

2014 Drinking Water Quality Consumer Confidence Report

The University of Kansas - Lawrence Campus – June 16, 2015

Prepared by the KU-LC 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-LC) about the quality of the drinking water provided to them by the KU-LC Public Water Distribution System (KUDS). The University is committed to providing users a safe, clean, and dependable supply of drinking water.

This 2014 Drinking Water Quality Consumer Confidence Report presents the results from analyses conducted by the KU-LC Department of Environment, Health & Safety (KU-LC EHS) and the City of Lawrence of drinking water samples collected from the KUDS and at the City of Lawrence Drinking Water Treatment Plants (LWTP) during the **2014 calendar year** (Tables 1, 2, 3, and 4). The overall conclusion of this report, based on the evaluation of these water quality test results, is that the drinking water provided to you by the KU-LC is safe and has not violated any federal or state water quality regulatory compliance standards. The KU-LC and the City of Lawrence, from whom the KU-LC purchases its water, routinely monitor the quality of the drinking water for all contaminants of concern. More information about contaminants and their potential health effects can be obtained by calling the U.S. Environmental Protection Agency's Safe Drinking Water Hotline (800-426-4791) or by visiting their [website](#).

All drinking water, including bottled water, can be presumed to contain small amounts of contaminants (i.e., any physical, chemical, biological, or radiological substance or matter in water). 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 specific contaminants in drinking 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 80 years) to have a one-in-a-million chance of having the described health effect.

In our continuing effort to vigilantly safeguard our drinking water supply, it may be necessary to make improvements in the water distribution system. Therefore, brief interruptions in the drinking water supply may occur from time to time. All public meetings regarding the KU-LC water system are posted on the KU-EHS News [website](#). If you have any questions, comments or concerns about the quality of the drinking water provided to you by the KU-LC or have any question about the information contained in

this report, please contact Jon Rossillon, KU-EHS Hazardous Materials/Environmental Protection Manager, by phone (785-864-4089) or by email (jrossillon@ku.edu). We welcome your input.

It should also be noted that 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., rheumatoid arthritis, lupus erythematosus, or multiple sclerosis), some elderly persons, and infants. These individuals or their parent/guardian should seek advice from their health care provider about the potential risk due to exposure to any possible drinking water contaminant.

One potential contaminant, *Cryptosporidium*, is required by EPA to be discussed in this report in order to inform individuals with a weakened immune system that resulting symptoms may be worse, last longer, and be life threatening {individuals with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS [especially if their CD4+ T lymphocyte count is lower than 200/mm³ – see Center for Disease Control (CDC) [web page](#)] or other immune system disorders, some elderly, and infants}. *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. The LWTP regularly monitors its source waters for this parasite. Guidelines to lessen your risk of exposure to this and other microbiological organisms can be viewed on the Center for CDC [web page](#) or obtained by calling the EPA Safe Drinking Water Hotline (800-426-4791).

In order to understand the sources of contaminants, the sources of drinking water need to be reviewed. These sources of 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. In some instances, these materials may be considered contaminants and, if present in high enough concentrations, pose a risk to human health.

The two primary drinking water sources for the KU-LC are the Kansas River and Clinton Lake. Six Kansas River alluvial wells are also 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](#).

Contaminants in drinking water fall into one of five categories:

- **Microbial contaminants:** for example, pathogens that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- **Inorganic chemical contaminants:** for example, salts and metals that can be naturally occurring and also originate from urban stormwater runoff, industrial and domestic wastewater discharges, oil and gas production, mining, and farming.
- **Organic chemical contaminants:** these are volatile organic and synthetic chemicals that can arise as byproducts of industrial processes and petroleum production as well as from gas stations, urban stormwater runoff, and septic systems.
- **Pesticides:** chemical preparations used to kill or control pests (e.g., herbicides for plants and insecticides for insects) that may come from many sources including agriculture, urban stormwater runoff, residential, and commercial activities.
- **Radioactive contaminants:** radionuclides found naturally in the soil or the result of oil/gas production and mining activities as a result of their extraction processes.

To assist you in understanding this report, the following explanations for abbreviations and definitions of various terms used in this report are provided:

AL – Action Level – The concentration of lead or copper in drinking water that, when exceeded, triggers the need for treatment techniques or other actions.

EPA – United States Environmental Protection Agency – The Federal Regulatory Agency responsible for establishing for drinking water standards.

KDHE – Kansas Department of Health and Environment – The State of Kansas Regulatory Agency responsible for establishing drinking water standards.

KUDS – University of Kansas Distribution System – The drinking water distribution system of the University.

LWTP – Lawrence Water Treatment Plants – The drinking water treatment facilities for the City of Lawrence.

Lead and Copper 90th Percentile – The concentration of lead or copper in a water sample that is the 90th percentile rank (ordered by concentration) of all samples.

LRAA – Locational Running Annual Average – Compliance with the MCL for the two groups of disinfection byproducts (TTHM and HAA5) is calculated for each

monitoring location in the distribution system separately, then averaged, rather than from the average of all samples from all sites (RAA).

MCL – Maximum Contaminant Level – The highest concentration level of a contaminant that is allowed in drinking water. The MCL is set as close to the MCL goal (MCLG) 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.

MPA – Monitoring Period Average – Average of samples results collected during a defined time frame.

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

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

µmhos/cm – Micromhos per Centimeter – These units express the ability of a material (e.g., water) to conduct the flow of an electrical current (i.e., the specific conductance). The more electrically conductive a material is, the higher the mho (pronounced mō) value reading. In relation to drinking water, specific conductance is related to water temperature and the amount of dissolved minerals in the water. It does not identify the specific minerals that are present.

N – Nitrogen – atom; atomic weight 14.006. When nitrate concentrations are presented “as N,” it refers to only the weight of the nitrogen in each molecule [Nitrate (NO₃) weight = 62.004 while Nitrate as N weight = 14.006].

N/A – Not Applicable or Not Available – The information does not apply for this contaminant and/or category or is not available (e.g., not measured).

ND – Not Detected – The detection limit for a compound (e.g., the lowest concentration of a contaminant that can be measured) is determined by the analytical method that is used. If the concentration of a contaminant is listed as ND, it may still be present, however, below the level detectable by that method.

NTU – Nephelometric Turbidity Units – The turbidity of water (i.e., clarity, cloudiness) is expressed in terms of NTU units. Turbidity, an optical property of water, is caused by suspended particles in the water that either scatter or absorb light. These particles can be both inorganic (e.g., clay or silt) and organic (e.g., algae). The more suspended particles in the water, the more light is scattered and the more turbid the water would appear. A water sample with a turbidity level of five (5) NTU would appear noticeably cloudy.

P – Phosphorus – atom; atomic weight 30.97. When the concentration (weight/volume of water) of a phosphorus containing molecule is presented “as P,” it refers to only the portion of that molecule, e.g., orthophosphate (PO_4^{-3}), represented by the weight of the phosphorus atoms [the weight of Orthophosphate (PO_4^{-3}) = 94.97 while the weight of Orthophosphate as P = 30.97].

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 – pH units measure how acidic or alkaline (i.e., basic) a solution is. A pH of 7 is neutral. The pH is a measure of the concentration of free hydrogen ions (H^+) in the solution. Specifically, pH is the negative logarithm of the hydrogen ion concentration ($\text{pH} = -\log[\text{H}^+]$). Therefore, a lower pH unit represents a larger concentration of hydrogen ions – i.e., more acidic. Also, a change of one pH unit represents a 10-fold change in the concentration of hydrogen ions (e.g., a solution having a pH 6 has 10 times more hydrogen ions than a pH 7 solution).

ppb – Parts per billion is a concentration expression equivalent to micrograms per liter ($\mu\text{g}/\text{L}$); 3 ppb is equal to 3 $\mu\text{g}/\text{L}$. To put into perspective what a ppb is, if you were to sample a single part per billion of the Robinson Gym swimming pool (25 meters long x 10 meters wide x 1.5 meters average depth), that amount of water would equal 7.5 drops (0.375 cm^3).

ppm – Parts per million is a concentration expression for a solution equivalent to milligrams per liter (mg/L); 3 ppm is equal to 3 mg/L . To put into perspective what parts per million represents, if you lived in a residency hall with two other students, the population of your room would equal approximately 1 ppm of the total population of the state of Kansas (2.9 million – 2012 US Census Bureau).

RAA – Running Annual Average is the average concentration of a substance present at in all samples from all sites to determine the compliance with MCL over the reporting period.

SMCL – Secondary Maximum Contaminant Level is established by the Kansas Department of Health and Environment (KDHE) with guidance from the United States Environmental Protection Agency (EPA). These secondary contaminants do not pose a health risk; rather, they affect various aesthetic qualities of drinking water relating to the public acceptance of drinking water (e.g., taste, odor, and color).

TT – Treatment Technique – A process (i.e., technology), when installed, leads to the reduction in the level of a contaminant (e.g., turbidity and organic carbon).

Table 1 presents the tests results for Primary Contaminants conducted on water samples collected directly from both the LWTP and the KUDS. Although copper is an essential nutrient (Recommended Daily Allowance 0.9 milligram for both adult men and women over the age of 19; *Dietary Reference Intakes Essential Guide Nutrient Requirements*, Food and Nutrition Board, National Institute of Medicine, National Academies, 2006), 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 to 4 in 100,000 people), should consult their personal physician if copper is detected in their drinking water. The main source of copper in drinking water is the leaching of copper from water delivery pipes and bathroom fixtures due to corrosive (acidic) water. In water systems that have been sitting unused for several hours, running the water for time period of 30 to 60 seconds before using it for drinking or cooking will significantly reduce the concentration of copper.

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 are the ingestion of lead-based paint (banned in 1978; homes built before 1960 may contain lead-based paint) and/or 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 a time period of 30 seconds to 2 minutes before using the water for drinking or cooking 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](#).

The KUDS drinking water is tested for total coliform and *Escherichia coli* (abbreviated as *E. coli*) bacteria on a monthly schedule. Copper and lead are tested every three years. These sampling schedules are established by the EPA under the National Primary Drinking Water Regulations (40 CFR [141](#) & [143](#)). Coliform bacteria are commonly found in the environment (e.g., in soils, surface waters, and on vegetation) and are usually harmless. Coliform bacteria will not likely cause illness. *E. coli* are a large and diverse group of bacteria. These bacteria originate only from the digestive system of mammals, including humans. The presence of *E. coli* in water is a strong indication of recent sewage or animal waste contamination which makes them excellent indicator organisms. Most strains of *E. coli* bacteria are harmless and are an important part of a healthy human digestive tract; however, certain strains may cause illness. Sources of *E. coli* contamination include: runoff from animal feedlots and

Table 1. Primary Drinking Water Contaminants from KUDS and LWTP (2014).

Parameter	Concentration Goal (EPA MCLG)	Highest Level Allowed (EPA MCL)	90th Percentile	Range	Location Sampled
COPPER AND LEAD MONITORING					
Copper (tested in 2014)	1.3 ppm	1.3 ppm (AL)	0.120 ppm	0.011 - 0.180 ppm	KUDS
Lead (tested in 2014)	0.0 ppb	15.0 ppb (AL)	3.3 ppb	ND – 6.2 ppb	KUDS
Parameter	Concentration Goal (EPA MCLG)	Highest Level Allowed (EPA MCL)	Highest Level Detected	Range	Location Sampled
MICROBIOLOGICAL CONTAMINANTS					
Total Coliform and <i>Escherichia coli</i> (<i>E. coli</i>) Bacteria	0 samples	Routine sample is <i>E. coli</i> + and one repeat sample is Total Coliform+ or <i>E. coli</i> +	0 samples	N/A	KUDS
Turbidity	N/A	TT	0.287 NTU	0.029 - 0.287 NTU	LWTP
DISINFECTION BYPRODUCTS					
Chloramine	MRDLG = 4.0 ppm	MRDL = 4.0 ppm	3.5 ppm (RAA)	3.5 - 3.6 ppm	LWTP
			3.6 ppm (MPA)		LWTP
Halacetic Acids (HAA)	0 ppb	60 ppb	29 ppb (LRAA)	14 - 37 ppb	KUDS
Total Chlorine	MRDLG = 4.0 ppm	MRDL = 4.0 ppm	4.0 ppm	0.5 - 4.0 ppm	KUDS
Total Trihalomethanes (THM)	0 ppb	80 ppb	49 ppb (LRAA)	14 - 74 ppb	KUDS
ORGANIC CONTAMINANTS					
Atrazine	3.00 ppb	3.00 ppb	0.5 ppb	ND - 0.5 ppb	LWTP
INORGANIC CONTAMINANTS					
Arsenic	0.0 ppb	10.0 ppb	2.1 ppb	ND - 2.1 ppb	LWTP
Barium	2.000 ppm	2.000 ppm	0.110 ppm	0.024 - 0.110 ppm	LWTP
Chromium (total)	100.0 ppb	100.0 ppb	2.5 ppb	ND - 2.5 ppb	LWTP
Nitrate (as N)	10.0 ppm	10.0 ppm	1.10 ppm	ND - 1.10 ppm	LWTP
Selenium	50.00 ppb	50.00 ppb	1.20 ppb	ND - 1.20 ppb	LWTP
RADIONUCLIDE CONTAMINANTS					
Radium Isotope 228	0 pCi/L	5 pCi/L	1.6 pCi/L	ND - 1.6 pCi/L	LWTP
Gross Alpha & Beta	0 pCi/L	15 pCi/L	1.6 pCi/L	0.70 - 1.6 pCi/L	LWTP

agricultural areas where manure fertilizer is used, wildlife that use the source water as part of their natural habitat, runoff from areas contaminated with pet manure, septic system failure, and wastewater treatment plants if the water is inadequately treated. *E. coli* may cause short-term health 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. In rare cases, *E. coli* infection can lead to kidney failure and death. Microbial growth, like *E. coli*, can be influenced by turbidity (i.e., cloudiness) which, while posing no health risk itself, can interfere with disinfection and provide a medium for microbial growth.

Disinfectants (e.g., chlorine and chloramine) are an essential element of drinking water treatment because of the protection they provide against waterborne disease-causing microorganisms. These disinfectants can react with naturally occurring materials in the water to form byproducts such as trihalomethanes and haloacetic acids. An extensive research effort is currently underway to better understand the potential health risks (e.g., bladder cancer) associated with exposure to disinfection byproducts. Because of these potential health concerns, the KUDS is monitored four times per year for these byproducts.

The primary source of many of the contaminants (arsenic, barium, chromium, and selenium) listed in Table 1 is the erosion of natural deposits (e.g., soil). Other sources include runoff of pesticides (e.g., the herbicides atrazine which is used on row crops), and stormwater runoff from areas where fertilizers have been applied (e.g., nitrate from agricultural areas or residential properties).

Table 2 is a list of Secondary Contaminants detected in the drinking water at the LWTP. These secondary contaminants primarily affect the aesthetic qualities of drinking water (e.g., taste and odor) and are not federally regulated as they do not pose any health risks; however, they do have recommended secondary MCL. The primary source of secondary contaminants is the erosion and leaching of natural deposits (e.g., soil). Another source is additives to drinking water that help prevent tooth decay (i.e., fluoride).

Table 3 is a list of drinking water parameters designated by EPA to be monitored as part of the Unregulated Contaminant Monitoring Rule (UCMR) 3 program which is now completed as of January 2014. As specified by the Safe Drinking Water Act, EPA reviews contaminants that had been targeted through existing prioritization processes, including previous UCMR contaminants and the Contaminant Candidate List. These contaminants were identified based on current research about their occurrence and

their health effect risk factors. This drinking water monitoring provides a basis for future regulatory actions to protect public health.

Table 2. Secondary Drinking Water Contaminants Having Recommended SMCL Monitored at the LWTP (January to December 2014).

Parameter	SMCL	Highest Level Detected	Range
Aluminum	0.05 - 0.20 ppm	0.12 ppm	ND - 0.12 ppm
Chloride	250 ppm	130 ppm	19 - 130 ppm
Fluoride	4.0 ppm	0.50 ppm	0.19 - 0.50 ppm
pH	6.5 – 8.5 pH Units	9.4 pH Units	7.4 - 9.4 pH Units
Sulfate	250 ppm	120 ppm	39 - 120 ppm
Total Dissolved Solids	500 ppm	450 ppm	220 - 450 ppm

Table 3. These parameters are monitored in the KUDS as specified by the Unregulated Contaminant Monitoring Rule 3 (January 2014).

Unregulated Contaminant	Highest Level Detected	Range
Chlorate	0.061 ppm	0.033 - 0.061 ppm
Chromium-6 (hexavalent chromium)	1.60 ppb	0.35 - 1.60 ppb
Chromium (total)	1.70 ppb	0.42 - 1.70 ppb
Molybdenum	3.10 ppb	2.00 - 3.10 ppb
Strontium	378 ppb	254 - 378 ppb
Vanadium	3.10 ppb	0.72 - 3.10 ppb

Table 4 is a list of supplemental parameters meant to provide additional information to the public about the water quality of the drinking water. There are no health risks associated with these parameters. Although total organic carbon (TOC) has no health risk, it provides a medium for the formation of disinfection byproducts (e.g., trihalomethanes and haloacetic acid compounds; Table 1) that may have possible carcinogenic effects (e.g., bladder cancer).

Table 4. Supplemental Drinking Water Parameters Collected at the LPWT (January to December 2014).

Parameter	Highest Level Detected	Range
Alkalinity (as mg/L CaCO ₃)	130 ppm	48 - 130 ppm
Bromide	0.05 ppm	0.01 - 0.05
Calcium	50 ppm	31 - 50 ppm
Magnesium	18 ppm	2 - 18 ppm
Manganese	0.0031 ppm	ND - 0.0031 ppm
Nickel	0.0014 ppm	ND - 0.0014 ppm
Orthophosphate (as P)	0.33 ppm	ND - 0.33 ppm
Potassium	10.0 ppm	3.2 - 10.0 ppm
Silica	13.00 ppm	0.29 - 13.00 ppm
Sodium	97 ppm	20 - 97 ppm
Specific Conductance	1,010 µmhos/cm	351 - 1,010 µmhos/cm
Total Hardness (as mg/L CaCO ₃)	212 ppm	106 - 212 ppm
Total Organic Carbon	3.9 ppm	2.4 - 3.9 ppm
Total Phosphorus (as P)	0.18 ppm	ND - 0.18 ppm

The concentration of N-Nitrosodimethylamine (NDMA) in drinking water is presented in **Table 5**. NDMA is considered a priority pollutant by EPA; however, no federal standard has been established. NDMA is considered an [“emerging contaminant.”](#) Sources of NDMA found in drinking water include effluent from industries such as tanneries, pesticide manufacturing plants, rubber and tire manufacturing plants, alkylamine manufacturing industries, fish processing industries, foundries, and dye

manufacturing plants. NDMA exposure may also occur through the ingestion of food that contains nitrosamines, such as smoked and cured meats (e.g., bacon and smoked sausage), as well as eating fish and cheese, drinking beer and breathing or inhaling cigarette smoke. NDMA is also a byproduct of wastewater and drinking water treatment plants that use chloramines for disinfection. The LWTP do use chloramines for disinfection purposes. NDMA is considered an emerging drinking water contaminant because of its potential carcinogenicity and toxicity.

Table 5. Other Drinking Water Contaminant Monitored at the LWTP (January to December 2014).

Parameter	Highest Level Detected	Range
N-nitrosodimethylamine (NDMA)	0.0024 ppb	ND - 0.0024 ppb

Web Links for Additional Drinking Water Quality Information

- [KU Department of Environment, Health & Safety](#)
- [KDHE Public Water Supply Section](#)
- [KDHE Source Water Assessment Report, City of Lawrence](#)
- [EPA Ground Water and Drinking Water](#)
- [Consumer Confidence Report, City of Lawrence](#)

Note: Some of these data and information presented in this report are from the City of Lawrence [Consumer Confidence Report 2015](#) covering the 2014 calendar year. The format has been modified. This report is available on the KU-LC EHS website (<https://ehs.drupal.ku.edu/ehs-reports>).