

APPENDIX B

WATER QUALITY TESTING FOR NEW PUBLIC WATER SUPPLY SOURCES

Analytical Requirements for New Sources

Background

This discussion defines the Bureau of Water's policy regarding water quality test results that must be submitted along with public water supply permit applications for new drinking water source waters. The intent of this policy is to insure that PWSSs comply with primary drinking water standards and monitoring requirements in the course of supplying the public with safe drinking water. This discussion specifically applies to community water supply systems and non-transient non-community water supply systems as defined in KAR 28-15a-2. Analytical requirements for new groundwater sources for transient non-community systems are initially limited to radon, IOCs, and VOCs. KDHE may request collection of additional samples from new sources for analysis for other parameters as is deemed necessary to protect public health. Additional sampling may also be required by KDHE for community and non-transient community water supply system as is deemed necessary in order to protect public health.

Regulations

Maximum contaminant levels, monitoring requirements based on maximum contaminant levels, and monitoring requirements for 15 inorganic contaminants not regulated by a maximum contaminant level (for which monitoring is still required) can be found in KAR 28-15, KAR 28-15a 61-66, KAR 28-15a 23-25, and KAR 28-15a-23, respectively. KAR 28-15-16 sets forth permit requirements for PWSSs. The results of the analyses performed by the KDHE laboratory, or by a laboratory certified by KDHE according to KSA 65-171(l), regarding the physical, bacteriological, chemical and radiological constituents of any untreated source waters must be submitted along with the permit application as part of ensuring that the proposed treatment facilities will be able to reliably produce a potable water meeting the requirements of the primary drinking water regulations established in KAR 28-15a. KSA 65-163 allows the Secretary of Health and Environment to require "... such other data and information as may be required ..." in addition to the specific state permit requirements as part of an application for a public water supply permit.

For a new source of supply, it is important that proper sampling techniques and testing procedures be employed to insure that its subsequent use will not result in an exceedance of a maximum contaminant level, trigger increased monitoring requirements or adversely impact public health.

Required Analyses

A summary of the analytical requirements for new sources can be found in Attachment A. In general, samples are collected from the test well (or new surface source) according to the instructions accompanying the sample containers provided by the laboratory and then submitted

to that laboratory for analyses. Any laboratory certified by KDHE according to the requirements of KSA 65-171(l) may perform the required analyses. Alternatively, the required analyses may be performed by the KDHE laboratory. The results of the analyses must be included with the plans, specifications and permit application for the source water submitted to the KDHE for its review. Except as noted below, the Bureau of Water will not approve the construction of a public water supply well or authorize the use of a new surface source until the results of the source water analyses have been provided for its review. For assistance with analytical requirements, sample bottle requests, scheduling, certified laboratories, and costs contact the KDHE's Bureau of Water at (785) 296-5514.

For new groundwater sources, an initial partial inorganic chemical analysis may be completed on test wells to determine the preferred site for development of the new well. Relevant parameters for this initial screening include calcium, magnesium, sodium, total alkalinity, chloride, sulfate, iron, manganese, nitrate, and total hardness. The analyses for the initial screening may be conducted in the field utilizing portable laboratory kits equipped with a spectrophotometer, available from several laboratory equipment supply companies. If a test well encounters separate aquifers with potentially differing water quality, then each aquifer should be sampled for at least the partial inorganic chemical analysis. If a separate aquifer is determined to be of poor quality, such as a shallow alluvial aquifer with elevated sulfate levels, the water supply well must be designed and constructed so as to adequately seal off that particular aquifer to prevent contamination of the lower aquifers and the well in general.

Once the site for the new well has been identified, samples must be obtained from a site-specific test well and analyzed for all required parameters to insure compliance with the drinking water standards. The test well should be located as close as possible to the site of the proposed well (preferably within 50 ft.) and the water samples collected from the same aquifer that will be screened and isolated in the completed well. If after completing a suitable test drilling program in the area, the water system is unable to locate a source of supply which meets the drinking water standards, a conference may be held with KDHE, the PWSS, and the engineer and/or well driller for the purpose of discussing the options that the water system has regarding the location of a new source, blending, treatment, or connection to adjacent supplies.

Offset Wells

If the PWSS proposes to construct an additional or replacement well in the same aquifer as an existing public water supply well and the proposed well will be located within 300 feet of the existing well, then the results of the chemical analyses of a recent sample from the existing well or the relevant point of entry to the distribution system may be submitted to KDHE for approval as satisfying new source water quality testing requirements provided the results are current and proper analytical methods were employed. It is important to note that the overall water quality of the additional/replacement well could significantly vary from that of the existing well depending on many factors including differences in well construction such as depth of screen or the presence of zones of dissimilar quality within the aquifer. Where there are potential water quality concerns such as elevated nitrate, iron, and manganese, or potential significant variation in the formation,

KDHE recommends additional investigative activities such as the drilling of a test well and sampling for at least a partial mineral analysis and any other parameters of concern.

Other Considerations

Groundwater quality may differ significantly over short distances. Even if water samples are obtained from a test well in compliance with these procedures and current standards, it is still possible that the water from the completed well may exceed drinking water standards for certain constituents that would require blending, treatment, or other methods to achieve compliance.

Recommended Sampling Procedures

Background

All new sources of public water supplies must be tested for chemical quality in accordance with Kansas Administrative Regulations and this discussion. It is imperative that the samples obtained for analyses are representative of the source. This section provides general information to achieve this purpose. It is not intended to be a comprehensive treatment of all potential sampling issues.

Precautions must be taken to insure representative samples of groundwater are collected from test wells. The degree and type of effort and care that goes into a sampling event is dependent on the chemical species of interest and the concentration levels of concern. The objective of this sampling effort is to obtain representative samples of the water in the test well to determine if the water will meet primary drinking water standards. These standards include limits for several volatile organic compounds (VOCs), synthetic organic compounds (SOCs), inorganic chemicals (IOCs), and radionuclides. Today's analytical methods and analytical instruments can detect the presence of these types of parameters to the part per billion. Improper sampling techniques or seemingly insignificant contamination of samples can adversely affect test results and potentially lead to a mischaracterization of a source as exceeding one or more of the primary drinking water standards.

Test Well Construction Considerations

The following well drilling recommendations are provided as part of minimizing the potential of contaminating water samples:

- A. The drilling of test wells does not require prior approval of KDHE. However, test wells must be drilled, completed, properly abandoned, and plugged in conformance with KAR 28-30-1 through 28-30-10. Test well construction must include provisions for a temporary, watertight, lockable cap until such time as the test well has been either completed into a source well or abandoned and plugged.
- B. The drilling rig and all associated items to be introduced into the bore hole must be thoroughly washed with hot potable water or steamed prior to the drill rig entering the drilling site. In addition, the drilling rig's water pump and plumbing system must be thoroughly flushed.

- C. All casing pipe including screened sections must be washed with a low-suds, non-phosphate detergent such as Alconox® and thoroughly rinsed prior to its introduction in the bore hole.
- D. Lubricating oils or solvents should not be used on the drill rod threads.
- E. All water used in the drilling and construction process shall be obtained from a potable water supply source. Sodium bentonite is acceptable for a drilling fluid mud. The use of some organic drilling fluids, such as polymeric additives, may enhance biological activity in the aquifer and should be avoided.

If the formation is not stable enough to support the bore hole, a temporary casing should be installed. A common approach to stabilization is to place material such as gravel pack into the bore hole annulus with a tremie pipe until the level of the material is sufficiently above the screen. Less porous material such as sand followed by a drilling mud may then be placed into the bore hole annulus with a tremie pipe to both seal the well and facilitate the removal of the casing at a later date.

- F. The use of PVC solvent-based cements should be avoided where a temporary casing is installed. Compounds such as tetrahydrofuran, methyl-ethyl-ketone, and toluene have been known to leach into groundwater samples at the milligram per liter or ppm level from PVC well casings whose pipe joints were glued with PVC solvent cements.

Sampling Considerations

- A. Purging the Well

After completion, the test well must be purged to remove contaminants left over from the drilling of the well and to ensure that the stagnant regions in the bore hole, e.g. water within the well casing, are thoroughly flushed with water from the aquifer. The volume of water that should be purged in order to obtain samples that are both representative of the aquifer and turbidity free can vary from well to well, however, most wells are considered adequately purged after having been pumped for three to ten well-bore volumes (Driscoll, 1986). The minimum volume of water to be purged as a function of casing diameter and depth may be estimated from the following equation:

$$V = N * 0.0408 * H * D^2$$

where,

- V = volume to be purged, gal
- N = minimum number of purge volumes, dimensionless
- D = inside diameter of the casing, in
- H = height of the water column in the casing, ft

An alternate approach to estimating the minimum purge volume would be to measure water quality parameters such as specific conductance, temperature, pH and turbidity for each well bore volume purged. The well would be considered to have been adequately purged after the trends of these parameters have stabilized for at least three consecutive purge volumes.

The nature of the aquifer, and the sampling equipment and methodology employed, must be taken into consideration to ensure that the well bore is adequately flushed so that the samples are representative of the aquifer. As an example, the number of purge volumes required to flush a well constructed in an aquifer having a high transmissivity may be much higher than estimated above if the well screen is in the lower portion of the casing. In this arrangement, the pump most likely will draw primarily from the aquifer with the region above the pump and screen remaining stagnant. Completely pumping the well bore dry would most likely be impractical; however, it may be practical to monitor the level in the well during the purging process along with the water quality parameters previously noted. Purging could be considered to be complete when the water level and the water quality parameter trends have stabilized (Scalf *et al.*, 1981).

B. Sampling Devices

There are a variety of different sampling devices that can be utilized for collecting groundwater samples. The sampling equipment used must not alter or contaminate the sample. Since samples will be analyzed for trace organic chemicals, special care must be taken as conventional oil-lubricated pumps, plastic tubing and fittings and rubber tubing can be significant sources of contamination. The following devices are recommended for the collection of samples:

1. Positive pressure pumps, such as a non-gas contact bladder pump where water is forced to the surface through positive pressure when operated below the well's water level, will cause the least amount of alteration in sample integrity as compared to other sample retrieval methods. A positive pressure pump may be operated electrically, mechanically, or by air/nitrogen pressure. Any surface on the pump system, including all tubing or piping, that comes into contact with the sample should be made of acceptable materials as defined below. A side tap may be installed on the pump discharge pipe to permit adjustment of the sample stream to a low flow. The tap, however, must not have an aerator.

Negative pressure pumps are not recommended for collection of groundwater samples for organic analyses because removing the groundwater under suction conditions may cause the groundwater being pumped to degas resulting in the loss of volatile compounds. This is also true for peristaltic pumps. A suction lift pump, however, may be utilized for purging the bore hole prior to collection of the sample. Similarly, air lift pumps that apply air pressure to the water well to force a sample out of the discharge tube are not recommended for collection of VOC samples. Such pumps may modify the pH of the water, alter the oxidation

state of certain constituents of interest by introducing oxygen into the sample, and potentially strip out volatile compounds.

2. One of the oldest and simplest methods of sampling a water well is the use of a bailer. A bailer may be in the form of a weighted bottle or capped length of pipe on a rope or some modification thereof is lowered and raised by hand. Bailers constructed entirely of PTFE have been manufactured specially for collecting groundwater samples for analyses. Bailers used for sampling VOCs should have a sample cock or draft valve in or near the bottom of the sampler to allow withdrawal of a sample from the well below the exposed surface of the water. Suspension lines for bailers should be kept off the ground and free of other contaminating materials that could be carried into the test well.

Acceptable materials for sampling devices that may contact any groundwater sample are stainless steel, PTFE or glass. Plastics (PVC, polyethylene, or polypropylene) are an acceptable material for contacting samples when the analytes are inorganic constituents (metals, radionuclides, anions, cations) and not organic constituents. The PVC material in contact with the sample should contain only non-cemented connections and meet the requirements of NSF International's ANSI/NSF standards for well casing or potable water applications.

All sampling equipment that may contact the sample must be cleaned prior to and after each use. Pumps or bailers require cleaning of internal and external parts prior to being lowered into the well. Equipment should first be washed with clean tap water, non-phosphate detergent, and rinsed with clean tap water. Pumps may be cleaned by pumping 2 liters of the detergent solution through the pump and its suction and discharge lines followed by a clean rinse. The exterior of the pump and lines should also be cleaned with the detergent solution. A final rinse with organic-free, distilled or deionized water completes the cleaning.

Adequate isolation must be provided when there is more than one aquifer or when there is more than one sampling zone within an aquifer. In general this can be accomplished with a straddle packer pump which is comprised of a length of axial pipe upon which are mounted two packers. The fixed spacing between the packers is perforated and the pump is positioned either between the packers or above the packers. The rubber packers are expanded with air or water via surface supply lines in order to isolate a sampling zone within a bore hole or well casing. The packers are deflated to allow for vertical movement and then inflated when the desired depth is attained. Various types of sampler pump devices are available to serve as a sampler pump and may be situated as is dictated by the configuration of the well and formation.

C. Sample Container and Preservation Requirements

The certified laboratory selected to analyze the samples must be contacted to obtain appropriate instructions and sample containers. The following discussion is a general

summary of the type and minimum size of the sample containers (provided by the KDHE laboratory), preservation requirements, and maximum holding times for the required chemical analyses. A summary of the required sample containers, preservation techniques and holding times may be found in Attachment B. Additional information may be obtained from the KDHE's Bureau of Water at (785) 296-5514. All groundwater samples shall be labeled and sealed and immediately chilled to a temperature of 40°F (4°C), then placed in coolers with securely closed lids for storage and transport. Samples must be received by the state-certified laboratory in sufficient time to conduct the requested analyses, usually within 24 hours of collection.

The following paragraphs describe specific sample container requirements as determined by the KDHE laboratory. If the containers are received from the KDHE laboratory, they will have already been properly cleaned and prepared with special cleaning solutions. Additional cleaning of the bottles should not be conducted in the field because of the possibility of sample contamination or loss of preservative. The caps of the container/bottles should be kept on at all times until sample collection.

A sample preservative will have been placed in some of the containers/bottles by the laboratory prior to shipment. This preservative is important for stabilizing the sample and preventing biological growth prior to analysis. This preservative should not be poured out or the container/bottles rinsed prior to sample collection. For some containers, the laboratory may provide the sample collector with the necessary preservative in a small vial for addition to the container after filling three quarters full with water. These preservatives are typically strong acids and extreme care should be taken to avoid contact with the skin. Eye protection should be worn. The instructions from the laboratory should be carefully followed to avoid sample invalidation.

Each sample bottle should be individually filled and recapped prior to filling another sample bottle. This will reduce the possibility of cross-contamination of one sample bottle with another via spillage or interchange of bottle caps. The samples should not be filtered in the field prior to collection. The laboratory may require the filling of additional containers for quality control purposes.

1. Metals – The sample container for metals is a 250 mL HDPE bottle with a leak-proof screw cap. It should contain a sample preservative, nitric acid, in sufficient quantity to lower the pH of the sample below 2.
2. Mineral Analyses and Miscellaneous Parameters – The sample container for the mineral analyses and miscellaneous parameters is a 1 liter cube container. A 250 mL polyethylene bottle may be substituted for the cube container. These containers should not contain a preservative.
3. Total Phosphate – The sample container for total phosphate analysis is a 250 mL high-density polyethylene amber bottle with a leak-proof screw cap. This container should contain a sulfuric acid solution for lowering the pH of the sample below 2.

4. Radionuclides

- a. The sample container for gross alpha particle activity, combined radium 226 and 228, and uranium radiological analyses is a one gallon plastic jug with a leak-proof cap. This jug should contain a small quantity of nitric acid solution to lower the pH of the sample below 2. For test well samples, there will also be a 20 mL glass vial.
- b. The sampling kit for radon should contain a faucet adaptor connected to a funnel, a syringe, a hypodermic needle and four glass vials containing 10 mL of mineral oil based liquid. A 10 cc sample is withdrawn from the volume in the funnel with the syringe. After slowly ejecting air from the syringe, place the tip of the needle at the bottom of the oil based liquid in an uncapped vial and eject the sample. After ejecting the sample remove the syringe and tightly secure the cap on the vial.

5. Volatile Organic Chemicals (VOCs) – The container provided for VOC analysis is a 40 mL glass vial. An additional vial may be provided by the laboratory for quality control purposes. Extreme care must be exercised in collecting the VOC sample. Prior to obtaining the VOC sample, the sample collector should thoroughly wash and rinse his/her hands. The VOC vial should not be opened in the presence of fuel vapors. To collect the sample, remove the cap and PTFE-lined septum (cap liner) from the vial making sure not to contaminate the inside of the cap. Contact with air and sample agitation should be minimized. If necessary, pumping rates should be significantly reduced during sampling for VOCs. Fill the vial to overflowing directly from a positive-pressure pump discharge port or bailer and place the vial on a flat surface. Float the PTFE-lined septum on top of the water in the vial, with the PTFE side (white side) in contact with the water. Screw cap on tightly, but not too tightly, since the cap will crack if excessive force is applied. Turn the vial upside down, tap lightly, and observe for air bubbles. If air bubbles are present, discard the sample. If a preservative such as hydrochloric acid or a chlorine quenching agent such as ascorbic acid has been added to the vial, discard the sample, obtain a new vial and repeat the sample collection procedure.

6. Synthetic Organic Chemicals (SOCs) – The containers for the complete SOC analysis consists of three 1 liter amber glass bottles with PTFE-lined screw caps and one 120 mL glass bottle. These bottles may contain a chlorine quenching agent. An additional bottle may be provided for laboratory quality control purposes. One of the samples collected in a 1 liter amber glass bottle should be preserved with hydrochloric acid (for analysis of PAHs, phthalates, and adipates).

D. Documentation

Once each of the sample bottles is properly filled, it should be labeled with the name of the collector, time and date of collection, sample identification number or source (e.g., test well

number), PWSS name, PWSS Account Number, and other pertinent information. A sample collection form must also be completed and returned with the samples. The legal description of the test well will be pre-printed on the sample submission form and must not be changed without first contacting KDHE's Bureau of Water at 785-296-5514. Samples should be returned to the laboratory within 24 hours of sample collection. After receipt of the samples by the KDHE laboratories, test results may be reported within one to six weeks depending upon the test requested.

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Appendix B: Water Quality Testing for New Public Water Supply Sources (Attachment A)

Analytical Requirements for New Sources¹⁻⁵

Metals

Aluminum	0.05-0.2	mg/L	SMCL	
Antimony	0.006	mg/L	MCL	
Arsenic	0.010	mg/L	MCL	(Effective January 1, 2006)
Barium	2	mg/L	MCL	
Beryllium	0.004	mg/L	MCL	
Cadmium	0.005	mg/L	MCL	
Chromium	0.1	mg/L	MCL	
Mercury	0.002	mg/L	MCL	
Nickel	---		---	(Remanded to USEPA)
Selenium	0.05	mg/L	MCL	
Silver	0.1	mg/L	SMCL	
Thallium	0.002	mg/L	MCL	
Lead	0.015	mg/L	TT	(90th percentile Action Level)
Copper	1.3	mg/L	TT	(90th percentile Action Level)
Copper	1.0	mg/L	SMCL	
Calcium	---	mg/L	---	
Magnesium	---	mg/L	---	
Sodium	---	mg/L	---	
Iron	0.3	mg/L	SMCL	
Manganese	0.05	mg/L	SMCL	
Potassium	---	mg/L	---	
Zinc	5	mg/L	SMCL	

Mineral Analysis

Fluoride	4.0	mg/L	MCL	
Fluoride	2.0	mg/L	SMCL	
Nitrate (as N)	10	mg/L	MCL	
Nitrite (as N)	1.0	mg/L	MCL	
Chloride	250	mg/L	SMCL	
Sulfate	250	mg/L	SMCL	
pH	6.5-8.5	units	SMCL	
Specific Conductance	---	microS/cm	---	
Total Dissolved Solids	500	mg/L	SMCL	
Total Alkalinity	---	mg/L as CaCO ₃	---	
Total hardness	---	mg/L as CaCO ₃	---	
Turbidity	---	NTU	---	
Total Phosphate	---	mg/L as P	---	

Radiological Contaminants

Gross Alpha Particle (excluding uranium) Activity	15	pCi/L	MCL	
Combined Radium 226 and 228	5	pCi/L	MCL	
Uranium	30	µg/L	MCL	

Analysis for uranium required if gross alpha greater than 15 pCi/L.

Analysis for Radium 226 and 228 required for all samples.

Appendix B: Water Quality Testing for New Public Water Supply Sources (Attachment A)

Analytical Requirements for New Sources¹⁻⁵

VOCs

Method 524.2 - Volatile Organics

Benzene	0.005	mg/L	MCL
Vinyl chloride	0.002	mg/L	MCL
Carbon Tetrachloride	0.005	mg/L	MCL
1,2-Dichloroethane	0.005	mg/L	MCL
Trichloroethylene	0.005	mg/L	MCL
P-Dichlorobenzene	0.075	mg/L	MCL
1,1-Dichloroethylene	0.007	mg/L	MCL
1,1,1-Trichloroethane	0.2	mg/L	MCL
O-Dichlorobenzene	0.6	mg/L	MCL
Cis-1,2-Dichloroethylene	0.07	mg/L	MCL
Trans-1,2-Dichloroethylene	0.1	mg/L	MCL
1,2-Dichloropropane	0.005	mg/L	MCL
Ethylbenzene	0.7	mg/L	MCL
Monochlorobenzene	0.1	mg/L	MCL
Styrene	0.1	mg/L	MCL
Tetrachloroethylene	0.005	mg/L	MCL
Toluene	1	mg/L	MCL
Xylene	10	mg/L	MCL
Dichloromethane	0.005	mg/L	MCL
1,1,2-Trichloroethane	0.005	mg/L	MCL
1,2,4-Trichlorobenzene	0.07	mg/L	MCL
Chloroform (THM)	---		---
Bromodichloromethane (THM)	---		---
Bromoform (THM)	---		---
Chlorodibromomethane (THM)	---		---
Chlorobenzene	---		---
M-Dichlorobenzene	---		---
Dibromomethane	---		---
1,1-Dichloropropene	---		---
1,1-Dichloroethane	---		---
1,1,2,2-Tetrachloroethane	---		---
1,3-Dichloropropane	---		---
Chloromethane	---		---
Bromomethane	---		---
1,2,3-Trichloropropane	---		---
1,1,1,2-Tetrachloroethane	---		---
Chloroethane	---		---
2,2-Dichloropropane	---		---
O-Chlorotoluene	---		---
P-Chlorotoluene	---		---
Bromobenzene	---		---
1,3-Dichloropropene	---		---

Appendix B: Water Quality Testing for New Public Water Supply Sources (Attachment A)

Analytical Requirements for New Sources¹⁻⁵

SOCs

Method 507/508 - Chlorinated Pesticides

Alachlor	0.002	mg/L	MCL
Atrazine	0.003	mg/L	MCL
Chlordane	0.002	mg/L	MCL
Endrin	0.002	mg/L	MCL
Heptachlor	0.0004	mg/L	MCL
Heptachlor Epoxide	0.0002	mg/L	MCL
Lindane	0.0002	mg/L	MCL
Methoxychlor	0.04	mg/L	MCL
PCBs	0.0005	mg/L	MCL
1016			
1221			
1232			
1242			
1248			
1254			
1260			
Simazine	0.004	mg/L	MCL
Toxaphene	0.003	mg/L	MCL
Hexachlorobenzene	0.001	mg/L	MCL
Hexachlorocyclopentadiene	0.05	mg/L	MCL
Aldrin	---		---
Butachlor	---		---
Dieldrin	---		---
Metolachlor	---		---
Metribuzin	---		---
Propachlor	---		---

Method 515.1 - Chlorinated Acid Pesticides

2,4-D	0.07	mg/L	MCL
2,4,5-TP	0.05	mg/L	MCL
Pentachlorophenol	0.001	mg/L	MCL
Dinoseb	0.007	mg/L	MCL
Picloram	0.5	mg/L	MCL
Dicamba	---		---

Method 525.2 - PAH's, Phthalates, Adipates

Benzo(a)pyrene	0.0002	mg/L	MCL
Di 2-Ethylhexyl Adipate	0.4	mg/L	MCL
Di 2-Ethylhexyl Phthalate	0.006	mg/L	MCL

1 MCLs established in 40 CFR Part 141.

2 SMCLs established in 40 CFR Part 143. SMCLs not enforceable.

3 "---" indicates an MCL has not been established for this parameter, but other regulatory limits or health advisories may apply.

4 Method references are contained in Methods for Determination of Organic Compounds in Drinking Water, EPA/600/4-90/020, July 1990, Environmental Systems Monitoring Laboratory, Cincinnati, OH 45268.

5 Methods utilized must be those noted above or as most recently required by USEPA.

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Appendix B: Water Quality Testing For New Public Water Supply Sources (Attachment B)

Sample Containers, Preservation Techniques, and Holding Times

Parameter Class	Container Type¹	Preservation²	Maximum Time from Collection to Analysis³
Metals	250 mL narrow mouth HDPE bottle, leak-proof screw cap	Cool to 4 ° C. Nitric Acid (pH <2)	6 months
Mineral Analyses and Miscellaneous Parameters	250 mL narrow mouth HDPE bottle, leak-proof screw cap, or 1 liter cube container	Cool to 4 ° C.	28 days except for turbidity (48 hours) and total alkalinity (14 days)
Total Phosphate	250 mL HDPE amber bottle with leak-proof screw cap	Sulfuric Acid (pH < 2)	28 days
Gross Alpha, Radium 226 and 228, and Uranium	1 gallon plastic jug with leak-proof screw cap; and 20 mL glass vial (test well)	Nitric Acid (pH < 2) (jug only)	6 months
Radon	20 mL glass vial with leak-proof cap	10 mL mineral oil based liquid	4 days
Volatile Organic Chemicals (Method 524.2)	40 mL glass vial, PTFE-lined silicone septum, leak-proof screw cap with hole	Cool to 4 ° C. Hydrochloric Acid (pH < 2)	14 days
Chlorinated Pesticides (Method 507/508)	1 liter amber glass bottle, PTFE-lined air-tight screw cap	Cool to 4 ° C.	7 days until extraction 14 days after extraction
Chlorinated Acid Pesticides (Method 515.1)	1 liter amber glass bottle, PTFE-lined air-tight screw cap	Cool to 4 ° C.	14 days until extraction 28 days after extraction
PAHs, Phthalates, Adipates (Method 525.2)	1 liter amber glass bottle, PTFE-lined air-tight screw cap	Cool to 4 ° C. Hydrochloric Acid (pH<2)	7 days until extraction 30 days after extraction
Carbamates ⁴ (Method 531.1)	120 mL glass bottle, PTFE-lined silicone septum, air-tight screw cap with hole	Cool to 4 ° C. Chloroacetic Acid Buffer	28 days

- 1 Laboratory may request additional containers be filled and returned for quality control purposes.
- 2 If residual chlorine will be present in a sample, the laboratory may require the addition of quenching agents. These agents may include: ascorbic acid powder (VOCs), sodium thiosulfate (carbamates), and sodium sulfite (PAHs, pesticides, phthalates, adipates).
- 3 Times refer to maximum time allowable between sample collection and sample procedure by laboratory for analysis to be valid. Sample collector, however, should transport samples to the laboratory as soon as possible. Laboratory should receive containers within 24 hours of sample collection.
- 4 Carbamate analysis presently waived by KDHE Laboratory.

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