Virginia Administrative Code

12VAC5-590-420. Treatment technique requirements.

This section establishes treatment technique requirements in lieu of maximum contaminant levels for specified contaminants. Failure to meet any requirement of this section after the applicable date specified is a treatment technique violation.

A. Beginning June 29, 1993, the filtration and disinfection provisions of this section are required treatment techniques for any waterworks supplied by a surface water source and waterworks supplied by a groundwater source under the direct influence of surface water. Prior to that date, waterworks are governed by the disinfection requirements of 12VAC5-590-500. In addition, this section establishes treatment technique requirements in lieu of PMCL's for the following contaminants: Giardia lamblia, viruses, heterotrophic bacteria (HPC), Legionella Cryptosporidium (for waterworks serving at least 10,000 people and using surface water or groundwater under the direct influence of surface water), and turbidity. Each waterworks with a surface water source or a groundwater source under the direct influence of surface water shall provide treatment of that source water that complies with these treatment technique requirements. The treatment technique requirements consist of installing and properly operating water treatment processes which reliably achieve:

1. At least 99.9% (3-log) removal and/or inactivation of Giardia lamblia cysts between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer; and

2. At least 99.99% (4-log) removal and/or inactivation of viruses between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer.

3. Beginning January 1, 2002, waterworks serving at least 10,000 people shall also reliably achieve at least 99% (2-log) removal of Cryptosporidium between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer.

B. A waterworks using a surface water source or a groundwater source under the direct influence of surface water is considered to be in compliance with the requirements of subsection A of this section if it meets the following disinfection and filtration requirements:

1. Disinfection. Waterworks with a surface water source or a groundwater source under the direct influence of surface water must provide disinfection treatment in accordance with this section by June 29, 1993.

a. The disinfection treatment must be sufficient to ensure that the total treatment processes of that waterworks achieve at least 99.9% (3-log) inactivation and/or removal of Giardia lamblia cysts and at least 99.99% (4-log) inactivation and/or removal of viruses.

b. The residual disinfectant concentration in the water entering the distribution system cannot be less than 0.2 mg/L for more than four hours.

c. The residual disinfectant concentration in the distribution system, measured as total chlorine, combined chlorine, or chlorine dioxide cannot be undetectable in more than 5.0% of the samples each month, for any two consecutive months that the waterworks serves water to the public. Water in the distribution system with a heterotrophic bacteria concentration less than or equal to 500/mL, measured as heterotrophic plate count (HPC) is deemed to have a detectable disinfectant residual for purposes of determining compliance with this requirement. Thus, the value "V" in percent in the following formula cannot exceed 5.0% in one month, for any two consecutive months.

V = (c + d + e) / (a + b) X 100

a = number of instances where the residual disinfectant concentration is measured;

b = number of instances where the residual disinfectant concentration is not measured but HPC is measured;

c = number of instances where the residual disinfectant concentration is measured but not detected and no HPC is measured;

d = number of instances where no residual disinfectant concentration is detected and where the HPC is greater than500/mL; and

e = number of instances where the residual disinfectant concentration s not measured and HPC is greater than500/mL.

d. The division may determine, based on site-specific considerations, that a waterworks owner has no means for having a sample transported and analyzed for HPC by a certified laboratory under the requisite time and temperature conditions and the waterworks is providing adequate disinfection in the distribution system, that the requirements of subdivision B 1 c of this section does not apply.

2. Filtration. (Also see 12VAC5-590-880.) All waterworks that use a surface water source or a groundwater source under the direct influence of surface water shall provide filtration treatment by June 29, 1993, by using one of the following methods:

a. Conventional filtration or direct filtration.

(1) The turbidity level of representative samples of a waterworks' filtered water shall be less than or equal to 0.5 NTU in at least 95% of the measurements taken each month, except that if the division determines that the system is capable of achieving at least 99.9% removal (3-log) and/or inactivation of Giardia lamblia cysts at some turbidity level higher than 0.5 NTU in at least 95% of the measurements taken each month, the division may substitute this higher turbidity limit for that waterworks. However, in no case may the division approve a turbidity limit that allows more than one NTU in more than 5.0% of the samples taken each month.

(2) The turbidity level of representative samples of a waterworks' filtered water shall at no time exceed five NTU.

(3) Beginning January 1, 2002, waterworks serving at least 10,000 people that use conventional

filtration treatment or direct filtration must:

(a) Achieve a filtered water turbidity of less than or equal to 0.3 NTU in at least 95% of the measurements taken each month. Samples must be representative of the waterworks' filtered water.

(b) The turbidity level of representative samples of a system's filtered water must at no time exceed 1 NTU, measured as specified in 12VAC5-590-440.

(c) A system that uses lime softening may acidify representative samples prior to analysis using a protocol approved by the commissioner.

b. Slow sand filtration.

(1) The turbidity level of representative samples of a waterworks' filtered water must be less than or equal to one NTU in at least 95% of the measurements taken each month, except that if the division determines there is no significant interference with disinfection at a higher turbidity level, the division may substitute this higher turbidity limit for that waterworks.

(2) The turbidity level of representative samples of a waterworks' filtered water shall at no time exceed five NTU.

c. Diatomaceous earth filtration.

(1) The turbidity level of representative samples of a waterworks' filtered water shall be less than or equal to one NTU in at least 95% of the measurements taken each month.

(2) The turbidity level of representative samples of a waterworks' filtered water shall at no time exceed five NTU.

d. Other filtration technologies. A waterworks owner may use a filtration technology not listed in subdivisions 2 a through c of this subsection if the owner demonstrates to the division (by pilot plant studies or other means) that the alternative filtration technology, in combination with disinfection treatment, achieves 99.9% removal (3-log) and/or inactivation of Giardia lamblia cysts and 99.99% removal (4-log) and/or inactivation of viruses, and beginning January 1, 2002, for waterworks serving at least 10,000 people, 99% of Cryptosporidium oocysts. For a waterworks owner that makes this demonstration, a turbidity limit will be established by the commissioner, which the waterworks must meet at least 95% of the time. In addition, the commissioner will establish a maximum turbidity limit that the waterworks must not exceed at any time. These turbidity limits shall consistently achieve the removal rates and/or inactivation rates stated in this subdivision.

e. Each waterworks using a surface water source or groundwater source under the direct influence of surface water shall be operated by licensed operators of the appropriate classification as per the Virginia Board for Waterworks and Wastewater Works Operators Regulations (18VAC155-20-10 et seq.).

f. If the division has determined that a waterworks has a surface water source or a groundwater source under the direct influence of surface water, filtration is required. The waterworks shall

provide disinfection during the interim before filtration is installed as follows:

(1) The residual disinfectant concentration in the distribution system cannot be less than 2.0 mg/L for more than four hours.

(2) The waterworks owner shall issue continuing boil water notices through the public notification procedure in 12VAC5-590-540 until such time as the required filtration equipment is installed.

(3) As an alternative to subdivisions B f 2 (1) and (2) of this section, the waterworks owner may demonstrate that the source can meet the appropriate C-T values shown in Appendix L and be considered to satisfy the requirements for 99.9% removal of Giardia cysts and virus, respectively. In addition, the waterworks owner must comply with the following:

(a) Justify that other alternative sources of supply meeting these regulations are not immediately available.

(b) Analysis of the source is performed quarterly for the contaminants listed in Tables 2.2, 2.3, and 2.4. The primary maximum contaminant levels shall not be exceeded.

(c) Daily turbidity monitoring and maintenance of the turbidity level not to exceed five NTU.

(d) MPN analysis of the raw water based on the minimum sample frequency chart below:

Population Served	Coliform Samples/Week
less than or equal to 500	1
501 - 3,300	2
3,301 - 10,000	3
10,001 - 25,000	4
25,000	5

Note: Must be taken on separate days.

(e) Bacteriological sampling of the distribution system at a frequency of twice that required by Table 2.1.

C. Lead and copper corrosion control techniques.

1. Corrosion control treatment requirements. The owners of all community and nontransient noncommunity waterworks shall install and operate optimum corrosion control treatment by completing the corrosion control treatment requirements described below which are applicable to such waterworks owners under subdivision C 2 of this section.

a. Waterworks owners proposal regarding corrosion control treatment. Based upon the results of lead and copper tap monitoring and water quality parameter monitoring, the owners of small and medium-size waterworks exceeding the lead or copper action level shall propose installation of one or more of the corrosion control treatments listed in subdivision C 1 c (1) of this section which the waterworks owner believes constitutes optimal corrosion control for that waterworks. The commissioner may require the waterworks owner to conduct additional water quality parameter monitoring in accordance with 12VAC5-590-370 B 6 b (2) of this section to assist the commissioner in reviewing the proposal.

b. Applicability of studies of corrosion control treatment (applicable to small and medium-size waterworks). The commissioner may require the owner of any small or medium-size waterworks that exceeds the lead or copper action level to perform corrosion control studies under subdivision C 1 c of this section to identify optimal corrosion control treatment for the waterworks.

c. Corrosion control studies.

(1) The owner of any waterworks required by the commissioner to perform corrosion control studies shall evaluate the effectiveness of each of the following treatments, and, if appropriate, combinations of the following treatments to identify the optimal corrosion control treatment for that waterworks:

(a) Alkalinity and pH adjustment;

(b) Calcium hardness adjustment; and

(c) The addition of a phosphate or silicate based corrosion inhibitor at a concentration sufficient to maintain an effective corrosion inhibitor residual concentration in all test tap samples.

(2) The waterworks owner shall evaluate each of the corrosion control treatments using either pipe rig/loop tests, metal coupon tests, partial-system tests, or analyses based on documented analogous treatments with other waterworks of similar size, water chemistry and distribution system configuration.

(3) The waterworks owner shall measure the following water quality parameters in any tests conducted under this paragraph before and after evaluating the corrosion control treatments listed above:

(a) Lead;

(b) Copper;

(c) pH;

(d) Alkalinity;

(e) Calcium;

(f) Conductivity;

(g) Orthophosphate (when an inhibitor containing a phosphate compound is used);

(h) Silicate (when an inhibitor containing a silicate compound is used);

(i) Water temperature.

(4) The waterworks owner shall identify all chemical or physical constraints that limit or prohibit the use of a particular corrosion control treatment and document such constraints with at least one of the following:

(a) Data and documentation showing that a particular corrosion control treatment has adversely affected other water treatment processes when used by another waterworks with comparable water quality characteristics; and/or

(b) Data and documentation demonstrating that the waterworks has previously attempted to evaluate a particular corrosion control treatment and has found that the treatment is ineffective or adversely affects other water quality treatment processes.

(5) The waterworks owner shall evaluate the effect of the chemicals used for corrosion control treatment on other water quality treatment processes.

(6) On the basis of an analysis of the data generated during each evaluation, the waterworks owner shall propose to the field office in writing, the treatment option that the corrosion control studies indicate constitutes optimal corrosion control treatment for that waterworks. The owner shall provide a rationale for its recommendation along with all supporting documentation specified in subdivision C 1 c (1) through (5) of this section.

d. Approval of optimal corrosion control treatment.

(1) Based upon consideration of available information including, where applicable, studies performed under subdivision C 1 c of this section and a waterworks' owner's proposed treatment alternative, the commissioner shall either approve the corrosion control treatment option recommended by the owner, or designate alternative corrosion control treatment(s) from among those listed in subdivision C 1 c (1) of this section. When approving optimal treatment the commissioner shall consider the effects that additional corrosion control treatment will have on water quality parameters and on other water quality treatment processes.

(2) The commissioner shall notify the waterworks owner of its determination on optimal corrosion control treatment in writing and explain the basis for this determination. If the commissioner requests additional information to aid a review, the owner shall provide the information.

e. Installation of optimal corrosion control. Each waterworks owner shall properly install and operate throughout the waterworks the optimal corrosion control treatment approved by the commissioner under subdivision C 1 d of this section and under 12VAC5-590-190.

f. Commissioner's review of treatment and specification of optimal water quality control parameters.

(1) The commissioner shall evaluate the results of all lead and copper tap samples and water

quality parameter samples submitted by the waterworks owner and determine whether the owner has properly installed and operated the optimal corrosion control treatment approved by the commissioner in subdivision C 1 d of this section. Upon reviewing the results of tap water and water quality parameter monitoring by the owner, both before and after the waterworks installs optimal corrosion control treatment, the commissioner shall designate:

(a) A minimum value or a range of values for pH measured at each entry point to the distribution system;

(b) A minimum pH value, measured in all tap samples. Such value shall be equal to or greater than 7.0, unless the commissioner determines that meeting a pH level of 7.0 is not technologically feasible or is not necessary for the waterworks owner to optimize corrosion control;

(c) If a corrosion inhibitor is used, a minimum concentration or a range of concentrations for the inhibitor, measured at each entry point to the distribution system and in all tap samples, that the commissioner determines is necessary to form a passivating film on the interior walls of the pipes of the distribution system;

(d) If alkalinity is adjusted as part of optimal corrosion control treatment, a minimum concentration or a range of concentrations for alkalinity, measured at each entry point to the distribution system and in all tap samples;

(e) if calcium carbonate stabilization is used as part of corrosion control, a minimum concentration or a range of concentrations for calcium, measured in all tap samples.

(2) The values for the applicable water quality control parameters listed above shall be those that the commissioner determines to reflect optimal corrosion control treatment for the waterworks. The commissioner may designate values for additional water quality control parameters determined by the commissioner to reflect optimal corrosion control for the waterworks. The commissioner shall notify the waterworks owner in writing of these determinations and explain the basis for its decisions.

g. Continued operation and monitoring. The owners of all waterworks shall maintain water quality parameter values at or above minimum values or within ranges designated by the commissioner under subdivision C 1 f of this section in each sample collected under 12VAC5-590-370 B 6 b (4). If the water quality parameter value of any sample is below the minimum value or outside the range designated by the commissioner, then the waterworks is out of compliance with this paragraph. As specified in 12VAC5-590-370 B 6 b (4), the waterworks owner may take a confirmation sample for any water quality parameter value no later than three days after the first sample. If a confirmation sample is taken, the result must be averaged with the first sampling result and the average must be used for any compliance determinations under this paragraph. The commissioner has the discretion to delete results of obvious sampling errors from this calculation.

h. Modification of the commissioner's treatment decisions. Upon his own initiative or in response to a request by a waterworks owner or other interested party, the commissioner may modify its determination of the optimal corrosion control treatment under subdivision C 1 d of

this section or optimal water quality control parameters under subdivision C 1 f of this section. A request for modification by an owner or other interested party shall be in writing, explain why the modification is appropriate, and provide supporting documentation. The commissioner may modify the determination where it is concluded that such change is necessary to ensure that the waterworks continues to optimize corrosion control treatment. A revised determination shall be made in writing, set forth the new treatment requirements, explain the basis for the commissioner's decision, and provide an implementation schedule for completing the treatment modifications.

2. Corrosion control treatment steps.

a. Waterworks owners shall complete the applicable corrosion control treatment requirements described in subdivision C 1 of this section by the deadlines established in this section.

(1) The owner of a large waterworks (serving greater than 50,000 persons) shall complete the corrosion control treatment steps specified in subdivision C 2 d of this section, unless the owner is deemed to have optimized corrosion control under subdivision C 2 b (2) of this section or C 2 b (3) of this section.

(2) The owner of a small waterworks (serving less than 3,300 persons) and a medium-size waterworks (serving greater than 3,300 and less than 50,000 persons) shall complete the corrosion control treatment steps specified in subdivision C 2 e of this section, unless the owner is deemed to have optimized corrosion control under subdivision C 2 b (1) through (3) of this section.

b. A waterworks owner is deemed to have optimized corrosion control and is not required to complete the applicable corrosion control treatment steps identified in this section if the waterworks satisfies one of the following criteria:

(1) The owner of a small or medium-size waterworks is deemed to have optimized corrosion control if the waterworks meets the lead and copper action levels during each of two consecutive six-month monitoring periods conducted in accordance with 12VAC5-590-370 B 6 a.

(2) Any waterworks owner may be deemed by the commissioner to have optimized corrosion control treatment if the owner demonstrates to the satisfaction of the commissioner that the owner has conducted activities equivalent to the corrosion control steps applicable to such waterworks under this section. If the commissioner makes this determination, the owner shall be provided with a written notice explaining the basis for the decision and the notice shall specify the water quality control parameters representing optimal corrosion control in accordance with subdivision C 1 f of this section. A waterworks owner shall provide the commissioner with the following information in order to support a determination under this paragraph:

(a) The results of all test samples collected for each of the water quality parameters in subdivision C 1 c (3) of this section.

(b) A report explaining the test methods used by the waterworks owner to evaluate the corrosion control treatments listed in subdivision C 1 c (1) of this section, the results of all tests conducted, and the basis for the owner's selection of optimal corrosion control treatment;

(c) A report explaining how corrosion control has been installed and how it is being maintained to insure minimal lead and copper concentrations at consumers' taps; and

(d) The results of tap water samples collected in accordance with 12VAC5-590-370 B 6 a at least once every six months for one year after corrosion control has been installed.

(3) Any waterworks is deemed to have optimized corrosion control if the owner submits results of tap water monitoring conducted in accordance with 12VAC5-590-370 B 6 a and source water monitoring conducted in accordance with 12VAC5-590-370 B 6 c that demonstrates for two consecutive six-month monitoring periods that the difference between the 90th percentile tap water lead level computed under 12VAC5-590-410 E, and the highest source water lead concentration, is less than the P Q L for lead (0.005 mg/L).

c. The owner of any small or medium-size waterworks that is required to complete the corrosion control steps due to the exceedance of the lead or copper action level may cease completing the treatment steps whenever the waterworks meets both action levels during each of two consecutive monitoring periods conducted pursuant to 12VAC5-590-370 B 6 a and submits the results to the field office. If any such waterworks thereafter exceeds the lead or copper action level during any monitoring period, the owner shall recommence completion of the applicable treatment steps, beginning with the first treatment step which was not previously completed in its entirety. The commissioner may require the owner to repeat treatment steps previously completed where the commissioner determines that this is necessary to properly implement the treatment requirements of this section. The commissioner shall notify the owner in writing of such a determination and explain the basis for its decision. The requirement for the owner of any small- or medium-sized waterworks to implement corrosion control treatment steps in accordance with subdivision 2 e of this subsection (including waterworks deemed to have optimized corrosion control under subdivision 2 b (1) of this subsection) is triggered whenever any small- or medium-sized waterworks exceeds the lead or copper action level.

d. Treatment steps and deadlines for large waterworks. Except as provided in subdivisions C 2 b (2) and (3) of this section, owners of large waterworks shall complete the following corrosion control treatment steps (described in the referenced portions of subdivision C 1 of this section, 12VAC5-590-370 B 6 a and b) by the indicated dates.

(1) Step 1: The waterworks owner shall conduct initial monitoring (12VAC5-590-370 B 6 a (4) (a) and B 6 b (2)) during two consecutive six-month monitoring periods by January 1, 1993.

(2) Step 2: The waterworks owner shall complete corrosion control studies (12VAC5-590-420 C 1 c) and submit the study and recommendations to the commissioner (12VAC5-590-200) by July 1, 1994.

(3) Step 3: The commissioner shall approve optimal corrosion control treatment (12VAC5-590-420 C 1 d) by January 1, 1995.

(4) Step 4: The waterworks owner shall install optimal corrosion control treatment (12VAC5-590-420 C 1 e) by January 1, 1997.

(5) Step 5: The waterworks owner shall complete follow-up sampling (12VAC5-590-370 B 6 a

(4) (b) and B 6 b (3)) by January 1, 1998.

(6) Step 6: The commissioner shall review installation of treatment and designate optimal water quality control parameters (12VAC5-590-420 C 1 f) by July 1, 1998.

(7) Step 7: The waterworks owner shall operate the waterworks in compliance with the commissioner-specified optimal water quality control parameters (12VAC5-590-420 C 1 g) and continue to conduct tap sampling (12VAC5-590-370 B 6 a (4) (c) and B 6 b (4)).

e. Treatment steps and deadlines for small and medium-size waterworks. Except as provided in 12VAC5-590-420 C 2 b, owners of small- and medium-size waterworks shall complete the following corrosion control treatment steps (described in the referenced portions of 12VAC5-590-420 C 1, 12VAC5-590-370 B 6 a and b) by the indicated time periods.

(1) Step 1: The waterworks owner shall conduct initial tap sampling (12VAC5-590-370 B 6 a (4) (a) and B 6 b (2)) until the waterworks either exceeds the lead or copper action level or becomes eligible for reduced monitoring under 12VAC5-590-370 B 6 a (4) (d). The owner of a waterworks exceeding the lead or copper action level shall propose optimal corrosion control treatment (12VAC5-590-420 C 1 a) within six months after it exceeds one of the action levels.

(2) Step 2: Within 12 months after a waterworks exceeds the lead or copper action level, the commissioner may require the waterworks owner to perform corrosion control studies (12VAC5-590-420 C 1 b). If the commissioner does not require the owner to perform such studies, the commissioner shall specify optimal corrosion control treatment (12VAC5-590-420 C 1 d) within the following timeframes:

(a) For medium-size waterworks, within 18 months after such waterworks exceeds the lead or copper action level,

(b) For small waterworks, within 24 months after such waterworks exceeds the lead or copper action level.

(3) Step 3: If the commissioner requires a waterworks owner to perform corrosion control studies under Step 2, the waterworks owner shall complete the studies (12VAC5-590-420 C 1 c) and submit the study and recommendations to the commissioner (12VAC5-590-200) within 18 months after the commissioner requires that such studies be conducted.

(4) Step 4: If the waterworks has performed corrosion control studies under Step 2, the commissioner shall designate optimal corrosion control treatment (12VAC5-590-420 C 1 d) within six months after completion of Step 3.

(5) Step 5: The waterworks shall install optimal corrosion control treatment (12VAC5-590-420 C 1 e) within 24 months after the commissioner designates such treatment.

(6) Step 6: The waterworks owner shall complete follow-up sampling (12VAC5-590-370 B 6 a (4) (b) and B 6 b (3)) within 36 months after the commissioner designates optimal corrosion control treatment.

(7) Step 7: The commissioner shall review the waterworks owner's installation of treatment and

designate optimal water quality control parameters (12VAC5-590-420 C 1 f) within six months after completion of Step 6.

(8) Step 8: The waterworks owner shall operate in compliance with the commissioner designated optimal water quality control parameters (12VAC5-590-420 C 1 g) and continue to conduct tap sampling (12VAC5-590-370 B 6 a (4) (c) and B 6 b (4)).

D. Water supply (source water) treatment requirements for lead and copper. The owner of any waterworks exceeding the lead or copper action level shall complete the applicable water supply monitoring and treatment requirements (described in the referenced portions of subdivision D 2 of this section, and in 12VAC5-590-370 B 6 a and c) by the following deadlines.

1. Deadlines for completing water supply treatment steps.

a. Step 1: The owner of a waterworks exceeding the lead or copper action level shall complete lead and copper water supply monitoring (12VAC5-590-370 B 6 c (2)) and make a treatment proposal to the appropriate field office within six months after exceeding the lead or copper action level.

b. Step 2: The commissioner shall make a determination regarding the need for water supply treatment (12VAC5-590-420 D 2 b) within six months after submission of monitoring results under step 1.

c. Step 3: If the commissioner requires installation of water supply treatment, the waterworks owner shall install the treatment (12VAC5-590-420 D 3) within 24 months after completion of step 2.

d. Step 4: The waterworks owner shall complete follow-up tap water monitoring (12VAC5-590-370 B 6 a (4) (b)) and water supply lead and copper monitoring (12VAC5-590-370 B 6 c (3)) within 36 months after completion of step 2.

e. Step 5: The commissioner shall review the waterworks owner's installation and operation of water supply treatment and specify maximum permissible water supply lead and copper levels (12VAC5-590-420 D 4) within six months after completion of step 4.

f. Step 6: The waterworks owner shall operate in compliance with the commissioner-specified maximum permissible lead and copper water supply levels (12VAC5-590-420 D 4) and continue water supply monitoring (12VAC5-590-370 B 6 c (4) (a)).

2. Description of water supply treatment requirements.

a. Waterworks treatment recommendation. The owner of any waterworks which exceeds the lead or copper action level shall propose in writing to the appropriate field office, the installation and operation of one of the water supply treatments listed in subdivision D 2 b of this section. An owner may propose that no treatment be installed based upon a demonstration that water supply treatment is not necessary to minimize lead and copper levels at users' taps.

b. Commissioner's determination regarding water supply treatment. The commissioner shall complete an evaluation of the results of all water supply samples submitted by the waterworks

owner to determine whether water supply treatment is necessary to minimize lead or copper levels in water delivered to users' taps. If the division determines that treatment is needed, the commissioner shall either require installation and operation of the water supply treatment recommended by the waterworks (if any) or require the installation and operation of another water supply treatment from among the following: ion exchange, reverse osmosis, lime softening or coagulation/filtration. If the commissioner requests additional information to aid in the review, the waterworks shall provide the information by the date specified by the commissioner in the request. The commissioner shall notify the waterworks in writing of the determination and set forth the basis for the decision.

3. Installation of water supply treatment. Each waterworks owner shall properly install and operate the water supply treatment designated by the commissioner under subdivision D 2 b of this section.

4. Commissioner's review of water supply treatment and specification of maximum permissible water supply lead and copper levels. The commissioner shall review the water supply samples taken by the waterworks owner both before and after the waterworks owner installs water supply treatment, and determine whether the owner has properly installed and operated the water supply treatment designated by the commissioner. Based upon the review, the commissioner shall designate the maximum permissible lead and copper concentrations for finished water entering the distribution system. Such levels shall reflect the contaminant removal capability of the treatment properly operated and maintained. The commissioner shall notify the owner in writing and explain the basis for the decision.

5. Continued operation and maintenance. Each waterworks shall be operated to maintain lead and copper levels below the maximum permissible concentrations designated by the commissioner at each sampling point monitored in accordance with 12VAC5-590-370 B 6 c. The waterworks is out of compliance with this subdivision if the level of lead or copper at any sampling point is greater than the maximum permissible concentration designated by the commissioner.

6. Modification of the commissioner's treatment decisions. Upon his own initiative or in response to a request by a waterworks owner or other interested party, the commissioner may modify its determination of the water supply treatment under D 2 b of this section, or may modify the maximum permissible lead and copper concentrations for finished water entering the distribution system under subdivision D 4 of this section. A request for modification by an owner or other interested party shall be in writing, explain why the modification is appropriate, and provide supporting documentation. The commissioner may modify the determination where he concludes that such change is necessary to ensure that the waterworks continues to minimize lead and copper concentrations in water supplies. A revised determination shall be made in writing, set forth the new treatment requirements, explain the basis for the commissioner's decision, and provide an implementation schedule for completing the treatment modifications.

E. Lead service line replacement requirements.

1. Owners of waterworks that fail to meet the lead action level in tap samples taken pursuant to 12VAC5-590-370 B 6 a (4) (b), after installing corrosion control and/or water supply treatment (whichever sampling occurs later), shall replace lead service lines in accordance with the

requirements of this section. If a waterworks is in violation of subdivision C 2 of this section or subsection D of this section for failure to install water supply or corrosion control treatment, the commissioner may require the owner to commence lead service line replacement under this section after the date by which the owner was required to conduct monitoring under 12VAC5-590-370 B 6 a (4) (b) has passed.

2. A waterworks owner shall replace annually at least 7.0% of the initial number of lead service lines in its distribution system. The initial number of lead service lines is the number of lead lines in place at the time the replacement program begins. The waterworks owner shall identify the initial number of lead service lines in its distribution system based upon a materials evaluation, including the evaluation required under 12VAC5-590-370 B 6 a (1) (a). The first year of lead service line replacement shall begin on the date the action level was exceeded in tap sampling referenced in subdivision E 1 of this section.

3. A waterworks owner is not required to replace an individual lead service line if the lead concentration in all service line samples from that line, taken pursuant to 12VAC5-590-370 B 6 a (2) (c), is less than or equal to 0.015 mg/L.

4. A waterworks owner shall replace the entire service line (up to the building inlet) unless the owner demonstrates to the satisfaction of the commissioner under subdivision E 5 of this section that it controls less than the entire service line. In such cases, the owner shall replace the portion of the line which the commissioner determines is under the owner's control. The owner shall notify the user served by the line that the waterworks owner will replace the portion of the service line under the waterworks owner's control and shall offer to replace the building owner's portion of the line, but is not required to bear the cost of replacing the building owner's portion of the line. For buildings where only a portion of the lead service line is replaced, the waterworks owner shall inform the resident(s) that the waterworks owner will collect a first flush tap water sample after partial replacement of the service line is completed if the resident(s) so desire. In cases where the resident(s) accept the offer, the waterworks owner shall collect the sample and report the results to the resident(s) within 14 days following partial lead service line replacement.

5. A waterworks owner is presumed to control the entire lead service line (up to the building inlet) unless the owner demonstrates to the satisfaction of the commissioner, in a letter submitted under 12VAC5-590-530 D 5 d, that the owner does not have any of the following forms of control over the entire line (as defined by state statutes, municipal ordinances, public service contracts or other applicable legal authority): authority to set standards for construction, repair, or maintenance of the line, authority to replace, repair, or maintain the service line, or ownership of the service line. The commissioner shall review the information supplied by the owner and determine whether the owner controls less than the entire service line and, in such cases, shall determine the extent of the waterworks owner's control. The commissioner's determination shall be in writing and explain the basis for the decision.

6. The commissioner shall require a waterworks owner to replace lead service lines on a shorter schedule than that required by this section, taking into account the number of lead service lines in the waterworks, where such a shorter replacement schedule is feasible. The commissioner shall make this determination in writing and notify the owner of the findings within 6 months

after the waterworks is triggered into lead service line replacement based on monitoring referenced in subdivision E 1 of this section.

7. Any waterworks owner may cease replacing lead service lines whenever first draw tap samples collected pursuant to 12VAC5-590-370 B 6 a (2) (b) meet the lead action level during each of two consecutive monitoring periods and the owner submits the results to the appropriate field office. If the first draw tap samples collected in any such waterworks thereafter exceeds the lead action level, the owner shall recommence replacing lead service lines, pursuant to subdivision E 2 of this section.

8. To demonstrate compliance with subdivisions E 1 through E 4 of this section, a waterworks owner shall report to the appropriate field office the information specified in 12VAC5-590-530 D 5.

F. Lead public education requirements. The owner of a waterworks that exceeds the lead action level based on tap water samples collected in accordance with 12VAC5-590-370 B 6 a shall deliver the public education materials contained in subdivisions F 1 and 2 of this section in accordance with the requirements in subdivision F 3 of this section.

1. Content of written materials. A waterworks owner shall include the following text in all of the printed materials distributed through the lead public education program. Any additional information presented by the owner shall be consistent with the information below and be in plain English that can be understood by laypersons.

a. Introduction. The United States Environmental Protection Agency (EPA) and (insert name of waterworks) are concerned about lead in your drinking water. Although most homes have very low levels of lead in their drinking water, some homes in the community have lead levels above the EPA action level of 15 parts per billion (ppb), or 0.015 milligrams of lead per liter of water (mg/L). Under Federal law we are required to have a program in place to minimize lead in your drinking water by (insert date when corrosion control will be completed for your waterworks). This program includes corrosion control treatment, source water treatment, and public education. We are also required to replace each lead service line that we control if the line contributes lead concentrations of more than 15 ppb after we have completed the comprehensive treatment program. If you have any questions about how we are carrying out the requirements of the lead regulation please give us a call at (insert waterworks phone number). This brochure explains the simple steps you can take to protect you and your family by reducing your exposure to lead in drinking water.

b. Health effects of lead. Lead is a common metal found throughout the environment in lead-based paint, air, soil, household dust, food, certain types of pottery porcelain and pewter, and water. Lead can pose a significant risk to your health if too much of it enters your body. Lead builds up in the body over many years and can cause damage to the brain, red blood cells and kidneys. The greatest risk is to young children and pregnant women. Amounts of lead that will not hurt adults can slow down normal mental and physical development of growing bodies. In addition, a child at play often comes into contact with sources of lead contamination like dirt and dust that rarely affect an adult. It is important to wash children's hands and toys often, and to try to make sure they only put food in their mouths.

c. Lead in drinking water.

(1) Lead in drinking water, although rarely the sole cause of lead poisoning, can significantly increase a person's total lead exposure, particularly the exposure of infants who drink baby formulas and concentrated juices that are mixed with water. The EPA estimates that drinking water can make up 20% or more of a person's total exposure to lead.

(2) Lead is unusual among drinking water contaminants in that it seldom occurs naturally in water supplies like rivers and lakes. Lead enters drinking water primarily as a result of the corrosion, or wearing away, of materials containing lead in the water distribution system and household plumbing. These materials include lead-based solder used to join copper pipe, brass and chrome plated brass faucets, and in some cases, pipes made of lead that connect your house to the water main (service lines). In 1986, Congress banned the use of lead solder containing greater than 0.2% lead, and restricted the lead content of faucets, pipes and other plumbing materials to 8.0%.

(3) When water stands in lead pipes or plumbing systems containing lead for several hours or more, the lead may dissolve into your drinking water. This means the first water drawn from the tap in the morning, or later in the afternoon after returning from work or school, can contain fairly high levels of lead.

d. Steps you can take in the home to reduce exposure to lead in drinking water.

(1) Despite our best efforts mentioned earlier to control water corrosivity and remove lead from the water supply, lead levels in some homes or buildings can be high. To find out whether you need to take action in your own home, have your drinking water tested to determine if it contains excessive concentrations of lead. Testing the water is essential because you cannot see, taste, or smell lead in drinking water. Some local laboratories that can provide this service are listed at the end of this booklet. (The waterworks owners should contact the Division of Consolidated Laboratory Service at (804) 786-3411 for a list of certified laboratories in their area). For more information on having your water tested, please call (insert phone number of waterworks).(2) If a water test indicates that the drinking water drawn from a tap in your home contains lead above 15 ppb, then you should take the following precautions:

(a) Let the water run from the tap before using it for drinking or cooking any time the water in a faucet has gone unused for more than six hours. The longer water resides in your home's plumbing the more lead it may contain. Flushing the tap means running the cold water faucet until the water gets noticeably colder, usually about 15-30 seconds. If your house has a lead service line to the water main, you may have to flush the water for a longer time, perhaps one minute, before drinking. Although toilet flushing or showering flushes water through a portion of your home's plumbing system, you still need to flush the water in each faucet before using it for drinking or cooking. Flushing tap water is a simple and inexpensive measure you can take to protect your family's health. It usually uses less than one or two gallons of water and costs less than (insert a cost estimate based on flushing two times a day for 30 days) per month. To conserve water, fill a couple of bottles for drinking water after flushing the tap, and whenever possible use the first flush water to wash the dishes or water the plants. If you live in a high-rise building, letting the water flow before using it may not work to lessen your risk from lead. The plumbing systems have more, and sometimes larger pipes than smaller buildings. Ask your

landlord for help in locating the source of the lead and for advice on reducing the lead level.

(b) Try not to cook with, or drink water from the hot water tap. Hot water can dissolve more lead more quickly than cold water. If you need hot water, draw water from the cold tap and heat it on the stove or microwave.

(c) Remove loose lead solder and debris from the plumbing materials installed in newly constructed homes, or homes in which the plumbing has recently been replaced, by removing the faucet strainers from all taps and running the water from three to five minutes. Thereafter, periodically remove the strainers and flush out any debris that has accumulated over time.

(d) If your copper pipes are joined with lead solder that has been installed illegally since it was banned in 1986, notify the plumber who did the work and request that he replace the lead solder with lead-free solder. Lead solder looks dull gray, and when scratched with a key looks shiny. In addition, notify the local building official in your city or county.

(e) Determine whether the service line that connects your home or apartment to the water main is made of lead. The best way to determine if your service line is made of lead is by either hiring a licensed plumber to inspect the line or by contacting the plumbing contractor who installed the line. You can identify the plumbing contractor by checking your localities' record of building permits which should be maintained in the files of the (insert name of department that issues building permits). A licensed plumber can at the same time check to see if your home's plumbing contains lead solder, lead pipes, or pipe fittings that contain lead. The waterworks that delivers water to your home should also maintain records of the materials located in the distribution system. If the service line that connects your dwelling to the water main contributes more than 15 ppb to drinking water, after our comprehensive treatment program is in place, we are required to replace the line. Since the line is only partially controlled by the (insert name of the city, county, or waterworks that controls the line), we are required to provide you with information on how to replace your portion of the service line, and offer to replace that portion of the line at your expense and take a follow-up tap water sample within 14 days of the replacement. Acceptable replacement alternatives include copper, steel, iron, and plastic pipes and must comply with local plumbing codes.

(f) Have an electrician check your wiring. If grounding wires from the electrical system are attached to your pipes, corrosion may be greater. Check with a licensed electrician or your local electrical code to determine if your wiring can be grounded elsewhere. DO NOT attempt to change the wiring yourself because improper grounding can cause electrical shock and fire hazards.

(3) The steps described above will reduce the lead concentrations in your drinking water. However, if a water test indicates that the drinking water coming from your tap contains lead concentrations in excess of 15 ppb after flushing, or after we have completed our actions to minimize lead levels, then you may want to take the following additional measures.

(a) Purchase or lease a home treatment device. Home treatment devices are limited in that each unit treats only the water that flows from the faucet to which it is connected, and all of the devices require periodic maintenance and replacement. Devices such as reverse osmosis systems or distillers can effectively remove lead from your drinking water. Some activated carbon filters

may reduce lead levels at the tap, however all lead reduction claims should be investigated. Be sure to check the actual performance of a specific home treatment device before and after installing the unit.

(b) Purchase bottled water for drinking and cooking.

(4) You can consult a variety of sources for additional information. Your family doctor or pediatrician can perform a blood test for lead and provide you with information about the health effects of lead. State and local government agencies that can be contacted include:

(a) (Insert the name of the waterworks) at (insert phone number) can provide you with information about your community's waterworks and a list of local laboratories that have been certified by Division of Consolidated Laboratory Services for testing water quality.

(b) (Insert the name of city or county department that issues building permits) at (insert phone number) can provide you with information about building permit records that should contain the names of plumbing contractors that plumbed your home.

(c) The Medical Director of (Insert the name of the city or county) Health Department, and the Virginia Department of Health Division of Maternal and Child Health, Lead Programs Director at 1-800-523-4019 can provide you with information about the health effects of lead and how you can have your child's blood tested.

(5) The following is a list of some state-approved laboratories in your area that you can call to have your water tested for lead. (Insert names and phone numbers of at least two laboratories.)

2. Content of broadcast materials. A waterworks owner shall include the following information in all public service announcements submitted under the lead public education program to television and radio stations for broadcasting:

a. Why should everyone want to know the facts about lead and drinking water? Because unhealthy amounts of lead can enter drinking water through the plumbing in your home. That's why I urge you to do what I did. I had my water tested for (insert free or $ per sample). You can contact the (insert the name of the waterworks) for information on testing and on simple ways to reduce your exposure to lead in drinking water.

b. To have your water tested for lead, or to get more information about this public health concern, please call (insert the phone number of the waterworks).

3. Delivery of a public education program.

a. In communities where a significant proportion of the population speaks a language other than English, public education materials shall be communicated in the appropriate language(s).

b. The owner of a community waterworks that fails to meet the lead action level on the basis of tap water samples collected in accordance with 12VAC5-590-370 B 6 a shall, within 60 days:

(1) Insert notices in each customer's water utility bill containing the information in subdivision F 1 of this section, along with the following alert on the water bill itself in large print: "SOME HOMES IN THIS COMMUNITY HAVE ELEVATED LEAD LEVELS IN THEIR DRINKING

WATER. LEAD CAN POSE A SIGNIFICANT RISK TO YOUR HEALTH. PLEASE READ THE ENCLOSED NOTICE FOR FURTHER INFORMATION."

(2) Submit the information in subdivision F 1 of this section to the editorial departments of the major daily and weekly newspapers circulated throughout the community.

(3) Deliver pamphlets and/or brochures that contain the public education materials in subdivisions F 1 b and d of this section to facilities and organizations, including the following:

(a) Public schools and/or local school boards;

(b) City or county health department;

(c) Women, Infants, and Children and/or Head Start Program(s) whenever available;

(d) Public and private hospitals and/or clinics;

(e) Pediatricians;

(f) Family planning clinics; and

(g) Local welfare agencies.

(4) Submit the public service announcement in subdivision F 2 of this section to at least five of the radio and television stations with the largest audiences that broadcast to the community served by the waterworks.

c. The owner of a community waterworks shall repeat the tasks contained in subdivisions F 3 b (1), (2), and (3) of this section every 12 months, and the tasks contained in subdivision F 3 b (4) of this section every six months for as long as the waterworks exceeds the lead action level.

d. Within 60 days after it exceeds the lead action level, the owner of a nontransient noncommunity waterworks shall deliver the public education materials contained in subdivisions F 1 a, b, and d of this section as follows:

(1) Post informational posters on lead in drinking water in a public place or common area in each of the buildings served by the waterworks, and

(2) Distribute informational pamphlets and/or brochures on lead in drinking water to each person served by the nontransient noncommunity waterworks.

e. The owner of a nontransient noncommunity waterworks shall repeat the tasks contained in subdivision F 3 d of this section at least once during each calendar year in which the waterworks exceeds the lead action level.

f. A waterworks owner may discontinue delivery of public education materials if the waterworks has met the lead action level during the most recent six-month monitoring period conducted pursuant to 12VAC5-590-370 B 6 a. The owner shall recommence public education in accordance with this section if the waterworks subsequently exceeds the lead action level during any monitoring period.

4. Supplemental monitoring and notification of results. The owner of a waterworks that fails to meet the lead action level on the basis of tap samples collected in accordance with 12VAC5-590-370 B 6 a shall offer to sample the tap water of any customer who requests it. The owner is not required to pay for collecting or analyzing the sample, nor is the owner required to collect and analyze the sample itself.

G. Beginning January 1, 1993, each waterworks owner shall certify annually in writing to the commissioner (using third party or manufacturer's certification) that, when polymers containing acrylamide or epichlorohydrin are used by the waterworks in drinking water systems, the combination (or product) of dose and monomer level does not exceed the following specified levels: Acrylamide = 0.05% dosed at 1 ppm (or equivalent) of polymer. Epichlorohydrin = 0.01% dosed at 20 ppm (or equivalent) of polymer. Certifications may rely on manufacturers or third parties, as approved by the commissioner.

H. Treatment technique for control of disinfection byproduct (DBPP) precursors.

1. Applicability.

a. Waterworks that use surface water or groundwater under the direct influence of surface water using conventional filtration treatment must operate with enhanced coagulation or enhanced softening to achieve the TOC percent removal levels specified in subdivision H 2 of this section unless the waterworks meets at least one of the alternative compliance criteria listed in subdivision H 1 b or c of this section.

b. Alternative compliance criteria for enhanced coagulation and enhanced softening waterworks. Waterworks that use surface water or groundwater under the direct influence of surface water provided with conventional filtration treatment may use the alternative compliance criteria in subdivisions H 1 b (1) through (6) of this section to comply with this section in lieu of complying with subdivision H 2 of this section. Waterworks must still comply with monitoring requirements in 12VAC5-590-370 B 3 j.

(1) The waterworks' source water TOC level, measured according to 12VAC5-590-440, is less than 2.0 mg/L, calculated quarterly as a running annual average.

(2) The waterworks' treated water TOC level, measured according to 12VAC5-590-440, is less than 2.0 mg/L, calculated quarterly as a running annual average.

(3) The waterworks' source water TOC level, measured according to 12VAC5-590-440, is less than 4.0 mg/L, calculated quarterly as a running annual average; the source water alkalinity, measured according to 12VAC5-590-440, is greater than 60 mg/L (as CaCO3), calculated quarterly as a running annual average; and either the TTHM and HAA5 running annual averages are no greater than 0.040 mg/L and 0.030 mg/L, respectively; or prior to the effective date for compliance in 12VAC590-370 B 3 b, the waterworks has made a clear and irrevocable financial commitment not later than the effective date for compliance in 12VAC590-370 B 3 b to use of technologies that will limit the levels of TTHMs and HAA5 to no more than 0.040 mg/L and 0.030 mg/L, respectively. Waterworks must submit evidence of a clear and irrevocable financial commitment, in addition to a schedule containing milestones and periodic progress reports for installation and operation of appropriate technologies, to the commissioner for approval not later

than the effective date for compliance in 12VAC590-370 B 3 b. These technologies must be installed and operating not later than June 30, 2005. Failure to install and operate these technologies by the date in the approved schedule will constitute a violation of these regulations.

(4) The TTHM and HAA5 running annual averages are no greater than 0.040 mg/L and 0.030 mg/L, respectively, and the waterworks uses only chlorine for primary disinfection and maintenance of a residual in the distribution system.

(5) The waterworks' source water SUVA, prior to any treatment and measured monthly according to 12VAC5-590-440, is less than or equal to 2.0 L/mg-m, calculated quarterly as a running annual average.

(6) The waterworks' finished water SUVA, measured monthly according to 12VAC5-590-440, is less than or equal to 2.0 L/mg-m, calculated quarterly as a running annual average.

c. Additional alternative compliance criteria for softening waterworks. Waterworks practicing enhanced softening that cannot achieve the TOC removals required by subdivision H 2 b of this section may use the alternative compliance criteria in subdivisions H 1 c (1) and (2) of this section in lieu of complying with subdivision H 2 of this section. Waterworks must still comply with monitoring requirements in 12VAC5-590-370 B 3 f (1).

(1) Softening that results in lowering the treated water alkalinity to less than 60 mg/L (as CaCO3), measured monthly according to 12VAC5-590-440 and calculated quarterly as a running annual average.

(2) Softening that results in removing at least 10 mg/L of magnesium hardness (as CaCO3), measured monthly and calculated quarterly as an annual running average.

2. Enhanced coagulation and enhanced softening performance requirements.

a. Waterworks must achieve the percent reduction of TOC specified in subdivision H 2 b of this section between the source water and the combined filter effluent, unless the commissioner approves a waterworks' request for alternate minimum TOC removal (Step 2) requirements under subdivision H 2 c of this section.

b. Required Step 1 TOC reductions, indicated in the following table, are based upon specified source water parameters measured in accordance with 12VAC5-590-440. Waterworks practicing softening are required to meet the Step 1 TOC reductions in the far-right column (Source water alkalinity greater than 120 mg/L) for the specified source water TOC:

Step 1 Required Removal of TOC by Enhanced Coagulation and Enhanced Softening

for Community or Nontransient Noncommunity Waterworks That Use Surface Water

or Groundwater Under the Direct Influence of Surface Water Using Conventional

Treatment 1,2

Source-water TOC, mg/L	Source-water alkalinity, mg/L as CaCOå3ç		
	0-60	60-120	;120 3
2.0-4.0	35.0%	25.0%	15.0%
4.0-8.0	45.0%	35.0%	25.0%
8.0	50.0%	40.0%	30.0%

FN1Waterworks meeting at least one of the conditions in subdivisions H 1 b (1) through (6) of this section are not required to operate with enhanced coagulation.

FN2Softening waterworks meeting one of the alternative compliance criteria in subdivision H 1 c of this section are not required to operate with enhanced softening.

FN3Waterworks practicing softening must meet the TOC removal requirements in this column.

c. Waterworks that use surface water or groundwater under the direct influence of surface water with conventional treatment systems that cannot achieve the Step 1 TOC removals required by subdivision H 2 b of this section due to water quality parameters or operational constraints must apply to the commissioner, within three months of failure to achieve the TOC removals required by subdivision H 2 b of this section, for approval of alternative minimum TOC (Step 2) removal requirements submitted by the waterworks. If the commissioner approves the alternative minimum TOC removal (Step 2) requirements, the commissioner may make those requirements retroactive for the purposes of determining compliance. Until the commissioner approves the alternate minimum TOC removal (Step 2) requirements, the waterworks must meet the Step 1 TOC removals contained in subdivision H 2 b of this section.

d. Alternate minimum TOC removal (Step 2) requirements. Applications, made to the commissioner by waterworks using enhanced coagulation, for approval of alternative minimum TOC removal (Step 2) requirements under subdivision H 2 c of this section must include, at a minimum, results of bench- or pilot-scale testing conducted under subdivision H 2 d (1) of this section. The submitted bench- or pilot-scale testing must be used to determine the alternate enhanced coagulation level.

(1) Alternate enhanced coagulation level is defined as coagulation at a coagulant dose and pH as determined by the method described in subdivisions H 2 d (1) through (5) of this section such that an incremental addition of 10 mg/L of alum (or equivalent amount of ferric salt) results in a TOC removal of equal to or less than 0.3 mg/L. The percent removal of TOC at this point on the "TOC removal versus coagulant dose" curve is then defined as the minimum TOC removal required for the waterworks. Once approved by the commissioner, this minimum requirement supersedes the minimum TOC removal required by the table in subdivision H 2 b of this section. This requirement will be effective until such time as the commissioner approves a new value based on the results of a new bench- and pilot-scale test. Failure to achieve the alternative minimum TOC removal levels set by the commissioner is a violation of these regulations.

(2) Bench- or pilot-scale testing of enhanced coagulation must be conducted by using representative water samples and adding 10 mg/L increments of alum (or equivalent amounts of ferric salt) until the pH is reduced to a level less than or equal to the enhanced coagulation Step 2 target pH shown in the following table:

Enhanced Coagulation Step 2 target pH	
Alkalinity (mg/L as CaCOå3ç)	Target pH
0-60	5.5
60-120	6.3
120-240	7.0
240	7.5

(3) For waters with alkalinities of less than 60 mg/L for which addition of small amounts of alum or equivalent addition of iron coagulant drives the pH below 5.5 before significant TOC removal occurs, the waterworks must add necessary chemicals to maintain the pH between 5.3 and 5.7 in samples until the TOC removal of 0.3 mg/L per 10 mg/L alum added (or equivalent addition of iron coagulant) is reached.

(4) The waterworks may operate at any coagulant dose or pH necessary (consistent with other sections of these regulations) to achieve the minimum TOC percent removal approved under subdivision H 2 c of this section.

(5) If the TOC removal is consistently less than 0.3 mg/L of TOC per 10 mg/L of incremental alum dose at all dosages of alum (or equivalent addition of iron coagulant), the water is deemed to contain TOC not amenable to enhanced coagulation. The waterworks may then apply to the commissioner for a waiver of enhanced coagulation requirements.

3. Compliance calculations.

a. Waterworks that use surface water or groundwater under the direct influence of surface water other than those identified in subdivision H 1 b or H 1 c of this section must comply with requirements contained in subdivision H 2 b or H 2 c of this section. Waterworks must calculate compliance quarterly, beginning after the waterworks has collected 12 months of data, by determining an annual average using the following method:

(1) Determine actual monthly TOC percent removal, equal to:

(1-(treated water TOC/source water TOC))X100

(2) Determine the required monthly TOC percent removal (from either the table in subdivision H 2 b of this section or from subdivision H 2 c of this section).

(3) Divide the value in subdivision H 3 a (1) of this section by the value in subdivision H 3 a (2) of this section.

(4) Add together the results of subdivision H 3 a (3) of this section for the last 12 months and divide by 12.

(5) If the value calculated in subdivision H 3 a (4) of this section is less than 1.00, the waterworks is not in compliance with the TOC percent removal requirements.

b. Waterworks may use the provisions in subdivisions H 3 b (1) through (5) of this section in lieu of the calculations in subdivisions H 3 a (1) through (5) of this section to determine compliance with TOC percent removal requirements.

(1) In any month that the waterworks' treated or source water TOC level, measured according to 12VAC5-590-440, is less than 2.0 mg/L, the waterworks may assign a monthly value of 1.0 (in lieu of the value calculated in subdivision H 3 a (3) of this section) when calculating compliance under the provisions of subdivision H 3 a of this section.

(2) In any month that a waterworks practicing softening removes at least 10 mg/L of magnesium hardness (as CaCO3), the waterworks may assign a monthly value of 1.0 (in lieu of the value

calculated in subdivision H 3 a (3) of this section) when calculating compliance under the provisions of subdivision H 3 a of this section.

(3) In any month that the waterworks' source water SUVA, prior to any treatment and measured according to 12VAC5-590-440, is equal to or less than 2.0 L/mg-m, the waterworks may assign a monthly value of 1.0 (in lieu of the value calculated in subdivision H 3 a (3) of this section) when calculating compliance under the provisions of subdivision H 3 a of this section.

(4) In any month that the waterworks' finished water SUVA, measured according to 12VAC5-590-440, is equal to or less than 2.0 L/mg-m, the waterworks may assign a monthly value of 1.0 (in lieu of the value calculated in subdivision H 3 a (3) of this section) when calculating compliance under the provisions of subdivision H 3 a of this section.

(5) In any month that a waterworks practicing enhanced softening lowers alkalinity below 60 mg/L (as CaCO3), the waterworks may assign a monthly value of 1.0 (in lieu of the value calculated in subdivision H 3 a (3) of this section) when calculating compliance under the provisions of subdivision H 3 a of this section.

c. Waterworks that use surface water or groundwater under the direct influence of surface water and using conventional treatment may also comply with the requirements of this section by meeting the criteria in subdivision H 1 b or c of this section.

4. Enhanced coagulation or enhanced softening is the treatment technique required to control the level of DBP precursors in drinking water treatment and distribution systems for waterworks using surface water or groundwater under the direct influence of surface water and using conventional treatment.

I. The best technology, treatment techniques, or other means available for achieving compliance with the maximum contaminant levels for disinfection byproducts show in Table 2.13 are listed below:

1. Enhanced coagulation or enhanced softening or GAC10, with chlorine as the primary and residual disinfectant is the best available technology for achieving compliance with the maximum contaminant level for TTHM or HAA5.

2. Control of ozone treatment process to reduce production of bromate is the best available technology for achieving compliance with the maximum contaminant level for bromate.

3. Control of treatment processes to reduce disinfectant demand and control of disinfection treatment processes to reduce disinfectant levels is the best available technology for achieving compliance with the maximum contaminant level for chlorite.

4. A waterworks that is installing GAC or membrane technology to comply with Table 2.13 may apply to the commissioner for an extension of up to 24 months past the dates in 12VAC5-590-370 B 3 b, but not beyond December 31, 2003. In granting the extension, the commissioner must set a schedule for compliance and may specify any interim measures that the waterworks must take. Failure to meet the schedule or interim treatment requirements constitutes a violation of 12VAC5-590-410.

J. The best technology, treatment techniques, or other means available for achieving compliance with the maximum residual disinfectant levels identified in Table 2.12 is the control of treatment processes to reduce disinfectant demand and control of disinfection treatment processes to reduce disinfectant levels.

K. If spent filter backwash water, thickener supernatant, or liquids from dewatering processes is recycled, in any waterworks supplied by a surface water source and waterworks supplied by a groundwater source under the direct influence of surface water that employ conventional filtration or direct filtration treatment, then it is subject to the recycle treatment technique requirement. Under this requirement recycle flows must be returned through all the processes of the treatment system, or an alternate location approved by the State, by June 8, 2004.

12VAC5-590-530. Reporting.

A. The results of any required monitoring activity shall be reported by the waterworks owner to the appropriate field office no later than the 10th day of the month following the month during which the tests were taken.

1. Waterworks required to sample quarterly must report to the appropriate field office within 10 days after the end of each quarter in which samples were collected.

2. Waterworks required to sample less frequently than quarterly must report to the appropriate field office within 10 days after the end of each monitoring period in which samples were collected.

B. It shall be the duty and responsibility of an owner to report to the appropriate field office in the most expeditious manner (usually by telephone) under the following circumstances. If it is done by telephone a confirming report shall be mailed as soon as practical.

1. When a bacteriological examination shows a repeat sample is required (see 12VAC5-590-380 D), a report shall be made within 48 hours. A waterworks owner must report a total coliform PMCL violation to the appropriate field office no later than the end of the next business day.

2. When the daily average of turbidity testing exceeds 5 NTU a report shall be made within 48 hours.

3. When a Primary Maximum Contaminant Level of an inorganic or organic chemical is exceeded for a single sample the owner shall report same within seven days. If any one sample result would cause the compliance average to be exceeded the owner shall report same in 48 hours.

4. When the average value of samples collected pursuant to 12VAC5-590-410 exceeds the Primary Maximum Contaminant Level of any organic or inorganic chemical the owner shall report same within 48 hours.

5. When the maximum contaminant level for radionuclides has been exceeded as determined by Table 2.5 the results shall be reported within 48 hours.

6. The waterworks owner shall report to the appropriate field office within 48 hours the failure to comply with the monitoring and sanitary survey requirements of this chapter.

7. The waterworks owner shall report to the appropriate field office within 48 hours the failure to comply with the requirements of any schedule prescribed pursuant to a variance or exemption.

C. Reporting requirements for filtration treatment and disinfection treatment.

1. The owner of a waterworks that provides filtration treatment shall report monthly to the division the following specified information beginning June 29, 1993, or when filtration is installed, whichever is later.

a. Turbidity measurements as required by 12VAC5-590-370 B 7 a shall be reported within 10

days after the end of each month the waterworks serves water to the public. Information that shall be reported includes:

(1) The total number of filtered water turbidity measurements taken during the month.

(2) The number and percentage of filtered water turbidity measurements taken during the month which are less than or equal to the turbidity limits specified in 12VAC5-590-420 B 2 for the filtration technology being used.

(3) The date and value of any turbidity measurements taken during the month which exceed 5 NTU.

b. In addition, a waterworks serving at least 10,000 people using surface water or groundwater under the direct influence of surface water that provides conventional filtration treatment or direct filtration must report monthly to the commissioner the information specified in subdivisions C 1 b (1) and (2) of this section beginning January 1, 2002. Also, a waterworks that provides filtration approved under 12VAC5-590-420 B 2 d must report monthly to the commissioner the information specified in subdivision C 1 b (1) of this section beginning January 1, 2002. The reporting in subdivision C 1 b (1) of this section is in lieu of the reporting specified in C 1 a.

(1) Turbidity measurements as required by 12VAC5-590-420 B 2 a (3) must be reported within 10 days after the end of each month the system serves water to the public. Information that must be reported includes:

(a) The total number of filtered water turbidity measurements taken during the month.

(b) The number and percentage of filtered water turbidity measurements taken during the month that are less than or equal to the turbidity limits specified in 12VAC5-590-420 B 2 a (3) or 12VAC5-590-420 B 2 d.

(c) The date and value of any turbidity measurements taken during the month that exceed 1 NTU for systems using conventional filtration treatment or direct filtration, or that exceed the maximum level set by the commissioner under 12VAC590-420 B 2 d.

(2) Waterworks must maintain the results of individual filter monitoring taken under 12VAC5-590-370 B 7 b (1) for at least three years. Waterworks must report that they have conducted individual filter turbidity monitoring under 12VAC5-590-370 B 7 b (1) within 10 days after the end of each month the waterworks system serves water to the public. Waterworks must report individual filter turbidity measurement results taken under 12VAC5-590-370 B 7 b (1) within 10 days after the end of each month the waterworks serves water to the public only if measurements demonstrate one or more of the conditions in subdivisions C 1 b (2) (a) through (d) of this section. Waterworks that use lime softening may apply to the commissioner for alternative exceedance levels for the levels specified in subdivisions C 1 b (2) (a) through (d) of this section if they can demonstrate that higher turbidity levels in individual filters are due to lime carryover only and not due to degraded filter performance.

(a) For any individual filter that has a measured turbidity level of greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart, the waterworks must report the filter number,

the turbidity measurement, and the date, or dates, on which the exceedance occurred. In addition, the waterworks must either produce a filter profile for the filter within seven days of the exceedance (if the waterworks is not able to identify an obvious reason for the abnormal filter performance) and report that the profile has been produced or report the obvious reason for the exceedance.

(b) For any individual filter that has a measured turbidity level of greater than 0.5 NTU in two consecutive measurements taken 15 minutes apart at the end of the first four hours of continuous filter operation after the filter has been backwashed or otherwise taken offline, the waterworks must report the filter number, the turbidity, and the date, or dates, on which the exceedance occurred. In addition, the waterworks must either produce a filter profile for the filter within seven days of the exceedance (if the waterworks is not able to identify an obvious reason for the abnormal filter performance) and report that the profile has been produced or report the obvious reason for the exceedance.

(c) For any individual filter that has a measured turbidity level of greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of three consecutive months, the waterworks must report the filter number, the turbidity measurement, and the date, or dates, on which the exceedance occurred. In addition, the waterworks must conduct a self-assessment of the filter within 14 days of the exceedance and report that the self-assessment was conducted. The self-assessment must consist of at least the following components: assessment of filter performance; development of a filter profile; identification and prioritization of factors limiting filter performance; assessment of the applicability of corrections; and preparation of a filter self-assessment report.

(d) For any individual filter that has a measured turbidity level of greater than 2.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of two consecutive months, the waterworks must report the filter number, the turbidity measurement, and the date, or dates, on which the exceedance occurred. In addition, the waterworks must arrange for the conduct of a comprehensive performance evaluation by the commissioner or a third party approved by the commissioner no later than 30 days following the exceedance and have the evaluation completed and submitted to the commissioner no later than 90 days following the exceedance.

2. Disinfection information specified below shall be reported to the division within 10 days after the end of each month the waterworks serves water to the public. Information that shall be reported includes:

a. For each day, the lowest measurement of residual disinfectant concentration in mg/L in water entering the distribution system.

b. The date and duration of each period when the residual disinfectant concentration in water entering the distribution system fell below 0.2 mg/L and when the division was notified of the occurrence.

c. The following information on the samples taken in the distribution system in conjunction with total coliform monitoring pursuant to 12VAC5-590-420 B.

(1) Number of instances where the residual disinfectant concentration is measured;

(2) Number of instances where the residual disinfectant concentration is not measured but HPC is measured;

(3) Number of instances where the residual disinfectant concentration is measured but not detected and no HPC is measured;

(4) Number of instances where no residual disinfectant concentration is detected and where HPC is greater than 500/mL;

(5) Number of instances where the residual disinfectant concentration is not measured and HPC is greater than 500/mL;

(6) For the current and previous month the system serves water to the public, the value of "V" in percent in the following formula:

$$V = \frac{c + d + e}{a + b} \times 100$$

a = the value in subdivision C 2 c (1) of this section

b = the value in subdivision C 2 c (2) of this section

c = the value in subdivision C 2 c (3) of this section

d = the value in subdivision C 2 c (4) of this section

e = the value in subdivision C 2 c (5) of this section

(7) If the division determines, based on site specific considerations, that a waterworks owner has no means for having a sample transported and analyzed for HPC by a certified laboratory within the requisite time and temperature conditions and that the waterworks is providing adequate disinfection in the distribution system, the requirements of subdivision C 2 c (1) through (6) of this section do not apply.

d. A waterworks owner need not report the data listed in subdivision C 2 a of this section if all data listed in subdivisions C 2 a through c of this section remain on file at the waterworks and the division determines that the waterworks owner has submitted all of the information required by subdivisions C 2 a through c of this section for the last 12 months.

3. Additional reporting requirements.

a. Each waterworks owner, upon discovering that a waterborne disease outbreak potentially attributable to that waterworks has occurred, shall report that occurrence to the division as soon as possible, but no later than by the end of the next business day.

b. If at any time the turbidity exceeds 5 NTU, the waterworks owner shall inform the division as soon as possible, but no later than the end of the next business day.

c. Additional reporting requirements for waterworks serving at least 10,000 people.

(1) If at any time the turbidity exceeds 1 NTU in representative samples of filtered water in a waterworks using conventional filtration treatment or direct filtration, the waterworks must inform the commissioner as soon as possible, but no later than the end of the next business day.

(2) If at any time the turbidity in representative samples of filtered water exceed the maximum level set by the commissioner in 12VAC5-590-420 B 2 d for filtration technologies other than conventional filtration treatment, direct filtration, slow sand filtration, or diatomaceous earth filtration, the waterworks must inform the commissioner as soon as possible, but no later than the end of the next business day.

d. If at any time the chlorine residual falls below 0.2 mg/L in the water entering the distribution system, the waterworks owner shall notify the division as soon as possible, but no later than by the end of the next business day. The waterworks owner also shall notify the division by the end of the next business day whether or not the residual was restored to at least 0.2 mg/L within four hours.

D. Reporting requirements for lead and copper. All waterworks owners shall report all of the following information to the appropriate field office in accordance with this section.

1. Reporting requirements for tap water monitoring for lead and copper and for water quality parameter monitoring.

a. A waterworks owner shall report the information specified below for all tap water samples within the first 10 days following the end of each applicable monitoring period specified in 12VAC5-590-370 B 6 a, b and c (i.e., every six months, annually, or every three years).

(1) The results of all tap samples for lead and copper including location or a location site code and the criteria under 12VAC5-590-370 B 6 a (1) (c), (d), (e), (f) and/or (g) under which the site was selected for the waterworks' sampling pool;

(2) A certification that each first draw sample collected by the waterworks is one-liter in volume and, to the best of their knowledge, has stood motionless in the service line, or in the interior plumbing of a sampling site, for at least six hours;

(3) Where residents collected samples, a certification that each tap sample collected by the residents was taken after the waterworks owner informed them of proper sampling procedures specified in 12VAC5-590-370 B 6 a (2) (b);

(4) The 90th percentile lead and copper concentrations measured from among all lead and copper tap water samples collected during each monitoring period (calculated in accordance with 12VAC5-590-410 E 3);

(5) With the exception of initial tap sampling conducted pursuant to 12VAC5-590-370 B 6 a (4) (a), the waterworks owner shall designate any site which was not sampled during previous

monitoring periods, and include an explanation of why sampling sites have changed;

(6) The results of all tap samples for pH, and where applicable, alkalinity, calcium, conductivity, temperature, and orthophosphate or silica collected under 12VAC5-590-370 B 6 b (2) through (5);

(7) The results of all samples collected at the entry point(s) to the distribution system for applicable water quality parameters under 12VAC5-590-370 B 6 b (2) through (5).

b. By the applicable date in 12VAC5-590-370 B 6 a (4) (a) for commencement of monitoring, the owner of each community waterworks which does not complete the targeted sampling pool with tier 1 sampling sites meeting the criteria in 12VAC5-590-370 B 6 a (1) (c) shall send a letter to the appropriate field office justifying the selection of tier 2 and/or tier 3 sampling sites under 12VAC5-590-370 B 6 a (1) (d) and/or (e).

c. By the applicable date in 12VAC5-590-370 B 6 a (4) (a) for commencement of monitoring, the owner of each nontransient, noncommunity waterworks which does not complete the sampling pool with tier 1 sampling sites meeting the criteria in 12VAC5-590-370 B 6 a (1) (f) shall send a letter to the appropriate field office justifying the selection of sampling sites under 12VAC5-590-370 B 6 a (1) (g).

d. By the applicable date in 12VAC5-590-370 B 6 a (4) (a) for commencement of monitoring, the owner of each waterworks with lead service lines that is not able to locate the number of sites served by such lines required under 12VAC5-590-370 B 6 a (1) (b) (i) shall send a letter to the appropriate field office demonstrating why the owner was unable to locate a sufficient number of such sites based upon the information listed in 12VAC5-590-370 B 6 a (1) (b).

e. Each waterworks owner who requests that the commissioner reduce the number and frequency of sampling shall provide the information required under 12VAC5-590-370 B 6 a (4) (d).

2. Water supply (source water) monitoring reporting requirements.

a. A waterworks owner shall report the sampling results for all source water samples collected in accordance with 12VAC5-590-370 B 6 c within the first 10 days following the end of each source water monitoring period (i.e., annually, per compliance period, per compliance cycle) specified in 12VAC5-590-370 B 6 c.

b. With the exception of the first round of source water sampling conducted pursuant to 12VAC5-590-370 B 6 c (2), the waterworks owner shall specify any site which was not sampled during previous monitoring periods, and include an explanation of why the sampling point has changed.

3. Corrosion control treatment reporting requirements. By the applicable dates under 12VAC5-590-420 C 2, waterworks owners shall report the following information:

a. For waterworks demonstrating that they have already optimized corrosion control, information required in 12VAC5-590-420 C 2 b (2) or (3).

b. For waterworks required to optimize corrosion control, the owner's recommendation regarding

optimal corrosion control treatment under 12VAC5-590-420 C 1 a.

c. For waterworks required to evaluate the effectiveness of corrosion control treatments under 12VAC5-590-420 C 1 c, the information required by that paragraph.

d. For waterworks required to install optimal corrosion control designated by the commissioner under 12VAC5-590-420 C 1 d (1), a letter certifying that the owner has completed installing that treatment.

4. Water supply source water treatment reporting requirements. By the applicable dates in 12VAC5-590-420 D, waterworks owners shall provide the following information to the appropriate field office:

a. If required under 12VAC5-590-420 D 2 a, the owner's recommendation regarding source water treatment;

b. For waterworks required to install source water treatment under 12VAC5-590-420 D 2 b, a letter certifying that the waterworks has completed installing the treatment designated by the commissioner within 24 months after the commissioner designated the treatment.

5. Lead service line replacement reporting requirements. Waterworks owners shall report the following information to the appropriate field office to demonstrate compliance with the requirements of 12VAC5-590-420 E:

a. Within 12 months after a waterworks exceeds the lead action level in sampling referred to in 12VAC5-590-420 E 1, the owner shall demonstrate in writing to the appropriate field office that the owner has conducted a materials evaluation, including the evaluation in 12VAC5-590-370 B 6 a (1), to identify the initial number of lead service lines in the distribution system, and shall provide the appropriate field office with the waterworks' schedule for replacing annually at least 7.0% of the initial number of lead service lines in its distribution system.

b. Within 12 months after a waterworks exceeds the lead action level in sampling referred to in 12VAC5-590-420 E 1, and every 12 months thereafter, the waterworks owner shall demonstrate to the appropriate field office in writing that the waterworks owner has either:

(1) Replaced in the previous 12 months at least 7.0% of the initial lead service lines (or a greater number of lines specified by the commissioner under 12VAC5-590-420 E 6) in the distribution system, or

(2) Conducted sampling which demonstrates that the lead concentration in all service line samples from an individual line(s), taken pursuant to 12VAC5-590-370 B 6 a (7) (c), is less than or equal to 0.015 mg/L. In such cases, the total number of lines replaced and/or which meet the criteria in 12VAC5-590-420 E 3 shall equal at least 7.0% of the initial number of lead lines identified under subdivision D 5 a of this section (or the percentage specified by the commissioner under 12VAC5-590-420 E 6).

c. The annual letter submitted to the appropriate field office under subdivision D 5 b of this section shall contain the following information:

(1) The number of lead service lines scheduled to be replaced during the previous year of the waterworks' replacement schedule;

(2) The number and location of each lead service line replaced during the previous year of the waterworks' replacement schedule;

(3) If measured, the water lead concentration and location of each lead service line sampled, the sampling method, and the date of sampling.

d. As soon as practicable, but in no case later than three months after a waterworks exceeds the lead action level in sampling referred to in 12VAC5-590-420 E 1, any waterworks owner seeking to rebut the presumption that it has control over the entire lead service line pursuant to 12VAC5-590-420 E 4 shall submit a letter to the appropriate field office describing the legal authority (e.g., state statutes, municipal ordinances, public service contracts or other applicable legal authority) which limits the waterworks owner's control over the service lines and the extent of the waterworks owner's control.

6. Public education program reporting requirements. By December 31st of each year, the owner of any waterworks that is subject to the public education requirements in 12VAC5-590-420 F shall submit a letter to the appropriate field office demonstrating that the waterworks owner has delivered the public education materials that meet the content requirements in 12VAC5-590-420 F 1 and 2 and the delivery requirements in 12VAC5-590-420 F 3. This information shall include a list of all the newspapers, radio stations, television stations, facilities and organizations to which the owner delivered public education materials during the previous year. The owner shall submit the letter required by this paragraph annually for as long as it exceeds the lead action level.

7. Reporting of additional monitoring data. The owner of any waterworks which collects sampling data in addition to that required by this subpart shall report the results to the appropriate field office within the first 10 days following the end of the applicable monitoring period under 12VAC5-590-370 B 6 a, b and c during which the samples are collected.

E. Reporting requirements for disinfection byproducts. Waterworks must report the following information in accordance with subsection A of this section. (The field office may choose to perform calculations and determine whether the PMCL was violated, in lieu of having the waterworks report that information):

1. A waterworks monitoring for TTHM and HAA5 under the requirements of 12VAC5-590-370 B 3 b on a quarterly or more frequent basis must report:

a. The number of samples taken during the last quarter.

b. The location, date, and result of each sample taken during the last quarter.

c. The arithmetic average of all samples taken in the last quarter.

d. The annual arithmetic average of the quarterly arithmetic averages of this section for the last four quarters.

e. Whether, based on 12VAC5-590-390 C 2 b (2), the PMCL was violated.

2. A waterworks monitoring for TTHMs and HAA5 under the requirements of 12VAC5-590-370 B 3 b less frequently than quarterly (but at least annually) must report:

a. The number of samples taken during the last year.

b. The location, date, and result of each sample taken during the last monitoring period.

c. The arithmetic average of all samples taken over the last year.

d. Whether, based on 12VAC5-590-390 C 2 b (2), the PMCL was violated.

3. A waterworks monitoring for TTHMs and HAA5 under the requirements of 12VAC5-590-370 B 3 b less frequently than annually must report:

a. The location, date, and result of the last sample taken.

b. Whether, based on 12VAC5-590-390 C 2 b (2), the PMCL was violated.

4. A waterworks monitoring for chlorite under the requirements of 12VAC5-590-370 B 3 b must report:

a. The number of entry point samples taken each month for the last three months.

b. The location, date, and result of each sample (both entry point and distribution system) taken during the last quarter.

c. For each month in the reporting period, the arithmetic average of all samples taken in each three sample set taken in the distribution system.

d. Whether, based on 12VAC5-590-390 C 2 b (2) (c), the PMCL was violated, in which month and how many times it was violated each month.

5. A waterworks monitoring for bromate under the requirements of 12VAC5-590-370 B 3 b must report:

a. The number of samples taken during the last quarter.

b. The location, date, and result of each sample taken during the last quarter.

c. The arithmetic average of the monthly arithmetic averages of all samples taken in the last year.

d. Whether, based on 12VAC5-590-390 C 2 b (2) (b), the PMCL was violated.

F. Reporting requirements for disinfectants. Waterworks must report the information specified below in accordance with subsection A of this section. (The field office may choose to perform calculations and determine whether the MRDL was violated, in lieu of having the waterworks report that information):

1. A waterworks monitoring for chlorine or chloramines under the requirements of 12VAC5-590-370 B 3 b must report:

a. The number of samples taken during each month of the last quarter.

b. The monthly arithmetic average of all samples taken in each month for the last 12 months.

c. The arithmetic average of all monthly averages for the last 12 months.

d. Whether, based on 12VAC5-590-410 C 2 b (3) (a), the MRDL was violated.

2. A waterworks monitoring for chlorine dioxide under the requirements of 12VAC5-590-370 B 3 b must report:

a. The dates, results, and locations of samples taken during the last quarter.

b. Whether, based on 12VAC5-590-410 C 2 b (3) (b), the MRDL was violated.

c. Whether the MRDL was exceeded in any two consecutive daily samples and whether the resulting violation was acute or nonacute.

G. Reporting requirements for disinfection byproduct precursors and enhanced coagulation or enhanced softening. Waterworks must report the following information in accordance with subsection A of this section. (The field office may choose to perform calculations and determine whether the treatment technique was met, in lieu of having the waterworks report that information):

1. A waterworks monitoring monthly or quarterly for TOC under the requirements of 12VAC5-590-370 B 3 b and required to meet the enhanced coagulation or enhanced softening requirements in 12VAC5-590-420 H 2 b or c must report:

a. The number of paired (source water and treated water) samples taken during the last quarter.

b. The location, date, and results of each paired sample and associated alkalinity taken during the last quarter.

c. For each month in the reporting period that paired samples were taken, the arithmetic average of the percent reduction of TOC for each paired sample and the required TOC percent removal.

d. Calculations for determining compliance with the TOC percent removal requirements, as provided in 12VAC5-590-420 H 3 a.

e. Whether the system is in compliance with the enhanced coagulation or enhanced softening percent removal requirements in 12VAC5-590-420 H 2 a for the last four quarters.

2. A waterworks monitoring monthly or quarterly for TOC under the requirements of 12VAC5-590-370 B 3 b and meeting one or more of the alternative compliance criteria in 12VAC5-590-420 H 1 b or c must report:

a. The alternative compliance criterion that the system is using.

b. The number of paired samples taken during the last quarter.

c. The location, date, and result of each paired sample and associated alkalinity taken during the

last quarter.

d. The running annual arithmetic average based on monthly averages (or quarterly samples) of source water TOC for systems meeting a criterion in 12VAC5-590-420 H 1 b (2) or (3) or of treated water TOC for systems meeting the criterion in 12VAC5-590-420 H 1 b (2).

e. The running annual arithmetic average based on monthly averages (or quarterly samples) of source water SUVA for systems meeting the criterion in 12VAC5-590-420 H 1 b (5) or of treated water SUVA for systems meeting the criterion in 12VAC5-590-420 H 1 b (6).

f. The running annual average of source water alkalinity for systems meeting the criterion in 12VAC5-590-420 H 1 b (3) and of treated water alkalinity for systems meeting the criterion in 12VAC5-590-420 H 1 c (1).

g. The running annual average for both TTHM and HAA5 for systems meeting the criterion in 12VAC5-590-420 H 1 b (3) or (4).

h. The running annual average of the amount of magnesium hardness removal (as CaCO3, in mg/L) for systems meeting the criterion in 12VAC5-590-420 H 1 c (2).

i. Whether the system is in compliance with the particular alternative compliance criterion in 12VAC5-590-420 H 1 b or c.

H. Reporting of analytical results to the appropriate field office will not be required in instances where the state laboratory performs the analysis and reports same to that office.

I. Recycle flow reporting requirements. Any waterworks supplied by a surface water source and waterworks supplied by a groundwater source under the direct influence of surface water that employ conventional filtration or direct filtration treatment must notify the state in writing by December 8, 2003, if the system recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes. This notification must include, as a minimum:

1. A plant schematic showing the origin of all flows that are recycled, including but not limited to: spent filter backwash water, thickener supernatant, and liquids from dewatering processes. The schematic shall also specify the hydraulic conveyance used to transport all recycle flows, and the location where recycle flows are reintroduced back into the treatment plant.

2. Typical recycle flow in gallons per minute (gpm), the highest observed plant flow experienced in the previous year (gpm), design flow for the treatment plant (gpm), and state-approved operating capacity for the plant

~~I.~~ J. Information to be included on the operation monthly report shall be determined by the division for each waterworks on an individual basis. Appendix G contains suggested monthly operation report requirements.

12VAC5-590-540. Public notification (Reference Appendix F for checklist and sample format).

A. It shall be the duty and responsibility of the owner to give public notification under the following circumstances. (See Appendix F for mandatory health effects language.)

1. When any applicable PMCL or MRDL has been exceeded as set forth in 12VAC5-590-370.

2. Failure to comply with an applicable treatment technique.

3. Failure to comply with the requirements of any schedule prescribed pursuant to a variance or exemption.

4. Failure to do the prescribed monitoring as required.

5. Failure to comply with an applicable testing procedure as prescribed in 12VAC5-590-440.

6. Having been granted or having in effect a variance or exemption from an applicable PMCL.

7. Special public notification requirements for fluoride. Notice of violations of the Primary or Secondary Maximum Contaminant Level for fluoride, notices of variances and exemptions from the Primary Maximum Contaminant Level for fluoride, and notices of failure to comply with variance and exemption schedules for the Primary Maximum Contaminant Level for fluoride shall consist of the public notice in Appendix H plus a description of the nature of the violation and a description of any steps which the waterworks is taking to come into compliance.

8. General lead notification as required by PL 100-572 (LCCA).

a. In addition to the requirements of subdivisions A 1 through 6 of this section, the owner of each community waterworks and each nontransient noncommunity waterworks shall issue notice to persons served by that system that may be affected by lead contamination of their waterworks. The division may require subsequent notices. The owner shall provide notice under this section even if there is no exceedance of the Lead Action Level as defined in 12VAC5-590-410 E 1.

b. Notice under subdivision A 8 of this section is not required if the waterworks demonstrates to the division that the waterworks including the residential and nonresidential portions connected to the water system are lead free. For the purposes of this paragraph, the term "lead free" when used with respect to solders and flux refers to solders and flux containing not more than 0.2% lead, and when used with respect to pipes and pipe fittings refers to pipes and pipe fittings containing not more than 8.0% lead.

c. Manner of notice. Notice shall be given to persons served by the waterworks either by (i) three newspaper notices (one for each of three consecutive months) as directed by the division; or (ii) once by mail notice with the water bill or in a separate mailing as directed by the division; or (iii) once by hand delivery. For nontransient noncommunity waterworks, notices may be given by continuous posting. If posting is used, the notice shall be posted in a conspicuous place in the area served by the waterworks and continue for three months as directed by the division.

d. General content of notice. Notices issued under this section shall provide a clear and readily

understandable explanation of the potential sources of lead in drinking water, potential adverse health effects, reasonably available methods of mitigating known or potential lead content in drinking water, any steps the waterworks is taking to mitigate lead content in drinking water, and the necessity for seeking alternative water supplies, if any. The notice shall include the mandatory health effects language set out in Appendix F. In addition, each notice shall also include specific advice on how to determine if materials containing lead have been used in homes or the water distribution system and how to minimize exposure to water likely to contain high levels of lead. Each notice shall be conspicuous and shall not contain unduly technical language, unduly small print, or similar problems that frustrate the purpose of the notice. Each notice shall contain the telephone number of the waterworks owner, operator, or designee as a source of additional information regarding the notice. Where appropriate, the notice shall be multilingual; and

9. Availability of unregulated contaminant results. The owner shall notify persons served by the waterworks of the availability of the results of sampling conducted for unregulated contaminants under 12VAC5-590-370 B 4 by including a notice in the first set of water bills issued by the waterworks after the receipt of the results or written notice within three months. The notice shall identify a person and the telephone number for information on the monitoring results. For surface water source waterworks which provide this public notice after the first quarter of monitoring, the notice must include a statement that additional monitoring will be conducted for three more quarters with the results available upon request.

B. Tier I. The owner of a waterworks in violation as described in subdivisions A 1, 2, and 3 of this section shall give notice as follows:

1. Newspaper. By publication in a daily newspaper of general circulation in the area served by the system as soon as possible but in no case later than 14 days after the violation or failure. If the area served by a waterworks is not served by a daily newspaper of general circulation, notice shall instead be given by publication in a weekly newspaper of general circulation serving the area; and

2. Mail or hand delivery. By mail delivery (by direct mail or with the water bill) or by hand delivery not later than 45 days after the violation or failure. The division may waive mail or hand delivery if it determines that the owner of the waterworks in violation has corrected the violation or failure within the 45-day period. The division must make the waiver in writing and within the 45-day period; and

3. Imminent health threats. For violations of the PMCLs of contaminants or MRDLs of disinfectants that may pose an acute risk to human health by furnishing a copy of the notice to the radio and television stations serving the area served by the public water system as soon as possible but in no case later than 72 hours after the violation. The following violations are acute violations:

a. Violation of the bacteriological PMCL.

b. Violation of the nitrate PMCL.

c. Occurrence of a waterborne disease outbreak as determined by the commissioner or the State

Epidemiologist in an unfiltered waterworks with a surface source or groundwater source influenced by surface water.

d. Violation of the MRDL for chlorine dioxide as defined in Table 2.12 and determined according to 12VAC5-590-410 C 2 b (3) (b) (i).

e. Other violations as determined by the division.

4. Long term violations. Following the initial notice given under subdivisions B 1 or B 2 of this section, the owner must give notice at least once every three months by mail delivery (by direct mail or with the water bill) or by hand delivery, for as long as the violation or failure exists.

5. Exceptions:

a. In lieu of the requirements of subdivision B 1 of this section, the owner of a community waterworks in an area that is not served by a daily or weekly newspaper of general circulation shall give notice within 14 days after the violation or failure by hand delivery or by continuous posting in conspicuous places within the area served by the waterworks. Posting must continue for as long as the violation or failure exists. Notice by hand delivery must be repeated at least every three months for as long as the violation or failure exists.

b. In lieu of the requirements of subdivisions B 1 and B 2 of this section, the owner of a noncommunity waterworks may give notice within 14 days after the violation or failure by hand delivery or by continuous posting in conspicuous places within the area served by the waterworks. Posting must continue for as long as the violation or failure exists. Notice by hand delivery must be repeated at least every three months for as long as the violation or failure exists.

C. Tier II. The owner of a waterworks in violation as described in subdivisions A 4, A 5, or A 6 of this section shall give notice as follows:

1. Within three months of the violation or granting of a variance or exemption by publication in a daily newspaper of general circulation in the area served by the waterworks. If the area served by a waterworks is not served by a daily newspaper of general circulation, notice shall instead be given by publication in a weekly newspaper of general circulation serving the area.

2. For long term violations, the owner shall give notice at least once every three months by mail delivery (by direct mail or with the water bill) or by hand delivery, for as long as the violation exists. Repeat notice of the existence of a variance or exemption must be given every three months for as long as the variance or exemption remains in effect.

3. Exceptions:

a. Community waterworks. In lieu of the requirements of subdivisions C 1 and C 2 of this section, the owner of a community waterworks in an area that is not served by a daily or weekly newspaper of general circulation shall give notice, within three months of the violation or granting of the variance or exemption, by hand delivery or by continuous posting in conspicuous places within the area served by the waterworks. Posting must continue for as long as the violation exists or a variance or exemption remains in effect. Notice by hand delivery must be repeated at least every three months for as long as the violation exists or a variance or exemption

remains in effect.

b. Noncommunity waterworks. In lieu of the requirements of subdivisions C 1 and C 2 of this section, the owner of a noncommunity waterworks shall give notice, within three months of the violation or the granting of the variance or exemption, by hand delivery or by continuous posting in conspicuous places within the area served by the waterworks. Posting must continue for as long as the violation exists, or a variance or exemption remains in effect. Notice by hand delivery must be repeated at least every three months for as long as the violation exists or a variance or exemption remains in effect.

c. Minor violations. In lieu of the requirements of subdivisions C 1 and C 2 of this section, the owner of a waterworks, at the discretion of the division, may provide less frequent notice for minor monitoring violations as defined by the division, if approved by EPA. Notice of such violations must be given no less frequently than annually.

D. Notice to new billing units. The owner of a community waterworks must give a copy of the most recent public notice for any outstanding violation of any maximum contaminant level, or any maximum residual disinfectant level, or any treatment technique requirement or any variance or exemption schedule to all new billing units or new hookups prior to or at the time service begins.

E. General contents of public notice. Each notice required by this section must provide a clear and readily understandable explanation of the violation, any potential adverse health effects, the population at risk, the steps that the waterworks is taking to correct such violation, the necessity for seeking alternative water supplies, if any, and any preventive measures the consumer should take until the violation is corrected. Each notice shall be conspicuous and shall not contain unduly technical language, unduly small print, or similar problems that frustrate the purpose of the notice. Each notice shall include the telephone number of the owner, operator, or designee of the waterworks as a source of additional information concerning the notice. Where appropriate, the notice shall be multilingual.

F. Mandatory health effects language. When providing the information on potential adverse health effects required by subsection E of this section in notices of violations of Maximum Contaminant Levels or treatment techniques requirements, or notices of the granting or the continued existence of exemptions or variances, or notices of failure to comply with a variance or exemption schedule, the owner of a waterworks shall include the language specified in Appendix F as appropriate. If language for a particular contaminant is not specified in Appendix F, this subsection does not apply.

G. Public notification by the division. The division may give notice to the public required by this section on behalf of the owner of the waterworks if the division complies with the requirements of this section. However, the owner of the waterworks remains legally responsible for ensuring that the requirements of this section are met.

H. Within 10 days of completion of each public notice, the waterworks owner shall provide the appropriate field office with a representative copy of each type of notice distributed, published, posted and made available to the consumers or to the media.

12VAC5-590-550. Recordkeeping.

All waterworks shall retain within their facilities or at a convenient location near their facilities the following records for the minimum time periods specified:

A. Bacteriological Records--Five years

B. Chemical Analyses--10 years

C. Individual filter monitoring required under 12VAC5-590-530 C 1 b (2)--Three years; and

D. The following information shall be provided for subsections A and B of this section:

1. Date, place, and time of sampling as well as the name of the person who collected the sample;

2. Identification of sample (e.g., routine, check sample, raw water, other);

3. Date of analysis;

4. Laboratory and/or person responsible for performing analysis;

5. Analytical method/technique used; and

6. Results of the analysis.

E. Original records of all sampling data and analyses, reports, surveys, letters, evaluations, schedules, commissioner determinations, and any other information required by 12VAC5-590-420 C 1 and 2, D, E, and F; and 12VAC5-590-370 B 6 a, b, and c pertaining to lead and copper. Each waterworks owner shall retain the records required by this section for no fewer than 12 years.

F. Action taken to correct violations of these regulations--three years after last action with respect to violation involved.

G. Copies of reports, summaries, or communications relating to any sanitary surveys performed--10 years following inspection.

H. Variance or exemptions granted (and records related thereto)--five years following expiration of variance or exemption.

I. Cross connection control program records--10 years.

J. Systems that recycle flow, as stipulated in 12VAC5-590-420.K., must collect and retain on file recycle flow information for review and evaluation by the state beginning June 8, 2004. Information shall include, as a minimum:

1. Copy of the recycle notification submitted to the state under 12VAC5-590-530.I.

2. List of all recycle flows and the frequency with which they are returned.

3. Average and maximum backwash flowrate through the filters and the average and maximum

duration of the filter backwash process, in minutes.

4. Typical filter run length and a written summary of how the filter run length is determined.

5. The type of treatment provided for the recycle flow.

6. Data on the physical dimensions of the equalization and/or treatment units, typical and maximum hydraulic loading rates, type of treatment chemicals used, average dose, frequency of use, and frequency at which solids are removed, if applicable.

~~J.~~ K. All waterworks shall retain the following additional records:

1. Plant operational records

2. Water well completion reports

3. As-built engineering plans and specifications of facilities

4. Shop drawings of major equipment

5. Records of equipment repair or replacement

6. Updated map of water distribution system

7. All accident reports

12VAC5-590-990. Waterworks waste.

A. With the exception of sanitary sewage and flows recycled through the water treatment system, the wastes generated during the operation of water filtration plants constitute industrial wastes and are subject to the State Water Control Law (Chapter 3.1, (§62.1-44.2 et seq.) of Title 62.1 of the Code of Virginia).

Industrial wastes generated by water treatment facilities include, but are not limited to, the following:

1. Filter backwash water;

2. Coagulant sludges;

3. Softening sludges;

4. Microscreening sludges;

5. Iron and manganese sludges;

6. Sludges from presedimentation units; and

7. Brine wastes.

B. After receipt of plans and specifications from the consulting engineer for the water treatment facilities, the division will advise the State Water Control Board of ~~the proposal~~ any proposal to treat and discharge industrial wastes into state waters.~~and~~ The division will submit to the State Water Control Board a letter report to include the following:

1. Capacity of the proposed treatment facilities;

2. Location of the proposed facilities;

3. Proposed final disposition of the treated waste effluent;

4. Name and address of the consulting engineer; and

5. Name and address of the owner.

C. Except for recycle flows as described in 12VAC5-590-420.K, t~~T~~he State Water Control Board will then deal directly with the consulting engineer in reference to the ~~proposed treatment~~ final disposal of these wastes. ~~and, when approved, a certificate for these waste treatment facilities will be issued by the State Water Control Board. Final plans and specifications of the approved waste treatment facilities will be submitted by the consulting engineer to the division.~~

D. The sanitary wastes from water treatment plants must receive treatment. Wastes from these facilities must be discharged either directly to a sanitary sewer system or to an approved individual waste disposal facility providing suitable treatment.

APPENDIX F. CHECKLIST OF PUBLIC NOTICE CONTENTS.

The notice provides a clear and readily understandable explanation of the

1. violation/action

2. potential adverse health effects (mandatory health effects language)

3. population at risk

4. steps the system is taking to correct the violation

5. necessity of seeking alternative water supplies (if any)

6. preventive measures the consumer should take until the violation corrected

The notice

7. is clear and conspicuous in design

8. contains nontechnical language

9. uses print that is easily read

10. content creates no problems that would frustrate the purpose of public notification

11. contains the telephone number of the owner, operator, or designee of the waterworks as a source of additional information

12. contains multi-lingual information, where appropriate

NOTE: The circled numbers on the example correspond to items found in the checklist above. NA means not applicable in this situation.

FORMAT: Public Notice with Health Effects Language

July 1, 1991 Regional Water Authority

Upper Water System Encounters Delay in Lowering Nitrate Levels

Water From This Location Should Not Be Given To Children Under One Year Of Age

SITUATION The Regional Water Authority has announced a delay in installation of water treatment equipment. As a result:

STOP - Water available at this water system may be slightly higher in nitrates than recommended and should not be given to children under one year of age, or used in making baby formula.

GENERAL INFORMATION Water measured at this water system contained 12 milligrams of nitrate per liter of water. That is slightly higher that the nitrate limit of 10 milligrams per liter, established by the State Health Department.The Authority has ordered special water treatment equipment that is designed to lower nitrate levels, and was scheduled to have the equipment installed by June. The Turnpike Authority was granted an exemption by the

State Health Department to meet that deadline. However, because of installation delays, the equipment will not be installed until August. An application has been made to the State Health Department to approve that schedule.

HEALTH INFORMATION The United States Environmental Protection Agency (EPA) sets drinking water standards. Insert Mandatory Language Here. Safe Water Available. Low nitrate, safe water is available free of charge from the Lucky Lady restaurant.

INFORMATION The Authority regrets the inconvenience.If you have questions regarding nitrates or the schedule for completing this work, please contact:

Bob Bullet

Regional Water Authority

(804) 555-4266

MANDATORY HEALTH EFFECTS LANGUAGE FOR PUBLIC NOTIFICATION OF A VIOLATION OF PMCLs, TREATMENT TECHNIQUE REQUIREMENTS, THE GRANTING OF A VARIANCE OR EXEMPTION, OR SCHEDULE OF A VARIANCE OR EXEMPTION.

1. Trichloroethylene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that trichloroethylene is a health concern at certain levels of

exposure. This chemical is a common metal cleaning and dry cleaning fluid. It generally gets into drinking water by improper waste disposal. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed at lower levels over long periods of time. EPA has set forth the enforceable drinking water standard for trichloroethylene at 0.005 mg/L to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water which meets this standard is associated with little to none of this risk and should be considered safe.

2. Carbon tetrachloride. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that carbon tetrachloride is a health concern at certain levels of exposure. This chemical was once a popular household cleaning fluid. It generally gets into drinking water by improper waste disposal. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed at lower levels over long periods of time. EPA has set the enforceable drinking water standard for carbon tetrachloride at 0.005 mg/L to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water which meets this standard is associated with little to none of this risk and should be considered safe.

3. 1,2-Dichloroethane. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that 1,2-dichloroethane is a health concern at certain levels of exposure. This chemical is used as a cleaning fluid for fats, oils, waxes, and resins. It generally gets into drinking water from improper waste disposal. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals may also increase the risk of cancer in humans who are exposed at lower levels over long periods of time. EPA has set the enforceable drinking water standard for 1,2-dichloroethane at 0.005 mg/L to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water which meets this standard is associated with little to none of this risk and should be considered safe.

4. Vinyl chloride. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that vinyl chloride is a health concern at certain levels of exposure. This chemical is used in industry and is found in drinking water as a result of the breakdown of related solvents. The solvents are used as cleaners and degreasers of metals and generally get into drinking water by improper waste disposal. This chemical has been associated with significantly increased risks of cancer among certain industrial workers who were exposed to relatively large amounts of this chemical during their working careers. This chemical has also been shown to cause cancer in laboratory animals when the animals are exposed at high levels over their lifetimes. Chemicals that cause increased risk of cancer among exposed industrial workers and in laboratory animals also may increase the risk of cancer in humans who are exposed at lower levels over long periods of time. EPA has set the enforceable drinking water standard for vinyl chloride at 0.002 mg/L to reduce the risk of cancer or other adverse health effects which have been observed in humans and laboratory animals. Drinking water which

meets this standard is associated with little to none of this risk and should be considered safe.

5. Benzene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that benzene is a health concern at certain levels of exposure. This chemical is used as a solvent and degreaser of metals. It is also a major component of gasoline. Drinking water contamination generally results from leaking underground gasoline and petroleum tanks or improper waste disposal. This chemical has been associated with significantly increased risks of leukemia among certain industrial workers who were exposed to relatively large amounts of this chemical during their working careers. This chemical has also been shown to cause cancer in laboratory animals when the animals are exposed at high levels over their lifetimes. Chemicals that cause increased risk of cancer among exposed industrial workers and in laboratory animals also may increase the risk of cancer in humans who are exposed at lower levels over long periods of time. EPA has set the enforceable drinking water standard for benzene at 0.005 mg/L to reduce the risk of cancer or other adverse health effects which have been observed in humans and laboratory animals. Drinking water which meets this standard is associated with little to none of this risk and should be considered safe.

6. 1,1-Dichloroethylene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that 1,1-dichloroethylene is a health concern at certain levels of exposure. This chemical is used in industry and is found in drinking water as a result of the breakdown of related solvents. The solvents are used as cleaners and degreasers of metals and generally get into drinking water by improper waste disposal. This chemical has been shown to cause liver and kidney damage in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals which cause adverse health effects in laboratory animals also may cause adverse health effects in humans who are exposed at lower levels over long periods of time. EPA has set the enforceable drinking water standard for 1,1-dichloroethylene at 0.007 mg/L to reduce the risk of these adverse health effects which have been observed in laboratory animals. Drinking water which meets this standard is associated with little to none of this risk and should be considered safe.

7. Para-dichlorobenzene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that para-dichlorobenzene is a health concern at certain levels of exposure. This chemical is a component of deodorizers, moth balls, and pesticides. It generally gets into drinking water by improper waste disposal. This chemical has been shown to cause liver and kidney damage in laboratory animals such as rats and mice when the animals are exposed to high levels over their lifetimes. Chemicals which cause adverse effects in laboratory animals also may cause adverse health effects in humans who are exposed at lower levels over long periods of time. EPA has set the enforceable drinking water standard for para-dichlorobenzene at 0.075 mg/L to reduce the risk of these adverse health effects which have been observed in laboratory animals. Drinking water which meets this standard is associated with little to none of this risk and should be considered safe.

8. 1,1,1-Trichloroethane. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that the 1,1,1-trichloroethane is a health concern at certain levels of exposure. This chemical is used as a cleaner and degreaser of metals. It generally gets into drinking water by improper waste disposal. This chemical has been shown to damage the liver, nervous system, and circulatory system of laboratory animals such as rats and

mice when the animals are exposed at high levels over their lifetime. Some industrial workers who were exposed to relatively large amounts of this chemical during their working careers also suffered damage to the liver, nervous system, and circulatory system. Chemicals which cause adverse health effects among exposed industrial workers and in laboratory animals may also cause adverse health effects in humans who are exposed at lower levels over long periods of time. EPA has set the enforceable drinking water standard for 1,1,1-trichloroethane at 0.2 mg/L to protect against the risk of these adverse health effects which have been observed in humans and laboratory animals. Drinking water which meets this standard is associated with little to none of this risk and should be considered safe.

9. Copper (as required in 12VAC5-590-540 A 2, 4, and 5). The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that copper is a health concern at certain exposure levels. Copper, a reddish-brown metal, is often used to plumb residential and commercial structures that are connected to water distribution systems. Copper contaminating drinking water as a corrosion by-product occurs as the result of the corrosion of copper pipes that remain in contact with water for a prolonged period of time. Copper is an essential nutrient, but at high doses it has been shown to cause stomach and intestinal distress, liver and kidney damage, and anemia. Persons with Wilson's disease may be at a higher risk of health effects due to copper than the general public. The EPA's national primary drinking water regulation requires all public water systems to install optimal corrosion control to minimize copper contamination resulting from the corrosion of plumbing materials. Public water systems serving 50,000 people or fewer that have copper concentrations below 1.3 parts per million (ppm) in more than 90% of tap water samples (the EPA "action level") are not required to install or improve their treatment. Any water system that exceeds the action level must also monitor their source water to determine whether treatment to remove copper in source water is needed.

10. Lead (as required in 12VAC5-590-540 A 8). The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that lead is a health concern at certain levels of exposure. There is currently a standard of 0.050 mg/L. Based on new health information, EPA is likely to lower this standard significantly.

Part of the purpose of the lead notice (see 12VAC5-590-540 A 8) is to inform you of the potential adverse health effects of lead.

This is being done even though your water may not be in violation of the current standard. The EPA and others are concerned about lead in drinking water. Too much lead in the human body can cause serious damage to the brain, kidneys, nervous system, and red blood cells. The greatest risk, even with short term exposure, is to young children and pregnant women.

Lead levels in your drinking water are likely to be highest:

a. if your home or water system has lead pipes, or

b. if your home has copper pipes with lead solder, and

c. if the home is less than five years old and built before 1988, or

d. if you have soft or acidic water, or

e. if water sits in the pipes for several hours.

The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that lead is a health concern at certain exposure levels. Materials that contain lead have frequently been used in the construction of water supply distribution systems, and plumbing systems in private homes and other buildings. The most commonly found materials include service lines, pipes, brass and bronze fixtures, and solders and fluxes. Lead in these materials can contaminate drinking water as a result of the corrosion that takes place when water comes into contact with those materials. Lead can cause a variety of adverse health effects in humans. At relatively low levels of exposure, these effects may include interference with red blood cell chemistry, delays in normal physical and mental development in babies and young children, slight deficits in the attention span, hearing, and learning abilities of children, and slight increases in the blood pressure of some adults. EPA's national primary drinking water regulation requires all public water systems to optimize corrosion control to minimize lead contamination resulting from the corrosion of plumbing materials. Public water systems serving 50,000 people or fewer that have lead concentrations below 15 parts per billion (ppb) in more than 90% of tap water samples (the EPA "action level") have optimized their corrosion control treatment. Any water system that exceeds the action level must also monitor their source water to determine whether treatment to remove lead in source water is needed. Any water system that continues to exceed the action level after installation of corrosion control and/or source water treatment must eventually replace all lead service lines contributing in excess of 15 ppb of lead to drinking water. Any water system that exceeds the action level must also undertake a public education program to inform consumers of ways they can reduce their exposure to potentially high levels of lead in drinking water.

11. Mandatory Language for Total Coliform Violations. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that the presence of total coliforms is a possible health concern. Total coliforms are common in the environment and are generally not harmful themselves. The presence of these bacteria in drinking water, however, generally is a result of a problem with water treatment or the pipes which distribute the water, and indicates that the water may be contaminated with organisms that can cause disease. Disease symptoms may include diarrhea, cramps, nausea, and possibly jaundice and any associated headaches and fatigue. These symptoms, however, are not just associated with disease-causing organisms in drinking water, but also may be caused by a number of factors other than your drinking water. EPA has set an enforceable drinking water standard for total coliforms to reduce the risk of these adverse health effects. Under this standard, no more than 5.0% of the samples collected during a month can contain these bacteria, except that systems collecting fewer than 40 samples/month that have one total coliform positive sample per month are not violating the standard. Drinking water which meets this standard is usually not associated with a health risk from disease causing bacteria and should be considered safe.

12. Mandatory Language For Fecal Coliform/E. coli Violation. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that the presence of fecal coliforms or E. coli is a serious health concern. Fecal coliforms and E. coli are generally not harmful themselves, but their presence in drinking water is serious because they usually are associated with sewage or animal wastes. The presence of these bacteria in drinking water is generally a result of a problem with water treatment or the pipes which distribute the water, and

indicates that the water may be contaminated with organisms that can cause disease. Disease symptoms may include diarrhea, cramps, nausea, and possibly jaundice, and associated headaches and fatigue. These symptoms, however, are not just associated with disease causing organisms in drinking water, but also may be caused by a number of factors other than your drinking water. EPA has set an enforceable drinking water standard for fecal coliforms and E. coli to reduce the risk of these adverse health effects. Under this standard all drinking water samples must be free of these bacteria. Drinking water which meets this standard is associated with little or none of this risk and should be considered safe. The Virginia Department of Health recommends that consumers take the following precautions:

(To be inserted by the waterworks according to instructions from state or local authorities.)

13. Microbiological Contaminants (for use when there is a violation of the treatment technique requirements for filtration, ~~and~~ disinfection, and recycle flows in 12VAC5-590-420). The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that the presence of microbiological contaminants are a health concern at certain levels of exposure. If water is inadequately treated, microbiological contaminants in that water may cause disease. Disease symptoms may include diarrhea, cramps, nausea, and possibly jaundice, and any associated headaches and fatigue. These symptoms, however, are not just associated with disease-causing organisms in drinking water, but also may be caused by a number of factors other than your drinking water. EPA has set enforceable requirements for treating drinking water to reduce the risk of those adverse health effects. Treatment such as filtering and disinfecting the water removes or destroys microbiological contaminants. Drinking water which is treated to meet EPA requirements is associated with little to none of this risk and should be considered safe.

14. [Reserved].

15. Asbestos. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that asbestos fibers greater than 10 micrometers in length are a health concern at certain levels of exposure. Asbestos is a naturally occurring mineral. Most asbestos fibers in drinking water are less than 10 micrometers in length and occur in drinking water from natural sources and from corroded asbestos-cement pipes in the distribution system. The major uses of asbestos were in the production of cements, floor tiles, paper products, paint, and caulking; in transportation-related applications; and in the production of textiles and plastics. Asbestos was once a popular insulating and fire retardant material. Inhalation studies have shown that various forms of asbestos have produced lung tumors in laboratory animals. The available information on the risk of developing gastrointestinal tract cancer associated with the ingestion of asbestos from drinking water is limited. Ingestion of intermediate-range chrysotile asbestos fibers greater than 10 micrometers in length is associated with causing benign tumors in male rats. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for asbestos at 7 million long fibers per liter to reduce the potential risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to asbestos.

16. Barium. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that barium is a health concern at certain levels of exposure. This inorganic chemical occurs naturally in some aquifers that serve as sources of groundwater. It is also used in oil and gas drilling muds, automotive paints, bricks, tiles and jet fuels. It generally gets into drinking water after dissolving from naturally occurring minerals in the ground. This chemical may damage the heart and cardiovascular system, and is associated with high blood pressure in laboratory animals such as rats exposed to high levels during their lifetimes. In humans, EPA believes that effects from barium on blood pressure should not occur below 2 parts per million (ppm) in drinking water. EPA has set the drinking water standard for barium at 2 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to barium.

17. Cadmium. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that cadmium is a health concern at certain levels of exposure. Food and the smoking of tobacco are common sources of general exposure. This inorganic metal is a contaminant in the metals used to galvanize pipe. It generally gets into water by corrosion of galvanized pipes or by improper waste disposal. This chemical has been shown to damage the kidney in animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Some industrial workers who were exposed to relatively large amounts of this chemical during working careers also suffered damage to the kidney. EPA has set the drinking water standard for cadmium at 0.005 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to cadmium.

18. Chromium. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that chromium is a health concern at certain levels of exposure. This inorganic metal occurs naturally in the ground and is often used in the electroplating of metals. It generally gets into water from runoff from old mining operations and improper waste disposal from plating operations. This chemical has been shown to damage the kidney, nervous system, and the circulatory system of laboratory animals such as rats and mice when the animals are exposed at high levels. Some humans who were exposed to high levels of this chemical suffered liver and kidney damage, dermatitis and respiratory problems. EPA has set the drinking water standard for chromium at 0.1 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to chromium.

19. Mercury. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that mercury is a health concern at certain levels of exposure. This inorganic metal is used in electrical equipment and some water pumps. It usually gets into water as a result of improper waste disposal. This chemical has been shown to damage the kidney of laboratory animals such as rats when the animals are exposed at high levels over their lifetimes. EPA has set the drinking water standard for mercury at 0.002 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to mercury.

20. Nitrate. The United States Environmental Protection Agency (EPA) sets drinking water

standards and has determined that nitrate poses an acute health concern at certain levels of exposure. Nitrate is used in fertilizer and is found in sewage and wastes from human and/or farm animals and generally gets into drinking water from those activities. Excessive levels of nitrate in drinking water have caused serious illness and sometimes death in infants under six months of age. The serious illness in infants is caused because nitrate is converted to nitrite in the body. Nitrite interferes with the oxygen carrying capacity of the child's blood. This is an acute disease in that symptoms can develop rapidly in infants. In most cases, health deteriorates over a period of days. Symptoms include shortness of breath and blueness of the skin. Clearly, expert medical advice should be sought immediately if these symptoms occur. The purpose of this notice is to encourage parents and other responsible parties to provide infants with an alternate source of drinking water. Local and state health authorities are the best source for information concerning alternate sources of drinking water for infants. EPA has set the drinking water standard at 10 parts per million (ppm) for nitrate to protect against the risk of these adverse effects. EPA has also set a drinking water standard for nitrite at 1 ppm. To allow for the fact that the toxicity of nitrate and nitrite are additive, EPA has also established a standard for the sum of nitrate and nitrite at 10 ppm. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to nitrate.

21. Nitrite. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that nitrite poses an acute health concern at certain levels of exposure. This inorganic chemical is used in fertilizers and is found in sewage and wastes from humans and/or farm animals and generally gets into drinking water as a result of those activities. While excessive levels of nitrite in drinking water have not been observed, other sources of nitrite have caused serious illness and sometimes death in infants under six months of age. The serious illness in infants is caused because nitrite interferes with the oxygen carrying capacity of the child's blood. This is an acute disease in that symptoms can develop rapidly. However, in most cases, health deteriorates over a period of days. Symptoms include shortness of breath and blueness of the skin. Clearly, expert medical advice should be sought immediately if these symptoms occur. The purpose of this notice is to encourage parents and other responsible parties to provide infants with an alternate source of drinking water. Local and state health authorities are the best source for information concerning alternate sources of drinking water for infants. EPA has set the drinking water standard at 1 part per million (ppm) for nitrite to protect against the risk of these adverse effects. EPA has also set a drinking water standard for nitrate (converted to nitrite in humans) at 10 ppm and for the sum of nitrate and nitrite at 10 ppm. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to nitrite.

22. Selenium. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that selenium is a health concern at certain high levels of exposure. Selenium is also an essential nutrient at low levels of exposure. This inorganic chemical is found naturally in food and soils and is used in electronics, photocopy operations, the manufacture of glass, chemicals, drugs, and as a fungicide and a feed additive. In humans, exposure to high levels of selenium over a long period of time has resulted in a number of adverse health effects, including a loss of feeling and control in the arms and legs. EPA has set the drinking water standard for selenium at 0.05 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this

risk and is considered safe with respect to selenium.

23. Acrylamide. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that acrylamide is a health concern at certain levels of exposure. Polymers made from acrylamide are sometimes used to treat water supplies to remove particulate contaminants. Acrylamide has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. Sufficiently large doses of acrylamide are known to cause neurological injury. EPA has set the drinking water standard for acrylamide using a treatment technique to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. This treatment technique limits the amount of acrylamide in the polymer and the amount of the polymer which may be added to drinking water to remove particulates. Drinking water systems which comply with this treatment technique have little to no risk and are considered safe with respect to acrylamide.

24. Alachlor. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that alachlor is a health concern at certain levels of exposure. This organic chemical is a widely used pesticide. When soil and climatic conditions are favorable, alachlor may get into drinking water by runoff into surface water or by leaching into groundwater. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for alachlor at 0.002 parts per million (ppm) to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water that meets this standard is associated with little to none of this risk and is considered safe with respect to alachlor.

25. Reserved.

26. Reserved.

27. Reserved.

28. Atrazine. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that atrazine is a health concern at certain levels of exposure. This organic chemical is a herbicide. When soil and climatic conditions are favorable, atrazine may get into drinking water by runoff into surface water or by leaching into groundwater. This chemical has been shown to affect offspring of rats and the heart of dogs. EPA has set the drinking water standard for atrazine at 0.003 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to atrazine.

29. Carbofuran. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that carbofuran is a health concern at certain levels of exposure. This organic chemical is a pesticide. When soil and climatic conditions are favorable, carbofuran may get into drinking water by runoff into surface water or by leaching into groundwater. This chemical has been shown to damage the nervous and reproductive systems of laboratory animals

such as rats and mice exposed at high levels over their lifetimes. Some humans who were exposed to relatively large amounts of this chemical during their working careers also suffered damage to the nervous system. Effects on the nervous system are generally rapidly reversible. EPA has set the drinking water standard for carbofuran at 0.04 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to carbofuran.

30. Chlordane. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that chlordane is a health concern at certain levels of exposure. This organic chemical is a pesticide used to control termites. Chlordane is not very mobile in soils. It usually gets into drinking water after application near water supply intakes or wells. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for chlordane at 0.002 parts per million (ppm) to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to chlordane.

31. Dibromochloropropane (DBCP). The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that DBCP is a health concern at certain levels of exposure. This organic chemical was once a popular pesticide. When soil and climatic conditions are favorable, dibromochloropropane may get into drinking water by runoff into surface water or by leaching into groundwater. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for DBCP at 0.0002 parts per million (ppm) to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to DBCP.

32. o-Dichlorobenzene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that o-dichlorobenzene is a health concern at certain levels of exposure. This organic chemical is used as a solvent in the production of pesticides and dyes. It generally gets into water by improper waste disposal. This chemical has been shown to damage the liver, kidney and the blood cells of laboratory animals such as rats and mice exposed to high levels during their lifetimes. Some industrial workers who were exposed to relatively large amounts of this chemical during working careers also suffered damage to the liver, nervous system, and circulatory system. EPA has set the drinking water standard for o-dichlorobenzene at 0.6 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to o-dichlorobenzene.

33. cis-1,2-Dichloroethylene. The United States Environmental Protection Agency (EPA) establishes drinking water standards and has determined that cis-1,2-dichloroethylene is a health concern at certain levels of exposure. This organic chemical is used as a solvent and intermediate in chemical production. It generally gets into water by improper waste disposal. This chemical

has been shown to damage the liver, nervous system, and circulatory system of laboratory animals such as rats and mice when exposed at high levels over their lifetimes. Some humans who were exposed to relatively large amounts of this chemical also suffered damage to the nervous system. EPA has set the drinking water standard for cis-1,2-dichloroethylene at 0.07 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to cis-1,2-dichloroethylene.

34. trans-1,2-Dichloroethylene. The United States Environmental Protection Agency (EPA) establishes drinking water standards and has determined that trans-1,2-dichloroethylene is a health concern at certain levels of exposure. This organic chemical is used as a solvent and intermediate in chemical production. It generally gets into water by improper waste disposal. This chemical has been shown to damage the liver, nervous system, and the circulatory system of laboratory animals such as rats and mice when exposed at high levels over their lifetimes. Some humans who were exposed to relatively large amounts of this chemical also suffered damage to the nervous system. EPA has set the drinking water standard for trans-1,2-dichloroethylene at 0.1 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to trans-1,2-dichloroethylene.

35. 1,2-Dichloropropane. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that 1,2-dichloropropane is a health concern at certain levels of exposure. This organic chemical is used as a solvent and pesticide. When soil and climatic conditions are favorable, 1,2-dichloropropane may get into drinking water by runoff into surface water or by leaching into groundwater. It may also get into drinking water through improper waste disposal. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for 1,2-dichloropropane at 0.005 parts per million (ppm) to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to 1,2-dichloropropane.

36. 2,4-D. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that 2,4-D is a health concern at certain levels of exposure. This organic chemical is used as a herbicide and to control algae in reservoirs. When soil and climatic conditions are favorable, 2,4-D may get into drinking water by runoff into surface water or by leaching into groundwater. This chemical has been shown to damage the liver and kidney of laboratory animals such as rats exposed at high levels during their lifetimes. Some humans who were exposed to relatively large amounts of this chemical also suffered damage to the nervous system. EPA has set the drinking water standard for 2,4-D at 0.07 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to 2,4-D.

37. Epichlorohydrin. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that epichlorohydrin is a health concern at certain levels of

exposure. Polymers made from epichlorohydrin are sometimes used in the treatment of water supplies as a flocculent to remove particulates. Epichlorohydrin generally gets into drinking water by improper use of these polymers. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for epichlorohydrin using a treatment technique to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. This treatment technique limits the amount of epichlorohydrin in the polymer and the amount of the polymer which may be added to drinking water as a flocculent to remove particulates. Drinking water systems which comply with this treatment technique have little to no risk and are considered safe with respect to epichlorohydrin.

38. Ethylbenzene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined ethylbenzene is a health concern at certain levels of exposure. This organic chemical is a major component of gasoline. It generally gets into water by improper waste disposal or leaking gasoline tanks. This chemical has been shown to damage the kidney, liver, and nervous system of laboratory animals such as rats exposed to high levels during their lifetimes. EPA has set the drinking water standard for ethylbenzene at 0.7 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to ethylbenzene.

39. Ethylene dibromide (EDB). The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that EDB is a health concern at certain levels of exposure. This organic chemical was once a popular pesticide. When soil and climatic conditions are favorable, EDB may get into drinking water by runoff into surface water or by leaching into groundwater. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for EDB at 0.00005 parts per million (ppm) to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water that meets this standard is associated with little to none of this risk and is considered safe with respect to EDB.

40. Heptachlor. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that heptachlor is a health concern at certain levels of exposure. This organic chemical was once a popular pesticide. When soil and climatic conditions are favorable, heptachlor may get into drinking water by runoff into surface water or by leaching into groundwater. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standards for heptachlor at 0.0004 parts per million (ppm) to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water that meets this standard is associated with little to none of this risk and is considered safe with respect to heptachlor.

41. Heptachlor epoxide. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that heptachlor epoxide is a health concern at certain levels of exposure. This organic chemical was once a popular pesticide. When soil and climatic conditions are favorable, heptachlor epoxide may get into drinking water by runoff into surface water or by leaching into groundwater. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standards for heptachlor epoxide at 0.0002 parts per million (ppm) to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water that meets this standard is associated with little to none of this risk and is considered safe with respect to heptachlor epoxide.

42. Lindane. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that lindane is a health concern at certain levels of exposure. This organic chemical is used as a pesticide. When soil and climatic conditions are favorable, lindane may get into drinking water by runoff into surface water or by leaching into groundwater. This chemical has been shown to damage the liver, kidney, nervous system, and immune system of laboratory animals such as rats, mice and dogs exposed at high levels during their lifetimes. Some humans who were exposed to relatively large amounts of this chemical also suffered damage to the nervous system and circulatory system. EPA has established the drinking water standard for lindane at 0.0002 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to lindane.

43. Methoxychlor. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that methoxychlor is a health concern at certain levels of exposure. This organic chemical is used as a pesticide. When soil and climatic conditions are favorable, methoxychlor may get into drinking water by runoff into surface water or by leaching into groundwater. This chemical has been shown to damage the liver, kidney, nervous system, and reproductive system of laboratory animals such as rats exposed at high levels during their lifetimes. It has also been shown to produce growth retardation in rats. EPA has set the drinking water standard for methoxychlor at 0.04 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to methoxychlor.

44. Monochlorobenzene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that monochlorobenzene is a health concern at certain levels of exposure. This organic chemical is used as a solvent. It generally gets into water by improper waste disposal. This chemical has been shown to damage the liver, kidney and nervous system of laboratory animals such as rats and mice exposed to high levels during their lifetimes. EPA has set the drinking water standard for monochlorobenzene at 0.1 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to monochlorobenzene.

45. Polychlorinated biphenyls (PCBs). The United States Environmental Protection Agency

(EPA) sets drinking water standards and has determined that polychlorinated biphenyls (PCBs) are a health concern at certain levels of exposure. These organic chemicals were once widely used in electrical transformers and other industrial equipment. They generally get into drinking water by improper waste disposal or leaking electrical industrial equipment. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for PCBs at 0.0005 parts per million (ppm) to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water that meets this standard is associated with little to none of this risk and is considered safe with respect to PCBs.

46. Pentachlorophenol. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that pentachlorophenol is a health concern at certain levels of exposure. This organic chemical is used as a wood preservative, herbicide, disinfectant, and defoliant. It generally gets into drinking water by runoff into surface water or leaching into groundwater. This chemical has been shown to produce adverse reproductive effects and to damage the liver and kidneys of laboratory animals such as rats exposed to high levels during their lifetimes. Some humans who were exposed to relatively large amounts of this chemical also suffered damage to the liver and kidneys. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for pentachlorophenol at 0.001 parts per million (ppm) to protect against the risk of cancer or other adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to pentachlorophenol.

47. Styrene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that styrene is a health concern at certain levels of exposure. This organic chemical is commonly used to make plastics and is sometimes a component of resins used for drinking water treatment. Styrene may get into drinking water from improper waste disposal. This chemical has been shown to damage the liver and nervous system in laboratory animals when exposed at high levels during their lifetimes. EPA has set the drinking water standard for styrene at 0.1 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to styrene.

48. Tetrachloroethylene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that tetrachloroethylene is a health concern at certain levels of exposure. This organic chemical has been a popular solvent, particularly for dry cleaning. It generally gets into drinking water by improper waste disposal. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for tetrachloroethylene at 0.005 parts per million (ppm) to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water that meets this standard is associated with little to none of this risk and

is considered safe with respect to tetrachloroethylene.

49. Toluene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that toluene is a health concern at certain levels of exposure. This organic chemical is used as a solvent and in the manufacture of gasoline for airplanes. It generally gets into water by improper waste disposal or leaking underground storage tanks. This chemical has been shown to damage the kidney, nervous system, and circulatory system of laboratory animals such as rats and mice exposed to high levels during their lifetimes. Some industrial workers who were exposed to relatively large amounts of this chemical during working careers also suffered damage to the liver, kidney and nervous system. EPA has set the drinking water standard for toluene at 1 part per million (ppm) to protect against the risk of adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to toluene.

50. Toxaphene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that toxaphene is a health concern at certain levels of exposure. This organic chemical was once a pesticide widely used on cotton, corn, soybeans, pineapples and other crops. When soil and climatic conditions are favorable, toxaphene may get into drinking water by runoff into surface water or by leaching into groundwater. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for toxaphene at 0.003 parts per million (ppm) to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water that meets this standard is associated with little to none of this risk and is considered safe with respect to toxaphene.

51. 2,4,5-TP. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that 2,4,5-TP is a health concern at certain levels of exposure. This organic chemical is used as a herbicide. When soil and climatic conditions are favorable, 2,4,5-TP may get into drinking water by runoff into surface water or by leaching into groundwater. This chemical has been shown to damage the liver and kidney of laboratory animals such as rats and dogs exposed to high levels during their lifetimes. Some industrial workers who were exposed to relatively large amounts of this chemical during working careers also suffered damage to the nervous system. EPA has set the drinking water standard for 2,4,5-TP at 0.05 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to 2,4,5-TP.

52. Xylenes. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that xylene is a health concern at certain levels of exposure. This organic chemical is used in the manufacture of gasoline for airplanes and as a solvent for pesticides, and as a cleaner and degreaser of metals. It usually gets into water by improper waste disposal. This chemical has been shown to damage the liver, kidney and nervous system of laboratory animals such as rats and dogs exposed to high levels during their lifetimes. Some humans who were exposed to relatively large amounts of this chemical also suffered damage to the nervous system. EPA has set the drinking water standard for xylene at 10 parts per million

(ppm) to protect against the risk of these adverse health effects. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to xylene.

53. Antimony. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that antimony is a health concern at certain levels of exposure. This inorganic chemical occurs naturally in soils, groundwater and surface waters and is often used in the flame retardant industry. It is also used in ceramics, glass, batteries, fireworks and explosives. It may get into drinking water through natural weathering of rock, industrial production, municipal waste disposal or manufacturing processes. This chemical has been shown to decrease longevity, and altered blood levels of cholesterol and glucose in laboratory animals such as rats exposed to high levels during their lifetimes. EPA has set the drinking water standard for antimony at 0.006 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to antimony.

54. Beryllium. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that beryllium is a health concern at certain levels of exposure. This inorganic metal occurs naturally in soils, groundwater and surface waters and is often used in electrical equipment and electrical components. It generally gets into water from runoff from mining operations, discharge from processing plants and improper waste disposal. Beryllium compounds have been associated with damage to the bones and lungs and induction of cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. There is limited evidence to suggest that beryllium may pose a cancer risk via drinking water exposure. Therefore, EPA based the health assessment on noncancer effects with an extra uncertainty factor to account for possible carcinogenicity. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for beryllium at 0.004 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to beryllium.

55. Cyanide. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that cyanide is a health concern at certain levels of exposure. This inorganic chemical is used in electroplating, steel processing, plastics, synthetic fabrics and fertilizer products. It usually gets into water as a result of improper waste disposal. This chemical has been shown to damage the spleen, brain and liver of humans fatally poisoned with cyanide. EPA has set the drinking water standard for cyanide at 0.2 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to cyanide.

56. Nickel. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that nickel poses a health concern at certain levels of exposure. This inorganic metal occurs naturally in soils, groundwater and surface waters and is often used in electroplating, stainless steel and alloy products. It generally gets into water from mining and refining operations. This chemical has been shown to damage the heart and liver in laboratory

animals when the animals are exposed to high levels over their lifetimes. EPA has set the drinking water standard at 0.1 parts per million (ppm) for nickel to protect against the risk of these adverse effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to nickel.

57. Thallium. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that thallium is a health concern at certain high levels of exposure. This inorganic metal is found naturally in soils and is used in electronics, pharmaceuticals, and the manufacture of glass and alloys. This chemical has been shown to damage the kidney, liver, brain and intestines of laboratory animals when the animals are exposed at high levels over their lifetimes. EPA has set the drinking water standard for thallium at 0.002 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to thallium.

58. Benzo(a)pyrene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that benzo(a)pyrene is a health concern at certain levels of exposure. Cigarette smoke and charbroiled meats are common source of general exposure. The major source of benzo(a)pyrene in drinking water is the leaching from coal tar lining and sealants in water storage tanks. This chemical has been shown to cause cancer in animals such as rats and mice when the animals are exposed at high levels. EPA has set the drinking water standard for benzo(a)pyrene at 0.0002 parts per million (ppm) to protect against the risk of cancer. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to benzo(a)pyrene.

59. Dalapon. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that dalapon is a health concern at certain levels of exposure. This organic chemical is a widely used herbicide. It may get into drinking water after application to control grasses in crops, drainage ditches and along railroads. This chemical has been shown to cause damage to the kidney and liver in laboratory animals when the animals are exposed to high levels over their lifetimes. EPA has set the drinking water standard for dalapon at 0.2 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to dalapon.

60. Dichloromethane. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that dichloromethane (methylene chloride) is a health concern at certain levels of exposure. This organic chemical is a widely used solvent. It is used in the manufacture of paint remover, as a metal degreaser and as an aerosol propellant. It generally gets into drinking water after improper discharge of waste disposal. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for dichloromethane at 0.005 parts per million (ppm) to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water which meets this standard is associated with little to none of this risk and should be considered safe with respect to dichloromethane.

61. Di(2-ethylhexyl)adipate. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that di(2-ethylhexyl)adipate is a health concern at certain levels of exposure. Di(2-ethylhexyl)adipate is a widely used plasticizer in a variety of products, including synthetic rubber, food packaging materials and cosmetics. It may get into drinking water after improper waste disposal. This chemical has been shown to damage liver and testes in laboratory animals such as rats and mice exposed to high levels. EPA has set the drinking water standard for di(2-ethylhexyl)adipate at 0.4 parts per million (ppm) to protect against the risk of adverse health effects. Drinking water which meets the EPA standards is associated with little to none of this risk and should be considered safe with respect to di(2-ethylhexyl)adipate.

62. Di(2-ethylhexyl)phthalate. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that di(2-ethylhexyl)phthalate is a health concern at certain levels of exposure. Di(2-ethylhexyl)phthalate is a widely used plasticizer, which is primarily used in the production of polyvinyl chloride (PVC) resins. It may get into drinking water after improper waste disposal. This chemical has been shown to cause cancer in laboratory animals such as rats and mice exposed to high levels over their lifetimes. EPA has set the drinking water standard for di(2-ethylhexyl)phthalate at 0.006 parts per million (ppm) to reduce the risk of cancer or other adverse health effects which have been observed in laboratory animals. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to di(2-ethylhexyl)phthalate.

63. Dinoseb. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that dinoseb is a health concern at certain levels of exposure. Dinoseb is a widely used pesticide and generally gets into drinking water after application on orchards, vineyards and other crops. This chemical has been shown to damage the thyroid and reproductive organs in laboratory animals such as rats exposed to high levels. EPA has set the drinking water standard for dinoseb at 0.007 parts per million (ppm) to protect against the risk of adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to dinoseb.

64. Diquat. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that diquat is a health concern at certain levels of exposure. This organic chemical is a herbicide used to control terrestrial and aquatic weeds. It may get into drinking water by runoff into surface water. This chemical has been shown to damage the liver, kidney and gastrointestinal tract and causes cataract formation in laboratory animals such as dogs and rats exposed at high levels over their lifetimes. EPA has set the drinking water standard for diquat at 0.02 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to diquat.

65. Endothall. The United States Environmental Protection Agency (EPA) has determined that endothall is a health concern at certain levels of exposure. This organic chemical is a herbicide used to control terrestrial and aquatic weeds. It may get into water by runoff into surface water. This chemical has been shown to damage the liver, kidney, gastrointestinal tract and reproductive system of laboratory animals such as rats and mice exposed at high levels over their lifetimes. EPA has set the drinking water standard for endothall at 0.1 parts per million (ppm) to

protect against the risk of these adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to endothall.

66. Endrin. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that endrin is a health concern at certain levels of exposure. This organic chemical is a pesticide no longer registered for use in the United States. However, this chemical is persistent in treated soils and accumulates in sediments and aquatic and terrestrial biota. This chemical has been shown to cause damage to the liver, kidney and heart in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. EPA has set the drinking water standard for endrin at 0.002 parts per million (ppm) to protect against the risk of these adverse health effects which have been observed in laboratory animals. Drinking water that meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to endrin.

67. Glyphosate. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that glyphosate is a health concern at certain levels of exposure. This organic chemical is a herbicide used to control grasses and weeds. It may get into drinking water by runoff into surface water. This chemical has been shown to cause damage to the liver and kidneys in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. EPA has set the drinking water standard for glyphosate at 0.7 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to glyphosate.

68. Hexachlorobenzene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that hexachlorobenzene is a health concern at certain levels of exposure. This organic chemical is produced as an impurity in the manufacture of certain solvents and pesticides. This chemical has been shown to cause cancer in laboratory animals such rats and mice when the animals are exposed to high levels during their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for hexachlorobenzene at 0.001 parts per million (ppm) to protect against the risk of cancer and other adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to hexachlorobenzene.

69. Hexachlorocyclopentadiene. The United States Environmental Protection Agency (EPA) establishes drinking water standards and has determined that hexachlorocyclopentadiene is a health concern at certain levels of exposure. This organic chemical is used as an intermediate in the manufacture of pesticides and flame retardants. It may get into water by discharge from production facilities. This chemical has been shown to damage the kidney and the stomach of laboratory animals when exposed at high levels over their lifetimes. EPA has set the drinking water standard for hexachlorocyclopentadiene at 0.05 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to hexachlorocyclopentadiene.

70. Oxamyl. The United States Environmental Protection Agency (EPA) establishes drinking water standards and has determined that oxamyl is a health concern at certain levels of exposure. This organic chemical is used as a pesticide for the control of insects and other pests. It may get into drinking water by runoff into surface water or leaching into groundwater. This chemical has been shown to damage the kidneys of laboratory animals such as rats when exposed at high levels over their lifetimes. EPA has set the drinking water standard for oxamyl at 0.2 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to oxamyl.

71. Picloram. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that picloram is a health concern at certain levels of exposure. This organic chemical is used as a pesticide for broadleaf weed control. It may get into drinking water by runoff into surface water or leaching into groundwater as a result of pesticide application and improper waste disposal. This chemical has been shown to cause damage to the kidneys and liver in laboratory animals such as rats when the animals are exposed at high levels over their lifetimes. EPA has set the drinking water standard for picloram at 0.5 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to picloram.

72. Simazine. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that simazine is a health concern at certain levels of exposure. This organic chemical is a herbicide used to control annual grasses and broadleaf weeds. It may leach into groundwater or run off into surface water after application. This chemical may cause cancer in laboratory animals such as rats and mice exposed at high levels during their lifetimes. Chemicals that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. EPA has set the drink water standard for simazine at 0.004 parts per million (ppm) to reduce the risk of cancer or other adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to simazine.

73. 1,2,4-Trichlorobenzene. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that 1,2,4-trichlorobenzene is a health concern at certain levels of exposure. This organic chemical is used as a dye carrier and as a precursor in herbicide manufacture. It generally gets into drinking water by discharges from industrial activities. This chemical has been shown to cause damage to several organs, including the adrenal glands. EPA has set the drinking water standard for 1,2,4-trichlorobenzene at 0.07 parts per one million (ppm) to protect against the risk of these adverse health effects. Drinking water which meets the EPA standard is associated with little to none of this risk and should be considered safe with respect to 1,2,4-trichlorobenzene.

74. 1,1,2-Trichloroethane. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined 1,1,2-trichloroethane is a health concern at certain levels of exposure. This organic chemical is an intermediate in the production of 1,1-dichloroethylene. It generally gets into water by industrial discharge of wastes. This chemical has been shown to damage the kidney and liver of laboratory animals such as rats exposed to

high levels during their lifetimes. EPA has set the drinking water standard for 1,1,2-trichloroethane at 0.005 parts per million (ppm) to protect against the risk of these adverse health effects. Drinking water which meets the EPA standard is to associated with little to none of this risk and should be considered safe with respect to 1,1,2-trichloroethane.

75. 2,3,7,8-TCDD(Dioxin). The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that dioxin is a health concern at certain levels of exposure. This organic chemical is an impurity in the production of some pesticides. It may get into drinking water by industrial discharge of wastes. This chemical has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Chemicals that cause cancer in laboratory animals also may increase in the risk of cancer in humans who are exposed over long periods of time. EPA has set the drinking water standard for dioxin at 0.00000003 parts per million (ppm) to reduce the risk of cancer or other adverse health effects which have the been observed in laboratory animals. Drinking water which meets this standard is associated with little to none of this risk and should be considered safe with respect to dioxin.

76. Chlorine. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that chlorine is a health concern at certain levels of exposure. Chlorine is added to drinking water as a disinfectant to kill bacteria and other disease-causing microorganisms and is also added to provide continuous disinfection throughout the distribution system. Disinfection is required for surface water systems. However, at high doses for extended periods of time, chlorine has been shown to affect blood and the liver in laboratory animals. EPA has set a drinking water standard for chlorine to protect against the risk of these adverse effects. Drinking water that meets this EPA standard is associated with little to none of this risk and should be considered safe with respect to chlorine.

77. Chloramines. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that chloramines are a health concern at certain levels of exposure. Chloramines are added to drinking water as a disinfectant to kill bacteria and other disease-causing microorganisms and are also added to provide continuous disinfection throughout the distribution system. Disinfection is required for surface water systems. However, at high doses for extended periods of time, chloramines have been shown to affect blood and the liver in laboratory animals. EPA has set a drinking water standard for chloramines to protect against the risk of these adverse effects. Drinking water that meets this EPA standard is associated with little to none of this risk and should be considered safe with respect to chloramines.

78. Chlorine dioxide. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that chlorine dioxide is a health concern at certain levels of exposure. Chlorine dioxide is used in water treatment to kill bacteria and other disease-causing microorganisms and can be used to control tastes and odors. Disinfection is required for surface water systems. However, at high doses, chlorine dioxide-treated drinking water has been shown to affect blood in laboratory animals. Also, high levels of chlorine dioxide given to laboratory animals in drinking water have been shown to cause neurological effects on the developing nervous system. These neurodevelopmental effects may occur as a result of a short-term excessive chlorine dioxide exposure. To protect against such potentially harmful exposures, EPA requires chlorine dioxide monitoring at the treatment plant, where disinfection occurs, and at

representative points in the distribution system serving water users. EPA has set a drinking water standard for chlorine dioxide to protect against the risk of these adverse effects.

Note: In addition to the language in this introductory text of paragraph 78, waterworks must include either the language in paragraph 78 i or 78 ii of this appendix. Waterworks with a violation at the treatment plant, but not in the distribution system, are required to use the language in paragraph 78 i of this appendix and treat the violation as a nonacute violation. Waterworks with a violation in the distribution system are required to use the language in paragraph 78. ii. of this appendix and treat the violation as an acute violation.

i. The chlorine dioxide violations reported today are the result of exceedances at the treatment facility only, and do not include violations within the distribution system serving users of this water supply. Continued compliance with chlorine dioxide levels within the distribution system minimizes the potential risk of these violations to present consumers.

ii. The chlorine dioxide violations reported today include exceedances of the EPA standard within the distribution system serving water users. Violations of the chlorine dioxide standard within the distribution system may harm human health based on short-term exposures. Certain groups, including pregnant women, infants, and young children, may be especially susceptible to adverse effects of excessive exposure to chlorine dioxide-treated water. The purpose of this notice is to advise that such persons should consider reducing their risk of adverse effects from these chlorine dioxide violations by seeking alternate sources of water for human consumption until such exceedances are rectified. Local and state health authorities are the best sources for information concerning alternate drinking water.

79. Disinfection byproducts and treatment technique for DBPs. The United States Environmental Protection Agency (EPA) sets drinking water standards and requires the disinfection of drinking water. However, when used in the treatment of drinking water, disinfectants react with naturally occurring organic and inorganic matter present in water to form chemicals called disinfection byproducts (DBPs). EPA has determined that a number of DBPs are a health concern at certain levels of exposure. Certain DBPs, including some trihalomethanes (THMs) and some haloacetic acids (HAAs), have been shown to cause cancer in laboratory animals. Other DBPs have been shown to affect the liver and the nervous system, and cause reproductive or developmental effects in laboratory animals. Exposure to certain DBPs may produce similar effects in people. EPA has set standards to limit exposure to THMs, HAAs, and other DBPs.

80. Bromate. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that bromate is a health concern at certain levels of exposure. Bromate is formed as a byproduct of ozone disinfection of drinking water. Ozone reacts with naturally occurring bromide in the water to form bromate. Bromate has been shown to produce cancer in rats. EPA has set a drinking water standard to limit exposure to bromate.

81. Chlorite. The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that chlorite is a health concern at certain levels of exposure. Chlorite is formed from the breakdown of chlorine dioxide, a drinking water disinfectant. Chlorite in drinking water has been shown to affect blood and the developing nervous system. EPA has set a drinking water standard for chlorite to protect against these effects. Drinking water that meets this standard is associated with little to none of these risks and should be considered

safe with respect to chlorite.

APPENDIX G. MONITORING AND REPORTING.

Analytical laboratory control testing, monitoring, and analyses at waterworks are made to control plant operation, to record plant performance, and to monitor conditions in the distribution system. Test results properly recorded, compiled and reported can be invaluable in improving plant performance, efficiency and cost effectiveness. Operational control testing should present evidence that the water has been properly prepared for each step in the treatment process. Testing should provide evidence that each process has proceeded according to its intended purpose and that finished water is clean, free from taste and odor, free from undesirable chemicals and considered safe.

Analytical equipment used to determine compliance with 12VAC5-590-510 D shall be of the laboratory type (continuous monitoring equipment may be acceptable if demonstrated to be accurate by correlation with a laboratory type instrument each shift) approved for use at the waterworks per 12VAC5-590-760.

These suggested monitoring and reporting requirements should be used as a guide in preparing, modifying, and reviewing operation monthly reports.

The field office of the Office of Water Programs will notify in writing each individual waterworks of the operation monthly report requirements and supply the waterworks with a standard example report form or will assist in the development of system specific report forms.

The following are suggested operation monthly report requirements ~~which~~ that should be reported to the appropriate field office:

ALL SURFACE WATER SYSTEMS:

Number of hours in operation

- hours per day in operation

Raw water treated

- gpd and monthly total at each entry point

Finished water produced

- gpd and monthly total

Finished water used for treatment process

- monthly total

Finished water delivered to consumers

- monthly total

accountability (water lost) in distribution system

- percentage

Raw water temperature

- average °C or °F

Number of connections

- monthly average

Population served

- monthly average

Treatment plant maintenance activities

- brief summary of major activities

Chemical feeder laboratory and instrument calibration as appropriate

- quarterly for each chemical feeder or instrument unless specified elsewhere, i.e., fluoride feeders or manufacturer recommended

Waterworks not requiring operators in attendance whenever the plant is in operation may reduce some of the daily requirements.

WATERWORKS THAT PROVIDE DISINFECTION BY CHLORINATION:

Water plant monitoring:

Chlorine compound used

- liquid, dry, calcium hypochlorite or sodium hypochlorite

Amount of chlorine compound used at each application point

daily gallons or pounds

Date chlorine compound replenished

- for each application point

Free chlorine residual testing after the chlorine contact period

- every two hours of plant operation for waterworks requiring operators in attendance whenever the plant is in operation (see 12VAC5-590-440 B). Records must be kept of each residual determination. The daily lowest/highest residuals measured and the number of measurements taken should be reported.

- once per day for waterworks providing treatment or only disinfection and serving 400 or more persons and not requiring operators in attendance whenever the plant is in operation.

- frequency for waterworks providing only disinfection and serving less than 400 persons shall be set by the division on an individual basis.

- daily or at the same time as chlorine residual testing if less than daily.

Distribution system monitoring:

Free chlorine testing

- seven days per week for waterworks serving 400 or more persons

- five days per week for waterworks serving less than 400 persons

- number of tests per test day and test locations shall be set by the division on an individual basis. Records must be kept of each residual determination. The lowest, highest and average residuals measured and the number of measurements taken should be reported.

Total chlorine residual testing

- once per week at locations reflecting the maximum residence time of the water in the system

- number of tests per test day and test locations shall be set by the division on an individual basis. Records must be kept of each residual determination. The average residual measured and the number of measurements should be reported.

pH

- daily or at the same time of chlorine residual testing if less than daily.

NOTE: If the system performs disinfection utilizing the combined chlorine residual process, total residual testing should be substituted for free residual testing.

WATERWORKS EMPLOYING TURBIDITY REMOVAL:

Raw water monitoring:

pH

- electrometrically, every two hours

Alkalinity

- total, once per shift

Hardness

- total, once per shift

Turbidity

- NTU, every two hours

Raw water chemical treatment:

Coagulant

- type, weight applied, dosage

Coagulant aids

- type, weight applied, dosage

Stabilizing chemicals

- type, weight applied, dosage

Taste and odor control chemicals

- type, weight applied, dosage

Treated water (postflash mix) monitoring:

pH

- electrometrically, twice per shift

Coagulation control

- set on an individual basis

Alkalinity

- total, once per shift

Settled water (applied water) monitoring:

Turbidity

- NTU, must be from each sedimentation basin for high rate, may be from top of filter for rapid rate, every two hours

Chlorine residual

- type and daily average, every two hours

Settled water (applied water) chemical treatment:

Chemical

- type, weight applied and dosage

Filter aids

- type, weight applied and dosage

Filtered water monitoring:

Turbidity

- NTU, from each filter, every two hours, report maximum for the day

Filter operation:

Filters in operation

- number

Filter run time

- number hours between backwashes

Head loss

- each filter, end of each day or prior to backwash

Backwash time

- average, minutes

Backwash rate

- maximum, gpm

Backwash water

- gallons used

Rewash time

- if provided, average, minutes

Filter drop test results

- each filter tested quarterly

Filter rise rate test results

- each filter tested semiannually

Filtered water chemical treatment:

Stabilizing chemical

- type, weight applied per day, average dosage

Finished water monitoring:

pH

- electrometrically, every two hours

Alkalinity

- total, once per shift

Hardness

- total and calcium, once per shift

Turbidity

- NTU, every two hours

Chlorine residual

- every two hours low/high average

NOTES:

1. Daily averages and highest daily reading of the results of the required number of tests or measurements should be reported except for filtered water turbidity. Records of each test should be kept.

2. Frequency of testing is on a per shift basis unless otherwise indicated.

3. Number of tests per shift shall be set by the division on an individual basis.

4. Exact location of sample collection or testing shall be set by the division on an individual basis.

5. Where multiple sources are available, raw water data must be reported for each source.

WATERWORKS PRACTICING RECYCLE

Recycle flow monitoring:

- total flows recycled, gallons

- average and maximum return rate of combined recycle flows

WATERWORKS FLUORIDATING:

Type of compound used

- chemical name

Amount of compound used at each application point

- pounds, daily

Feeder calibration date

- monthly

Hardness of water applied to sodium fluoride saturate feeders (where softners is required)

- weekly

Fluoride ion concentration in finished water

- one test per shift, minimum of one daily (monthly split sample with DCLS)

Fluoride ion concentration in the distribution system where two or more entry points contain fluoride

- frequency and location of tests shall be set by the division on an individual basis, both the minimum and maximum values must be reported

WATERWORKS EMPLOYING SOFTENING:

Lime, excess lime, and excess lime-soda processes:

- type, frequency and location of tests shall be set by the division on an individual basis

Cation exchange process:

Ion exchange material

- type, trade name

Regeneration

- date and method, each unit

Backwashing

- date and duration of washing, each unit

Softener influent hardness

- daily, each source

Softener effluent hardness

- daily, each unit

Blended water hardness

- daily, where appropriate

Stabilization chemical

- type, weight, applied daily dosage, stablized pH, alkalinity, hardness

WATERWORKS EMPLOYING IRON AND MANGANESE CONTROL:

Removal by oxidation using continuous potassium permanganate regeneration, detention, and filtration:

Raw water iron and manganese concentrations

- daily, each source

Pre-oxidation chemical (usually chlorine prior to application of permanganate)

- type, amount applied daily at each source and average dosage

Iron and manganese concentration prior to application of permanganate

- daily

Potassium permanganate

- amount applied daily and average dosage

Filter influent iron and manganese concentrations

- daily, each filter

Filter effluent iron and manganese concentrations

- daily, each filter

Removal by ion exchange:

Ion exchange material

- type, trade name

Regeneration

- date, each unit and method

Backwashing

- date and duration of washing each unit

Raw water iron and manganese concentrations

- daily, each source

Exchange unit iron and manganese influent concentrations

- daily, each unit

Exchange unit iron and manganese effluent concentrations

- daily, each unit

NOTES:

1. Ion exchange process may also remove barium and radium which should be included or

substituted in reporting.

2. Testing for other removal processes will be set by the division on an individual basis.

WATERWORKS EMPLOYING STABILIZATION BY:

The addition of carbon dioxide or acid to waters treated with excess lime for softening or manganese removal;

The addition of an alkali to reduce free carbon dioxide;

The addition of either soda ash or caustic soda to produce the desired calcium carbonate film where the alkalinity exceeds 35 mg/L;

The addition of lime to produce the desired calcium carbonate film where the water is soft;

The addition of a mixture of lime and soda ash to produce the desired calcium carbonate film where the water is soft and has a low carbon dioxide content;

The addition of polyphosphates for sequestering dissolved minerals.

Each chemical addition process should be monitored to determine the effectiveness of stabilization treatment and concentration of chemicals in the treated water. The type, frequency, and location of tests shall be set by the division on an individual basis.

WATERWORKS EMPLOYING TASTE AND ODOR CONTROL BY:

The addition of copper sulfate or other copper compounds to the reservoir;

The addition of activated carbon to the shallow areas of the reservoir;

The addition of potassium permanganate, chlorine, chlorine dioxide, or oxygen through aeration to the raw water;

The addition of powdered activated carbon to the treatment process at various locations; or

The use of granular activated carbon absorption units.

Each process should be monitored to ensure the threshold odor number does not exceed three. The dosage or application rates should be monitored to ensure correct control. The type, frequency, and location of tests and the reporting of usage shall be set by the division on an individual basis.

WATERWORKS EMPLOYING COLOR REMOVAL:

WATERWORKS EMPLOYING COLOR REMOVAL:

Raw water color -	platinum - cobalt method
Settled water color -	platinum - cobalt method
Finished water color -	platinum - cobalt method

Monitoring, reporting, and frequencies shall be set by the division on an individual basis.

CONSECUTIVE WATERWORKS:

Finished water purchased

- gallons per month per source

Finished water delivered to consumers

- gallons per month

Accountability

- percentage

Number of connections

- monthly average

Population served

- monthly average

Free chlorine residual testing in the distribution system

- same as for waterworks that provide disinfection by chlorination

Total chlorine residual testing in the distribution system

- same as for waterworks that provide disinfection by chlorination