of developing cancer

- *Uranium.* This naturally occurring radioactive mineral is present in certain types of soil and rocks throughout the United States. Over time, uranium can dissolve and enter ground water. Uranium cannot be detected through taste, sight or smell. Long-term exposures to Uranium can cause kidney damage.

APPENDIX B: COMMON SIGNS OF DRINKING WATER CONTAMINATION

Category	Observable Characteristic	Possible Contaminant/ Sources
Odor	Rotten egg smell	Hydrogen sulfide (drain), bacterial growth
	Moldy, musty odor	Bacterial growth
	Petroleum, gasoline-like odor	Underground storage tank leak (potentially harmful)
Discolored Water	Rusty color (reddish, orange)	Iron
	Black-brown color	Manganese, Pipe sedimentation
	Blue-green color	Copper
	Frothy, cloudy	Foaming agents, Tiny air bubbles
	Discolored (non-specific)	Aluminum, Zinc
Taste	Salty	Chloride, Sulfate, Total Dissolved Solids, Zinc, Sodium, Potassium, Magnesium
	Metallic taste	Copper, Iron, Manganese
	Chlorine taste	Chlorine
	Bitter taste	Foaming agents, Manganese, low pH
	Soda taste	High pH
Health Symptoms	Tooth discoloration	Fluoride
	Skin discoloration	Silver
	Graying on white portion of eyes	Silver