2008 Drinking Water Quality Report

The University of Kansas - Lawrence Campus - July 2009
Prepared by the Department of Environment, Health & Safety

The purpose of this report is to inform people who work for, attend, or visit the University of Kansas Lawrence campus (KU) about the quality of the drinking water provided to them by the KU Public Water Supply System. KU is committed to providing its users with a safe and dependable supply of drinking water.

This report presents the test results of KU campus drinking water conducted during the **2008 calendar year** (Tables 1, 2 3 and 4) and explains what those test results mean. The overall conclusion based on these results is that the drinking water provided to you by KU is safe and has not violated any federal or state water quality regulatory compliance standards. KU and the City of Lawrence, from whom KU purchases its water, routinely monitor the quality of its drinking water for all contaminants of concern. More information about contaminants and their potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791) or by visiting their website.

The primary drinking water sources to KU are the Kansas River and Clinton Lake. Six Kansas River alluvial wells are used occasionally and represent a very minor source of drinking water. An assessment of these water sources was completed by the state of Kansas in 2003. The results of that source water assessment can be viewed on the Kansas Department of Health and Environment (KDHE) web page.

All drinking water, including bottled water, can be presumed to contain at least small amounts of contaminants. However, the presence of contaminants does not necessarily indicate that the water poses a health risk. The U.S. Environmental Protection Agency (EPA) has regulations that limit the amount of certain contaminants in water provided by public water systems. To better understand the possible health risks associated with the exposure to most contaminants, a person would have to drink two liters of water every day at the allowable EPA maximum contaminant level (MCL) in drinking water for a lifetime (approximately 70 years) to have a one-in-a-million chance of having the described health effect.

In our continuing effort to vigilantly safeguard our water supply, it may be necessary to make improvements in the water distribution system. Therefore, brief interruptions in the water supply may occur from time to time. All public meetings regarding the KU water system are posted on the KU Department of Environment, Health & Safety (EHS) Events website. If you have any questions or comments about this report or about the quality of the drinking water provided to you by KU, please contact Jon Rossillon, EHS Hazardous Materials/Environmental Protection Manager, by phone (785-864-4089) or by email. We welcome your input.

Some individuals may be more vulnerable to specific contaminants in drinking water than the general population. People who may be more vulnerable include individuals who are immuno-compromised such as those who have cancer and are undergoing chemotherapy, have undergone a recent organ transplant, have HIV/AIDS or other immune system disorders (e.g., lupus), some elderly persons and infants. These individuals or their parent/guardian should seek advice from their health care providers about potential risk due to exposure to any possible drinking water contaminant.

Cryptosporidium, a very small, single-celled protozoan parasite, is present in surface waters throughout the US. Ingestion of this pathogen may cause cryptosporidiosis, an abdominal infection. The symptoms of this infection include diarrhea, nausea and abdominal cramps. If you have a weakened immune system (especially individuals living with HIV having a T-cell count lower than 200 – see EPA web page) the symptoms may be worse, last longer and be possibly life threatening. The City of Lawrence, which provides KU with its drinking water, monitors its source waters for this parasite. EPA/Center for Disease Control (CDC) guidelines on ways to lessen your risk of exposure to this and other microbiological organisms can be obtained by calling the EPA Safe Drinking Water Hotline (800-426-4791) or viewed on the CDC web page.

The sources of all drinking water include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it naturally dissolves minerals and can also pick up materials associated with the soil, plants and substances associated with animal and human activities.

Categories of contaminants that may be present in source water include:

- **Microbial contaminants:** such as viruses and bacteria, may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.

- **Inorganic chemical contaminants:** such as salts and metals, can be naturally occurring or originate from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

- **Organic chemical contaminants:** including synthetic and volatile organic chemicals, can arise as byproducts of industrial processes and petroleum production as well as from gas stations, urban stormwater runoff and septic systems.

- **Pesticides:** including herbicides and insecticides, may come from many sources including agriculture, urban stormwater runoff, residential and commercial activities.

- **Radioactive contaminants**: can occur naturally in the soil or possibly the result of oil and gas production and mining activities as a result of their extraction processes.

To assist you in better understanding this report, we have provided the following explanations for abbreviations and definitions of various terminologies:

AL – Action Level. The concentration of lead or copper which, if exceeded, triggers treatment or other requirements which a water system must follow.

EPA – United States Environmental Protection Agency (Federal Regulatory Agency for drinking water).

KDHE – Kansas Department of Health and Environment (State Regulatory Agency for drinking water).

Langelier Saturation Index (LSI) – The LSI is the pH change required to bring water to equilibrium in respect to calcium carbonate. The LSI value can be a positive or a negative number. Calcium carbonate can precipitate out of water to form a white crust, called scale, on the walls of water delivery pipes. Factors needed to calculate the LSI include the pH, alkalinity, calcium hardness, total dissolved solids and the temperature of the water.

Lead and Copper 90th Percentile – Out of every 10 locations sampled, 9 were at or below the level listed in the table.

MCL – Maximum Contaminant Level. The highest level (i.e., concentration) of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

MCLG – Maximum Contaminant Level Goal. The contaminant concentration at or below which there is no known or predicted health risk.

MFL – Million Fibers per Liter. A measure of the amount of asbestos fibers present in the water that are longer than ten micrometers (10 µm) in length.

MRDL – Maximum Residual Disinfectant Level. The highest level (i.e., concentration) of residual disinfectant that is allowed in drinking water.

MRDLG – Maximum Residual Disinfectant Level Goal. The level (i.e., concentration) of residual disinfectant in drinking water at or below which there is no known or expected risk to health. The MRDLG allows for a margin of safety.

Micromhos per Centimeter (µmhos/cm) – A measure of the ability of a material (e.g., water) to conduct the flow of an electrical current. The higher the mho (pronounced mō) value, the more conductive the material.

N – Nitrogen atom; atomic weight 14.0067. When nitrate concentrations are presented "as N," it refers to only the weight of the nitrogen in each molecule of nitrate [Nitrate (NO_3) weight = 62.0049].

N/A – Not Applicable. The information does not apply for this contaminant and/or category.

ND – Not Detected by the laboratory. The detection limit for a compound (e.g., the concentration of a contaminant) is determined based on the analytical method that is used by the laboratory.

NTU – Nephelometric Turbidity Units. A measure of the cloudiness (i.e., transparency) of water. Turbidity in excess of five NTU is just noticeable to the average person.

P – Phosphorus atom; atomic weight 30.9737. The portion of the total phosphorus or orthophosphate (PO_4^{-3}) represented by only the weight of the phosphorus atoms.

pCi/L – Picocuries per Liter. As a unit to measure radioactivity, a picocurie is an extremely small amount of radioactivity (10^{-12} of a curie or 1 millionth of a millionth of a curie).

pH Units – These units, which range from 1 to 14, measure how acidic (1 – 6.9) or alkaline (7.1 – 14) a solution is. A pH of 7 is neutral (neither acidic nor basic). It is a measure of the concentration of free hydrogen ions in the solution. Specifically, it is the negative logarithm of the hydrogen ion concentration. Therefore, a lower pH unit represents a larger concentration of hydrogen ions – i.e., the solution is more acidic. Also, a change of one pH unit represents a 10-fold change in the concentration of hydrogen ions (e.g., a solution with a of pH 6 has 10 times more free hydrogen ions than a pH 7 solution).

ppb – Micrograms per liter (µg/L) One part per billion. For example, if you were 32 years old, one second of your life would equal approximately 1 ppb.

ppm – Milligrams per liter (mg/L). One part per million. For example, if you walked from KU to Dallas, Texas (about 400 miles), one step would be about one ppm of that trip (or one foot in 189 miles is one ppm).

SMCL – Secondary Maximum Contaminant Level (or optimal level) set forth by KDHE. These secondary contaminants do not pose a health risk; rather they affect various aesthetic qualities of drinking water (e.g., taste, odor and color).

TT – Treatment Technique. A required process intended to reduce the level of a contaminant.

Table 1 presents the water quality tests results of water sampled from the KU distribution system. Total coliform and fecal coliform bacteria are tested on a monthly schedule. Copper and lead are tested every three years. These sampling schedules are set by the EPA under the Safe Drinking Water Act.

Coliform bacteria are commonly found in the environment (e.g., in soil and surface water and on vegetation) and are usually harmless. Coliform bacteria will not likely cause illness. Fecal coliform and *Escherichia coli* (commonly called *E. coli*) are bacteria whose presence indicates that the water may be contaminated with human or animal waste. If fecal coliform and/or E. coli bacteria are present in drinking water, these microbes may cause short-term effects such as diarrhea, cramps, nausea, or headaches. These microbes may pose a more significant health risk to infants, young children, the elderly, and people with severely compromised immune systems.

Ingestion of lead can cause serious health problems especially for pregnant women, infants and young children. These health problems include damage to the kidneys, liver, and neurological system including the brain. The most common sources of lead that is ingested are lead-based paint (banned in 1978 though homes built before 1960 may contain lead-based paint) and contaminated soils. Lead in drinking water is not a common source of lead poisoning. The source of lead in drinking water is primarily from the water delivery system (e.g., pipes, solder, and brass fixtures). When water has been sitting for several hours, flushing the tap for 30 seconds to 2 minutes before using the water for drinking or cooking you can minimize the potential for lead exposure. Information on lead in drinking water is available from the EPA's Safe Drinking Water Hotline (800-426-4791) or at their web page

Table 1. Primary Drinking Water Contaminants - Monitored in the KU Distribution System (January to December 2008)

Parameter	Concentration Goal (EPA MCLG)	Highest Level Allowed (EPA MCL)	Highest Level Detected	Range
Total Coliform Bacteria	0.00%	5% of monthly samples are positive (2 samples out of 40)	0.00%	N/A
Fecal Coliform Bacteria	0 samples	Routine sample and repeat sample are Total Coliform Positive; also one sample is Fecal Positive/E. Coli Positive	0 samples	N/A
Total Trihalomethanes	None	80 ppb	69.5 ppb	35.3 - 69.5 ppb
Haloacetic acids	None	60 ppb	53.2 ppb	1.1 - 53.2 ppb
Total Chlorine	MRDLG = 4.0 ppm	MRDL = 4.0 ppm	3.5 ppm	ND - 3.5 ppm
Parameter	**Concentration Goal (EPA MCLG)**	**Highest Level Allowed (EPA MCL)**	**90th Percentile**	**Range**
Copper (tested in 2008)	1.3 ppm	1.3 ppm (AL)	0.120 ppm	N/A
Lead (tested in 2008)	0 ppb	15 ppb (AL)	3.0 ppb	N/A

Although copper is an essential nutrient (Recommended Daily Allowance 0.9 milligrams for adult men and women; Food and Nutrition Board, National Institute of Medicine, National Academies), excess copper consumption over a short period of time can result in temporary gastrointestinal distress (e.g., nausea, vomiting, diarrhea and stomach cramps). People drinking water containing excessive copper over many years may suffer liver or kidney damage. Individuals with Wilson's Disease, a rare inherited (genetic) disorder (1 in 30,000 people), should consult their personal physician if copper is detected in their drinking water. The principal source of copper in drinking water results from the leaching of copper from pipes and bathroom fixtures due to corrosive (acidic) water. In water systems that have been sitting unused for several hours, running the water for 30 to 60 seconds before using it for drinking or cooking will often significantly reduce the concentration of copper.

Table 2 present the results of tests on the drinking water sampled at the Lawrence treatment plants (*2009 City of Lawrence Water Quality Report*). Total organic carbon (TOC) has no health effects; however, total organic carbon provides a medium for the formation of disinfection byproducts (e.g., trihalomethane and haloacetic acid compounds; Table 1) that may have possible carcinogenic (e.g., bladder cancer), reproductive and developmental effects. Turbidity also has no health effects; however, turbidity is an indication of water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). The primary source of these contaminants listed

Table 2. Primary Drinking Water Contaminants - Monitored at the Lawrence Treatment Plants (January to December 2008)

Parameter	Concentration Goal (EPA MCLG)	Highest Level Allowed (EPA MCL)	Highest Level Detected	Range
Alpha emissions (gross)	0 pCi/L	15 pCi/L	1.0 pCi/L	ND - 1.0 pCi/L
Arsenic	0 ppb	10 ppb	4.0 ppb	1.0 - 4.0 ppb
Asbestos (08/19/2004)	7 MFL	7 MFL	ND	N/A
Atrazine	3 ppb	3 ppb	1.4 ppb	0.2 - 1.4 ppb
Barium	2 ppm	2 ppm	0.1 ppm	0.032 - 0.100 ppm
Chromium	100 ppb	100 ppb	4.8 ppb	ND - 4.8 ppb
Combined Radium (isotopes 226 & 228)	0 pCi/L	5 pCi/L	1.0 pCi/L	ND - 1.0 pCi/L
Fluoride	4 ppm	4 ppm	0.86 ppm	0.52 - 0.86 ppm
Nitrate (as N)	10.0 ppm	10.0 ppm	0.67 ppm	0.1 - 0.67 ppm
Selenium	50 ppb	50 ppb	2.1 ppb	ND - 2.1 ppb
Total Organic Carbon	N/A	TT	4.2 ppm	2.4 - 4.2 ppm
Turbidity (Percentage of samples < 0.3 NTU)	N/A	TT	0.82 NTU (99%)	0.06 - 0.82 NTU

in Table 2 is the erosion of natural deposits (e.g., soil). Other sources include runoff of pesticides (e.g., pesticides used on row crops or residential properties), decay products of natural and man-made deposits, water additives (e.g., fluoride which promotes strong teeth), and runoff of fertilizers (e.g., from agricultural areas or residential properties).

Table 3 is a list of secondary contaminants that are not federally regulated as they do not pose a health risk. KDHE sets guidelines for these contaminants to insure public water systems provide consumers the best quality water possible. The major source of secondary contaminants is the erosion of natural deposits (e.g., soil). Another source is additives to control water delivery pipe corrosion (e.g., orthophosphorous).

Table 3. Secondary Drinking Water Contaminants - Monitored at the Lawrence Treatment Plants (January to December 2008)

Parameter	Highest Level Allowed (KDHE SMCL)	Highest Level Detected	Range
Alkalinity (as mg/L $CaCO_3$)	300 ppm	113 ppm	38 - 113 ppm
Aluminum	0.05 ppm	0.069 ppm	ND - 0.069 ppm
Calcium	200 ppm	57 ppm	32 - 57 ppm
Chloride	250 ppm	140 ppm	12 - 140 ppm
Corrosivity	0 Langelier Saturation Index	0.57 Langelier Saturation Index	0.28 - 0.57 Langelier Saturation Index
Magnesium	150 ppm	10 ppm	2.1 - 10.0 ppm
Nickel	0.1 ppm	0.0079 ppm	0.0013 - 0.0079 ppm
Orthophosphate (as P)	N/A	0.11 ppm	ND - 0.11 ppm
pH	6.5 – 8.5 pH Units	10.1 pH Units	6.4 - 10.1 pH Units
Potassium	100 ppm	13 ppm	3 - 13 ppm
Silica	50 ppm	11 ppm	0.59 - 11.00 ppm
Sodium	100 ppm	120 ppm	9.6 - 120.0 ppm
Specific Conductance	1,500 µmhos/cm	870 µmhos/cm	280 - 870 µmhos/cm
Sulfate	250 ppm	180 ppm	22 - 180 ppm
Total Dissolved Solids	500 ppm	560 ppm	160 - 560 ppm
Total Hardness	400 ppm	180 ppm	89 - 180 ppm
Total Phosphorus (as P)	5 ppm	0.26 ppm	0.14 - 0.26

Table 4 presents the amount of radiation from radon that is in the drinking water supplied to the KU campus. Radiation is a natural part of the environment and all people receive exposure to radioactivity that naturally occurs in the soil, water, air and food. Radon is the largest natural contributor to public radiation dose and is created when uranium decays to radium which then decays to radon. Radon is a gas that occurs in both the air and in water and cannot be detected by a person's senses because it is colorless, odorless and tasteless. Radon is a human carcinogen. Drinking water containing radon can increase the risk of stomach cancer. Breathing air containing radon may increase the risk of getting lung cancer. The primary source of radon found in indoor air is from radon moving up through the soil entering buildings though cracks and holes in the foundation. Radon from that source presents a much greater risk of lung cancer than radon in drinking water. The amount of radon entering buildings through the water distribution system is usually very small. EPA has proposed a regulation to reduce radon in drinking water (National Primary Drinking Water Regulations; Radon-222. Federal Register: November 2, 1999). One of the two proposed options includes a multimedia mitigation (MMM) program to reduce radon exposure (a component of the "Alternative Maximum Contamination Level;" Table 4). For additional information, contact the Kansas Radon Program by phone (800-693-5343) or visit their website or call EPA's Radon Hotline (800-SOS-RADON).

The water supplied to the KU campus is derived almost entirely from surface water sources (the Kansas River and Clinton Lake). Surface waters have the lowest concentrations of radon when compared with groundwater sources. Generally, radon concentrations found in surface waters are about one-tenth that found in most wells.

Table 4. Radiation from Radon - Monitored at the Lawrence Water Treatment Plants (January to December 2008)

Parameter	Alternative Maximum Contaminant Level (EPA AMCL)*	Highest Level Allowed (EPA MCL)*	Highest Level Detected	Range
Radon	4,000 pCi/L	300 pCi/L	23 pCi/L	ND - 23 pCi/L
	* Proposed EPA level	* Proposed EPA level		

Web Links for Additional Water Quality Information

KU Department of Environment, Health & Safety
KDHE Public Water Supply Section
KDHE Source Water Assessment Reports
Proposed Radon in Drinking Water Rule (EPA)
EPA Ground Water and Drinking Water

Note:** Some of the data and information presented in this report are from the* **2009 City of Lawrence Water Quality Report.** ***The format has been modified in some cases. This KU report is available on the EHS website.