



**Public Water Supply
Survival Guide
for the
Long Term 1
Enhanced Surface Water Treatment Rule**

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An “Acronyms and Definitions” list is provided as an aid to using this guide.

Section 1 provides a summary of the Long Term 1 Enhanced Surface Water Treatment Rule 1 and a timetable for compliance. Each requirement listed in the timetable is cross-referenced to the applicable state and federal rules, the applicable sections of this document, and the applicable references to EPA guidance manuals.

Section 2 describes the disinfection profiling requirements designed to make the water system operator aware of disinfection effectiveness on a weekly basis throughout the year, and describes monitoring Giardia inactivation periods which will serve as a benchmark when considering future changes in disinfection practices. This section provides procedures for avoiding disinfection profiling, developing a disinfection profile, and calculating a disinfection benchmark, as well as reporting and recordkeeping by the system.

Section 3 outlines the enhanced standards for conventional and direct filtration established under the Surface Water Treatment Rule, the turbidity monitoring applications for systems utilizing either individual or combined filters, and the applicable reporting and recordkeeping requirements for systems regarding effluent turbidity filter monitoring.

Section 4 explains KDHE’s policies and procedures that will be used in meeting the reporting and recordkeeping requirements, and special primacy requirements, which will be observed by KDHE in implementing the Long Term 1 Enhanced Surface Water Treatment Rule. This section discusses specifics such as sanitary surveys, the composite correction program, evaluation of alternative data for profiling purposes, determination of virus inactivation, changes in disinfection practices, and approvals of alternative technologies.

OVERVIEW

This guidance document is provided by the State of Kansas as a “quick reference guide” to assist Public Water Supply Systems in complying with the Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) requirements contained in the Kansas Primary Drinking Water Regulations. It presents a summary of the applicable regulatory requirements associated with the LT1ESWTR promulgated by the Environmental Protection Agency (EPA) on January 14, 2002 which has been primarily adopted by the Kansas Department of Health and Environment (KDHE). This guidance provides a summary of the applicable requirements and the dates by which the requirements must be met. It is a basic “what and when” summary for all public water systems. While all systems should feel comfortable using this document as a complete and accurate summary of LT1ESWTR requirements, the applicable full legal language is contained in the Kansas Administrative Regulations in conjunction with the Code of Federal Regulation which KDHE has adopted by reference.

This survival guide applies to:

Systems: CWSs, NTNCWSs, TNCWSs

Sources: Surface Water and Groundwater Under the Direct Influence of Surface Water

Persons Served: Less than 10,000

Treatment: All treatments

Specific questions regarding the information contained in this document, the Kansas Primary Drinking Water Regulations, or any other matters pertaining to drinking water and public water supply systems in Kansas should be directed to

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Additional information and e-mail addresses can be obtained by accessing KDHE’s web site at:

www.kdheks.gov

With the exception of the KDHE policies described in Section 4, reference is made to EPA guidance documents for specific details. Full citations to EPA manuals are given at the end of this “Survival Guide”, along with shortened names by which these publications are identified whenever they are cited in this document. KDHE staff, public water supply system officials, and other interested parties can refer to these documents when examining the specific details of the Long Term 1 Enhanced Surface Water Treatment Rule. A handy EPA Quick Reference Guide on the Long Term 1 Enhanced Surface Water Treatment Rule is also provided at the end of this survival guide.

ACRONYMS

ACC - Alternative Compliance Criteria

BAT - Best Available Technology

KDHE - Kansas Department of Health and Environment

CCP – Composite Correction Program

CFR - Code of Federal Regulations

CWS - Community Water System

D/DBP - Disinfectants and disinfection byproducts

D/DBPR - Disinfectants and Disinfection Byproducts Rule

DBPs - Disinfection Byproducts

DBPP - Disinfection Byproducts Precursor

DOC - Dissolved Organic Carbon

EPA - United States Environmental Protection Agency

GAC10 - Granular activated carbon adsorption with a 10 minute empty bed contact time

GWUDI - Ground Water Under the Direct Influence of Surface Water

HAA5 - Sum of five haloacetic acids (monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, dibromoacetic acid)

LT1ESWTR (LT1) – Long Term 1 Enhanced Surface Water Treatment Rule

MCL - Maximum Contaminant Level

MCLG - Maximum Contaminant Level Goal

MDBP – Microbial and Disinfection Byproduct

mg/L - Milligrams per liter

MRDL - Maximum Residual Disinfectant Level (as mg/L)

MRDLG - Maximum Residual Disinfectant Level Goal

NCWS - Non-Community Water System

NTNCWS - Non-Transient Non-Community Water System

PWS - Public Water System

SDWA - Safe Drinking Water Act

SOP - Standard Operating Procedure

SUVA - Specific Ultraviolet Absorbance

TNCWS - Transient Non-Community Water System

TOC - Total Organic Carbon

TTHMs - Total trihalomethanes (Sum of chloroform, bromoform, chlorodibromomethane, and bromodichloromethane)

DEFINITIONS

KDHE: The Kansas Department of Health and Environment is Kansas' primacy agency for the administration of the Safe Drinking Water Act. When the term "the State" is used in this survival guide, it refers to this agency.

EPA: The United States Environmental Protection Agency has federal oversight responsibility and authority regarding the administration and enforcement of the Safe Drinking Water Act. EPA prepares rules and technical / implementation guidance to implement the Safe Drinking Water Act through other agencies with primacy authority such as KDHE.

CCP: A Composite Correction Program is a structured approach to analyzing the performance of filtration and disinfection facilities. This activity is commonly carried out by a water system in cooperation with a third party consultant. The LT1 EHSWTR requires water systems to undergo a CCP evaluation under specific circumstances, as described in Section 3 of this guidance. See Appendix A for a more detailed definition about CCPs and Sanitary Surveys.

GWUDI: Systems utilizing "groundwater under the direct influence of surface water" (as previously determined by KDHE) are required to treat water from these sources as specified under the Surface Water Treatment Rule.

IESWTR: The Interim Enhanced Surface Water Treatment Rule, promulgated by EPA on December 16, 1998, is a companion rule to the Stage 1 Disinfection and Disinfection Byproducts Rule and a precursor to the Long Term 1 Enhanced Surface Water Treatment Rule. The IESWTR established enhanced requirements for filtration of surface and GWUDI sources. These two rules have interrelated provisions; actions initiated under one rule have the potential to effect compliance under the companion rule.

M/DBP Rules: The term "M/DBP Rules" stands for "Microbial / Disinfection Byproduct Rules" and refers to the TCR, SWTR, IESWTR, LT1ESWTR, LT2ESWTR, Stage 1 DDBPR, Stage 2 DDBPR, FBRR, and GWR collectively.

Stage 1 DDBP Rule: The Stage 1 Disinfectants and Disinfection Byproducts Rule, promulgated by EPA on December 16, 1998, is a companion rule to the Interim Enhanced Surface Water Treatment Rule. The Stage 1 DDBP Rule established enhanced requirements on the monitoring and treatment of disinfectants and disinfection residuals in system distribution systems. These two rules have interrelated provisions; actions initiated under one rule have the potential to effect compliance under the companion rule.

SWTR: The Surface Water Treatment Rule, promulgated by EPA on June 29, 1989, was the precursor to enhanced requirements established under the Interim Enhanced Surface Water Treatment Rule and the Stage 1 Disinfectants and Disinfection Byproducts Rule. It established filtration and disinfection requirements that provide for continuous protection from pathological microbes potentially present in source waters.

TCR: The Total Coliform Rule, promulgated by EPA on June 29, 1989, was a precursor to enhanced requirements established under the Interim Enhanced Surface Water Treatment Rule and the Stage 1 Disinfectants and Disinfection Byproducts Rule. The TCR established health goals and legal limits for total coliform levels in drinking water (as indicator organisms), requires the conduct of routine sanitary surveys of systems, and specifies the type and frequency of testing which systems must perform.

1. Summary and Compliance Timetable

1. A. Water Systems Affected by this Rule

The Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) imposes more stringent treatment requirements on systems that use surface water or ground water under the direct influence of surface water and serve less than 10,000 persons. The requirements are quite similar to those that were applied to larger systems by the 1998 Interim Enhanced Surface Water Treatment Rule (IESWTR). This guidance follows the same format as KDHE's guidance for the IESWTR.

1. B. General Requirements

The Long Term 1 Enhanced Surface Water Treatment Rule contains the following major provisions:

1. The definition of ground water under the direct influence of surface water (GWUDI) is modified to include *Cryptosporidium*.
2. All systems affected by the rule are required to achieve 2-log removal of *Cryptosporidium*. It is assumed that this requirement is being met when the system maintains compliance with the turbidity standards established by the rule.
3. For conventional or direct filtration systems, combined effluent turbidity standards are modified from those established in the Surface Water Treatment Rule. Turbidity must be less than 0.3 NTU in 95% of the measurements taken in a month and the turbidity level may not exceed 1 NTU.
4. Systems using conventional or direct filtration must conduct continuous turbidity monitoring (every fifteen minutes) for each individual filter. Systems that have only two filters may monitor combined effluent turbidity instead of individual filter turbidity.
5. If a system exceeds specified levels in individual filter turbidity, a series of follow-up actions are required.
6. Systems must prepare a disinfection profile (a graphical representation of *Giardia* inactivation measured weekly for a one year period) unless the system is excused from this requirement based on data showing disinfection byproduct levels that are less than 80% of the maximum contaminant level established in the Stage 1 DDBP Rule.
7. Systems that are required to prepare a disinfection profile and later decide to make a significant change in their disinfection practices must calculate a benchmark of disinfection effectiveness and receive KDHE approval prior to making the change.

1. C. Timetable for the LT1ESWTR

Date	Rule Requirement	References
Summer 2002	Systems that wish to be excused from the disinfection profiling requirement should collect TTHM and HAA5 samples during warmest water temperature a point of maximum residence time in the distribution system.	K.A.R. 28-15a-531 40 CFR 141.531 KDHE Survival Guide Sect. 2
July 1, 2003	Systems serving 500-9999 people must begin to develop a disinfection profile unless excused from this requirement by KDHE.	K.A.R. 28-15a-532 40 CFR 141.532(a) [531 to 536] KDHE Survival Guide Sect. 2 EPA Profiling / Benchmark. Man.
January 1, 2004	Systems serving fewer than 500 people must begin to develop a disinfection profile unless excused from this requirement by KDHE.	K.A.R. 28-15a-532 40 CFR 141.532(a) [531 to 536] KDHE Survival Guide Sect. 2 EPA Profiling / Benchmark. Man.
January 1, 2005	Systems must provide 2-log Crypto removal. Systems must meet new combined effluent turbidity limits. Systems must meet new individual filter turbidity monitoring requirements.	K.A.R. 28-15a-500 to 571 40 CFR 141.500-571 KDHE Survival Guide Sect. 3 EPA Turbidity Guidance Manual

2. Disinfection Profiling and Benchmarking

2. A. Introduction

The Stage 1 Disinfectants and Disinfection Byproducts Rule establishes limits on the concentration of total trihalomethanes and haloacetic acids in finished drinking water. Some surface water systems may find it necessary or desirable to change disinfection practices in order to minimize the occurrence of these substances. The Disinfection Profiling requirement of the LT1 rule is designed to make the water system operator aware of disinfection effectiveness on a weekly basis throughout the year. The period of lowest *Giardia* inactivation will serve as a benchmark when considering future changes in disinfection practices.

2. B. Summary of Requirements

Profiling and benchmarking is a three-step process. A brief description is provided here.

Step 1 — determining if a system must develop a profile. Systems that wish to be excused from the disinfection profiling requirement must submit trihalomethane and haloacetic acid sample data to KDHE which demonstrates that levels of these substances are less than 80% of the MCLs established in the Stage 1 DDBP Rule. The system must take these samples at the time of warmest water temperatures and at the point of longest residence time in the distribution system. Data collected at this time and in this manner after January 1, 1998 may be submitted. These samples are intended to provide a snapshot of disinfection byproduct concentrations in the distribution system under worst case conditions. This one-time sampling event is strictly for the purpose of determining whether or not a system may be excused from disinfection profiling and is not a part of the monitoring requirements of the Stage 1 DBP rule.

Water systems that serve more than 500 persons must take these samples during the summer or early fall of 2002. If the system chooses to not take these samples, or if the samples

are taken and results exceed 80% of the MCL for either class of compounds, disinfection profiling must begin by July 1, 2003.

Systems serving fewer than 500 persons have two seasons to collect disinfection byproduct samples, since the deadline for beginning disinfection profiling for systems of this size is January 1, 2004. It is recommended that systems take the samples as soon as possible so that technical assistance can be provided if disinfection profiling is required.

Step 2 — developing the profile. Systems that determine they must profile are required to begin 1) by July 1, 2003 for systems serving more than 500 persons; or 2) by January 1, 2004 for systems serving fewer than 500 persons. The profile must characterize inactivation through the entire treatment process. Once per week on the same calendar day, for twelve consecutive months, the system must monitor the following parameters:

- a. Temperature of the disinfected water at each residual disinfectant concentration sampling point during peak hourly flow.
- b. If chlorine disinfection is used, the pH of the disinfected water at each residual disinfection concentration sampling point at peak hourly flow.
- c. The disinfectant contact time(s) of the water before or at the first customer and prior to each additional point of disinfection during peak hourly flow.

Inactivation is then calculated by the “Concentration x Time” (CT) method used for the Surface Water Treatment Rule. Surface water systems are already familiar with this methodology. A table describing the calculations used to determine *Giardia* inactivation is provided in 40 CFR 141.534. Weekly *Giardia* inactivation values are plotted graphically so that the system has a year-long profile of disinfection performance.

Step 3 — calculating a disinfection benchmark and consulting with KDHE. If a water system decides in the future to make a significant change in its disinfection practices, it must calculate a benchmark and consult with KDHE. The system determines the average *G. lamblia* inactivation for each calendar month that data were profiled (one year minimum). This value is calculated by dividing the sum of weekly log inactivation by the number of values calculated for that month. The disinfection benchmark is the lowest average monthly inactivation for systems with one year of data. When consulting with KDHE, the system must submit its benchmark information, describe proposed changes to disinfection practices, and provide an analysis of how the changes in disinfection practice will affect current levels of disinfection effectiveness.

2. C. Reporting and Recordkeeping

The system must report results of trihalomethane and haloacetic acid sampling mentioned in Step 1 to KDHE as soon as possible after sampling takes place. If a system is required to profile, it must maintain a record of the completed profile in graphical or other acceptable format and make it available for examination by DEQ during regularly scheduled sanitary surveys.

3. Turbidity Requirements

3. A. Combined Effluent Turbidity

The LT1ESWTR tightens the turbidity standards established for conventional and direct filtration under the Surface Water Treatment Rule. **It is assumed that the requirement to achieve 2 log (99%) removal of Cryptosporidium is being met when these turbidity standards are maintained.** The following table compares the turbidity performance standards under the two rules:

Requirement	SWTR	LT1 ESWTR
Combined effluent turbidity measured every four hours must not exceed in 95% of monthly measurements...	0.5 NTU	0.3 NTU
Combined effluent turbidity must never exceed...	5 NTU	1 NTU

3. B. Individual Filter Turbidity Monitoring

The LT1ESWTR requires systems using conventional or direct filtration to monitor individual filters continuously (at least every fifteen minutes). If a system has only two filters, combined filter effluent may be measured in lieu of individual filters. However, the purpose of this requirement is to monitor the performance of individual filters and to detect variations in turbidity that might be masked if only combined effluent turbidity is measured. For this reason, it is recommended that all systems monitor individual filter turbidity. **This monitoring is not considered part of the treatment technique requirements of this rule.**

1. If the turbidity of an individual filter (or the turbidity of combined filter effluent [CFE] for systems with only two filters that elect to monitor CFE in lieu of individual filters) exceeds 1.0 NTU in two consecutive recordings fifteen minutes apart, the system must:

Report to the KDHE by the 10th of the following month and include the filter number(s), corresponding date(s), turbidity value(s) which exceeded 1.0 NTU, and the cause (if known) for the exceedance(s).

2. The following table describes responses the system must undertake if certain turbidity excursions occur. These actions are designed to diagnose the reasons for poor filter performance and suggest remedies that will help to prevent pathogen breakthrough. Definitions of comprehensive performance evaluation and comprehensive technical assistance are included in Appendix A of this guidance.

If a system was required to report to KDHE...	The system must...
For three months in a row and turbidity exceeded 1.0 NTU in two consecutive recordings 15 minutes apart at the same filter (or CFE for systems with only two filters that monitor CFE in lieu of individual filters)	Conduct a self-assessment of the filter(s) within 14 days of the day the filter exceeded 1.0 NTU in two consecutive measurements for the third straight month unless a comprehensive performance evaluation was required (see below). Systems monitoring CFE must conduct a filter assessment on both filters. The self-assessment consists 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. If a self-assessment is required, record the date that it was triggered and the date that it was completed.
For two months in a row and turbidity exceeded 2.0 NTU in two consecutive recordings fifteen minutes apart at the same filter (or CFE for systems with only two filters that monitor CFE in lieu of individual filters).	Arrange to have a comprehensive performance evaluation (CPE) conducted by DEQ, or a third party approved by DEQ, not later than 60 days following the day the filter exceeded 2.0 NTU in two consecutive measurements for the second straight month. If DEQ or an approved party has completed a CPE within the 12 prior months, or the system and DEQ are jointly participating in an ongoing Comprehensive Technical Assistance (CTA) project at the system, a new CPE is not required. If conducted, the CPE must be completed and submitted to DEQ no later than 120 days following the day the filter exceeded 2.0 NTU in two consecutive measurements for the second straight month.

3. C. Reporting and Recordkeeping

All reporting and recordkeeping requirements imposed by the LT1ESWTR are in addition to the requirements already established under the Surface Water Treatment Rule. The system must keep a record of individual filter turbidity monitoring results for at least **three** years. Because of the large number of measurements, this record may be stored in electronic format. The following table describes reporting requirements imposed by LT1.

Requirement	Information to Report	Frequency
Combined Filter Effluent Measurements	<ol style="list-style-type: none"> 1) Total number of filtered water turbidity measurements taken during the month. 2) The number and percentage of filtered water turbidity measurements which are less than or equal to the 95th percentile system established for the system. 3) The date and value of any turbidity measurements which exceeded the maximum turbidity value for the system. 	<p>By the 10th of the following month.</p> <p>By the 10th of the following month.</p> <p>¹By the 10th of the following month.</p>

Individual Filter Turbidity Requirements	<ol style="list-style-type: none"> 1) Verification that the system conducted individual filter turbidity monitoring during the month. 2) The filter number(s) and corresponding date(s) and the turbidity values that exceeded 1.0 NTU during the month, but only if two consecutive measurements exceeded 1.0 NTU. 3) If a self-assessment is required, the date that it was triggered and the date that it was completed. 4) If a CPE is triggered, a statement that the CPE is required and the date that it was triggered. 5) A copy of the completed CPE Report. 	<p>By the 10th of the following month.</p> <p>By the 10th of the following month.</p> <p>By the 10th of the following month (or 14 days after the self-assessment was triggered only if the self-assessment was triggered during the last four days of the month).</p> <p>By the 10th of the following month.</p> <p>Within 120 days after the CPE was triggered.</p>
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¹ For turbidity violations of the SWTR, IESWTR, or LT1ESWTR resulting from a single exceedance of the maximum allowable turbidity limit, public water supply systems shall consult with the KDHE as soon as practical but no later than 24 hours after the public water supply system learns of the violation as required by K.A.R. 28-15a-203.

4. KDHE Recordkeeping / Special Primacy Requirements

4. A. Introduction

The LT1ESWTR imposes certain requirements on KDHE as the primacy agency. KDHE must describe to EPA the approach it will take in making certain regulatory decisions in the implementation, administration, and enforcement of these requirements. For example, the Interim Enhanced Surface Water Treatment Rule (IESWTR) imposed a requirement that KDHE conduct a sanitary survey of all surface water systems at least once every three years for community systems and once every five years for non-community systems. A discussion of sanitary survey requirements is repeated in this survival guide because many systems affected by the LT1ESWTR will have no particular reason to consult the IESWTR guidance. Requirements concerning comprehensive performance evaluations of filtration systems that exceed turbidity standards are outlined here, and a description of recordkeeping requirements is also provided.

4. B. Sanitary Surveys

General: Federal regulations (40 CFR 142.16) require that KDHE conduct a sanitary survey of all community surface water and GWUDI systems every three years, and that non-community systems must be surveyed every five years. See Appendix B of this survival guide for selected excerpts from Kansas Rules and Regulations pertaining to sanitary surveys.

A sanitary survey is defined as consisting of eight elements:

1. Source
2. Treatment
3. Distribution system
4. Finished water storage
5. Pumps, pump facilities, and controls
6. Monitoring and reporting and data verification
7. System management and operation
8. Operator compliance with state requirements

(These eight elements are described in detail in EPA’s Sanitary Survey Manual.) If a water system has developed a disinfection profile, KDHE will examine the profile as part of the sanitary survey for that system. All eight elements of the survey must be examined during one on-site review of the water supply system.

System response required: KDHE requires that a water system respond in writing within 45 days of receiving a sanitary survey report describing how and on what schedule the system will respond to significant deficiencies noted in the report (K.A.R. 28-15-18(i). Operation and maintenance requirements.) Significant deficiencies are defined by KDHE as “any defect in a public water supply system’s design, operation, maintenance, or administration, as well as any failure or malfunction of any system component that causes, or has the potential to cause, an unacceptable risk to health or that could affect the reliable delivery of safe drinking water” (K.A.R. 28-15a-2(a)(4)(H). Definitions).

Significant deficiencies must be corrected: K.S.A. 65-171r (regarding public water supply systems and prohibited acts) and K.S.A. 65-171(s) (regarding public water supply systems and violation of standards, penalties, procedures, hearings, and judicial review) establishes that a failure by the system to correct deficiencies that are under the control of the public water system will constitute a violation of the Kansas Administrative Regulations. As such, administrative penalties and other remedies may be imposed by the state if the system does not comply with these requirements. It is KDHE’s responsibility to track and follow up on efforts by the system to meet the schedule for correcting deficiencies.

Discussion of significant deficiencies: EPA’s Sanitary Survey Manual (pages 4-7) describes some common deficiencies that may be significant for any given water system. These deficiencies and others from additional sources are compiled in Appendix B. This reference list may be helpful to an inspector when weighing the importance of a particular deficiency, but it is not intended to be prescriptive in nature. Questions that might be asked when deciding whether or not a deficiency is significant are:

- * **Does the deficiency cause the potential for contaminants to be introduced to the drinking water?**
- * **If left uncorrected, will the deficiency cause the potential for the introduction of contaminants at some point in the future?**
- * **Does the deficiency affect treatment in an unacceptable manner?**
- * **Does the deficiency pose risks to the safety of the public or operators?**

It is understood that a specific deficiency may be more serious for one water system than it is for another, given the complexity of the system, differences in treatment methods and control systems, and other site-specific factors. Professional judgment by the person conducting the sanitary survey will prevail in such matters. KDHE's evaluation and determination of significant deficiencies will necessarily err on the side of caution with respect to public health and safety.

[Outstanding performance: The IESWTR allows a state primacy agency to reduce the frequency of sanitary surveys for community water systems from once every three years to once every five years if the water system has demonstrated “outstanding performance.” Although KDHE does not initially intend to adopt a reduced schedule of sanitary surveys under this “outstanding performance” criteria, KDHE has requested the opportunity to negotiate an “outstanding performance” criteria at a later date if it is determined to be desirable in the future.]

4. C. Composite Correction Program

General: KDHE may require a system using surface water or GWUDI to arrange for a Composite Correction Program (CCP) to be performed for the purpose of finding and correcting deficiencies in water treatment or distribution. K.S.A. 65-171r (regarding public water supply systems and prohibited acts) and K.S.A. 65-171(s) (regarding public water supply systems and violation of standards, penalties, procedures, hearings, and judicial review) establishes that a failure to implement performance improvement factors identified in the course of the CCP is a violation of Kansas Administrative Regulations. As such, administrative penalties and other remedies may be imposed by the state if the system does not comply with these requirements. It is KDHE's responsibility to track and follow up on efforts by the system to meet the factors identified in the Composite Correction Program..

EPA Guidance: The EPA's CCP Manual describes the process to be followed in carrying out a CCP evaluation.

Service Providers: A water system required to conduct a CCP evaluation may obtain assistance from various service providers. These may consist of engineering firms or other qualified water industry professionals.

CCP Findings: A copy of the CCP findings report must be provided to KDHE for use in tracking system progress in implementing performance improvement opportunities identified during the CCP evaluation.

4. D. Calculation of Virus Inactivation for Systems using Chloramines or Ozone

KDHE will use the following approach in determining virus inactivation for systems using these disinfectants:

Chloramines: Systems that use chlorine prior to adding ammonia may apply Table E-13 of EPA's SWTR Guidance Manual. Systems that add ammonia first, or add the two chemicals concurrently, may use the protocol in Appendix G of the SWTR Guidance Manual. In the unlikely event that a system wishes to suggest an alternative means for determining virus inactivation, the system must provide a scientifically defensible rationale for the proposal.

Ozone: Systems utilizing ozone may apply Table E-11 of the SWTR Guidance Manual to determine virus inactivation. As above, an alternative method may be proposed and defended by the water system.

4. E. Consultation between KDHE and Public Water Supply Systems Planning to Modify Their Disinfection Practices

General: If a water system is required to develop a disinfection profile and the system subsequently decides to change its disinfection practices, it must first consult with KDHE, pursuant to K.S.A. 65-163 (regarding public water supply systems and water treatment residues, regulation, permits, and investigations) and K.A.R. 28-15a-542 (regarding consultation regarding significant change to disinfection practice for Subpart H systems serving fewer than 10,000 people.) The purpose of this requirement is to encourage the system and KDHE to work together to ensure that all potential water quality trade-offs are addressed and that any changes in disinfection practice do not result in a decrease in microbial protection. Changes subject to this requirement include:

- * **Changing the point of disinfection application**
- * **Changing the disinfectant**
- * **Changing the disinfection process**
- * **All other changes considered significant by the state, such as changes in pH, pre-treatment strategies, source water, contact basin dynamics, etc.)**

Because the above list is not all-inclusive, any system that is required to develop a disinfection profile and subsequently decides to make a change in its disinfection practices must notify KDHE so that the agency can determine whether or not the proposed change is significant and will require consultation between the system and KDHE.

Consultation: KDHE and the water system will weigh the following factors in their consultation:

- * **Why the system is proposing a change in disinfection practice**
- * **Evaluation of positive and negative impacts of the change**
- * **Calculation of an alternative benchmark**
- * **Examination of all known alternatives to the proposed change**

The goal of this consultation will be to ensure that any changes made by the system will represent the best available balance between microbial protection and disinfection byproduct formation potential. In determining whether or not the proposed change in disinfection practices will be approved, KDHE will consider criteria such as a) the microbial quality of the raw water; b) the effectiveness of watershed protection efforts; and c) the efficacy of the treatment process in removing microbiological contaminants.

4. F. Approval of Alternative Filtration Technologies

KDHE will approve the use of an alternative filtration technology after a comprehensive review of data gathered during a pilot study. Turbidity performance requirements will be maintained at 0.3 NTU unless sufficient data from a pilot study shows that a treatment system consistently achieves 99.9 percent removal and/or inactivation of *Giardia Lamblia* cysts, 99.99 percent removal and/or inactivation of viruses, and 99 percent removal of *Cryptosporidium* oocysts at a level above 0.3 NTU. If a system has removal data from a study acceptable to KDHE as performed under the ETV or NSF standard test procedures, it may be considered for approval without additional pathogen removal studies. An approval granted for the use of alternative technologies and establishing turbidity performance standards will be put into writing by the state.

4. G. Recordkeeping by KDHE

KDHE will maintain the following records with respect to the IESWTR, as required by 40 CFR 142.14:

1. Records of turbidity measurements submitted by the water system must be kept in the system file for a minimum of one year. This information must be set forth in a form that makes possible a comparison with the turbidity limits specified in the SWTR, the IESWTR, and the LT1ESWTR. KDHE will use an existing form that was developed for the SWTR, as modified to reflect the tighter standards established by the LT1ESWTR. An example of this form is included as Appendix C of this guidance. Because of the trend toward automatic logging of turbidity data, especially among larger systems, use of alternative formats is acceptable as long as equivalent information is provided, and as long as it is possible to compare the turbidity readings to the limits established in the SWTR, IESWTR, and the LT1ESWTR.

2. Records of disinfectant residual measurements and other parameters necessary to document disinfection effectiveness must be kept in the system file for a minimum of one year.

3. The following record types must be kept in the system file on a permanent basis:

- a. Any case-by-case, system-specific regulatory decisions made by KDHE.
- b. Records of consultations between a system and KDHE regarding changes in disinfection practices, including the status of the consultation.
- c. Records of decisions that systems using alternative filtration technologies can consistently achieve a 99.9 percent removal and/or inactivation of *Giardia lamblia* cysts, 99.99 percent removal and/or inactivation of viruses, and 99 percent removal of *Cryptosporidium* oocysts. The decision must include the state-determined turbidity standards for the system. A copy of this decision must be provided to the water system.
- d. Records of systems that are required to perform filter self-assessments, and a CCP or CPE evaluation (see Section 3 of this survival guide).

APPENDIX A

Composite Correction Program and Sanitary Surveys

Definitions

Composite Correction Program: The Composite Correction Program (CCP) is a systematic approach to identifying opportunities for improving the performance of water treatment and implementing changes that will capitalize on these opportunities. The CCP consists of two (2) elements:

a. Comprehensive Performance Evaluation: The Comprehensive Performance Evaluation (CPE) is a thorough review and analysis of a treatment plant's performance-based capabilities and associated administrative, operation, and maintenance practices. It is conducted to identify factors that may be adversely impacting a plant's capability to achieve compliance and emphasizes approaches that can be implemented without significant capital improvements. The CPE must consist of at least the following components: a) assessment of plant performance; b) evaluation of major unit processes; c) identification and prioritization of performance limiting factors; d) assessment of the applicability of comprehensive technical assistance; and e) preparation of a CPE report.

b. Comprehensive Technical Assistance: Comprehensive Technical Assistance (CTA) is the implementation phase that is carried out if the CPE results indicate improved performance potential. During the CTA phase, the system must identify and systematically address plant-specific factors. The CTA consists of a) follow-up to the CPE results; b) implementation of process control priority setting techniques; and c) maintaining long term involvement to systematically train staff and administrators.

Sanitary Survey: A Sanitary Survey is an onsite review of the water source, facilities, equipment, operation and maintenance of a public water system for the purpose of evaluating the adequacy of such source, facilities, equipment, operation and maintenance for producing and distributing safe drinking water. The sanitary survey will include, but is not limited to, the following elements:

- a. Source
- b. Treatment
- c. Distribution system
- d. Finished water storage
- e. Pumps, pump facilities, and controls
- f. Monitoring and reporting and data verification
- g. System management and operation
- h. Operator compliance with state requirements.

Significant Deficiency. A Significant Deficiency is any defect in a system's design, operation, maintenance, or administration, as well as any failure or malfunction of any system component which KDHE determines to cause, or have potential to cause, an unacceptable risk to health or that could affect the reliable delivery of safe drinking water.

Requirements

Sanitary Surveys

KDHE shall conduct a sanitary survey of all public water systems which use surface water or ground water under the direct influence of surface water.

Frequency: A sanitary survey shall be conducted for non-community water supply systems every five (5) years. For community water systems, a sanitary survey shall be conducted every three (3) years.

Report: A report describing the results of the sanitary survey will be provided to the water system.

Response Required: A water system must respond in writing not later than forty-five (45) days after receipt of the sanitary survey report describing how and on what schedule the system will address significant deficiencies identified in the survey.

Violation: Failure to address significant deficiencies identified in a sanitary survey that is within the control of the public water system and its governing body shall constitute a violation of Kansas Administration Regulations.

Composite Correction Program:

KDHE may require a public water system to conduct a Composite Correction Program for the purpose of identifying and correcting deficiencies in water treatment and distribution. Failure to implement the performance improvement factors identified through the CCP constitutes a violation of Kansas Administrative Regulations.

Appendix B

Significant Deficiencies in a Sanitary Survey

List of Potentially Significant Deficiencies That May Be Noted during a Sanitary Survey

The following deficiencies have the potential to meet KDHE's definition of a significant deficiency. This list is not intended to be prescriptive. The inspector in the field will have the final word on whether or not a particular deficiency is significant. However, each of these deficiencies has the potential to be significant and referring to this list may assist the inspector in making this decision.

Source:

- * Location of intake near pollution source
- * Well construction inadequate or in deteriorated condition
- * Spring collection facilities inadequate or in deteriorated condition

Treatment:

- * The hatch to a pressure filter has not been opened on a yearly basis to clean the media and to check for media loss and the condition of the underdrain system
- * Filter does not have adequate depth of media (e.g. less than 24 inches)
- * No standard operating procedure for taking a filter out of service for backwashing, for performing the backwash, or returning the filter to service
- * No process control plan for coagulant addition
- * Inadequate application of treatment chemicals
- * Chemical feed rates not adjusted for varying raw water quality conditions or changes in plant flow rate
- * Inadequate disinfection CT
- * Unsafe chemical storage

Distribution System:

- * TCR sampling plan not representative of the distribution system
- * Negative pressures at any time
- * System not flushed periodically
- * No disinfectant residual, or HPC levels greater than 500/ml, repeatedly, at same sites
- * Inadequate monitoring of disinfectant residual, when required
- * Inadequate cross-connection controls, either at the treatment facility or in the distribution system (or failure to have a cross-connection control program)
- * Unacceptable system leakage which could result in entrance of contaminants
- * System plans unavailable or outdated
- * Valve locations unknown
- * Valves not exercised regularly or known to be inoperable

Finished Water Storage:

- * Inadequate internal cleaning and maintenance of storage tank
- * Improper venting of tank
- * Lack of proper screening of overflow pipe and drain
- * Inadequate roofing (e.g. holes in the storage tank, improper hatch construction)

Pumps, Pump Facilities and Controls:

- * Ponding of water in pump housing
- * Inadequate pump capacity
- * Lack of redundant mechanical components
- * Electrical hazards

Monitoring/Reporting/Data Verification:

- * Failure to properly monitor water quality
- * Failure of system operator to address customer complaints regarding water quality or quantity
- * TCR sampling plan not available or not being followed
- * Chronic TCR coliform detections with inadequate remediation

Water System Management/Operation:

- * Lack of properly trained or licensed staff as required by the state
- * Lack of emergency response plan
- * Failure to meet water supply demands or interruptions to service (inadequate pump capacity, unreliable water source, lack of auxiliary power)
- * Inadequate follow-up to deficiencies not in previous sanitary surveys
- * Spare parts inventory inadequate
- * Lack of accessible contact list w/phone numbers for emergency repairs or troubleshooting
- * Evidence of poor or infrequent communication between operator and system managers

Operator Compliance with State Requirements:

- * Operator does not have the correct level of certification as required by regulation

Appendix C

Sample Turbidity Monitoring Form with Instructions

INSTRUCTIONS FOR “TURBIDITY, DISINFECTION AND CT” FORM

1. In the Heading Area of the form, enter: ¹⁾ the **Name** of the system, ²⁾ **Address**, ³⁾ **City**, ⁴⁾ public water supply **ID Number** and ⁵⁾ the **Month** and **Year**. The report is to be **Signed** and **Dated** by the person in responsible charge of the plant. **Return** the completed form no later than the **10th Day** following the end of the month.
2. In Column A, enter the daily minimum distribution system ¹⁾**Disinfectant Residual**. Also note whether the residual is ²⁾ *free chlorine (F)* or *combined chlorine (C)*, and specify ³⁾**Number of Residual Readings** that were taken that day.
3. In Column B, enter ¹⁾**Lowest Concentration** of disinfectant residual leaving the facility at any time during the 24 hour day. Indicate whether the residual is ²⁾ *Free Chlorine (F)* or *Combined Chlorine (C)*, and specify ³⁾ **Number of Residual Readings** that were taken that day.
4. In Column C, enter the **Highest Combined Filter Effluent (CFE) Turbidity Measurement** recorded during the 24-hour day. If this reading exceeds 5.0 NTU, notify KDHE within 24 hours or by the end of the next business day.
5. In Column D, enter the **Number of CFE Turbidity Measurements** taken during the 24-hour day. The regulations require that measurements be taken at least every 4 hours of plant operation unless the population served is less than 500 persons, then daily sampling is allowed.
6. In Column E, enter the number of turbidity readings which **Exceed 0.3 NTU (0.5 for systems < 10,000 until January 14, 2005)** during the 24-hour day.
7. In Column F, calculate the plant **CT Ratio** for the indicated 24-hour day by dividing the CT result by the CT required (CT₉₉) to get CT available. Total the CT available for the treatment segments to get the plant CT available (**CT Ratio**) value for the day. For help with this calculation, call the Public Water Supply Section at (785) 296-5516.
8. At the bottom of page 2, below Column D and Column E, **Add the Numbers** and enter the totals in their boxes.
9. In the Percent of NTU...in Compliance box, calculate the **Percentage of CFE Turbidity Readings** which are less than or equal 0.3 NTU (0.5 for systems < 10,000 until January 14, 2005) for the month. This is the total of Column D, minus total of Column E, result divided by total of Column D.
10. Use Comment lines or far right Column for: ¹⁾ date of **Sanitary Survey**, ²⁾ date **State** was **Contacted**, or ³⁾ dates, time and duration of any **Treatment Technique Failures or Violations**. Check any dates on which bacteriological compliance samples were collected. **Systems ≥ 10,000 are required to report continuous monitoring of individual filters beginning January 1, 2002. Systems <10,000 are required to report continuous monitoring of individual filters beginning January 14, 2005. Even when there are no problems, the monthly message must clearly state "Individual filters are continuously monitored for turbidity and results are recorded every 15 minutes as required".**

MONTHLY TURBIDITY - DISINFECTION - CT

SUMMARY REPORT FOR THE MONTH & YEAR OF: _____

PWS NAME/FACILITY: _____

ACCOUNT/PWS ID No.: _____

ADDRESS: _____

CITY & ZIP CODE: _____

MAIL TO:

KDHE - Bureau of Water
Public Water Supply Section
1000 SW Jackson St.; Suite 420
Topeka, KS 66612-1367

DATE	(A) Minimum Residual in Distribution System			(B) Minimum Residual Leaving the Plant			(C) Maximum Combined Filter Effluent (CFE) Turbidity Reading For Each Day	(D) Total Number of CFE Turbidity Readings Taken Each Day	(E) Number of CFE Turbidity Readings Greater than 0.3 NTU	(F) Disinfectant Contact Time Ratio	Bacteriological Samples Collected <input type="checkbox"/>
	Minimum Daily Residual	Disinfectant Type (Combined or Free)	# of Residual Readings Taken	Minimum Daily Residual	Disinfectant Type (Combined or Free)	# of Residual Readings Taken					
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
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30											
31											

TOTAL NUMBER OF READINGS:

Percent (%) of NTU Readings Which are in Compliance:

COMMENTS: _____

Please check box if the Individual Filter Effluent (IFE) was monitored and recorded every 15 minutes as required.

Please check box if any IFE exceeded 1.0 NTU in two consecutive readings taken 15 minutes apart. (attach required data with this report)

Prepared By: _____

Date Form Completed: _____

Signature on this form certifies all information above is accurate and complete to the best of the signer's knowledge.



A number of national guidance products and other informational materials have been developed by EPA to assist the state and regulated water systems in complying with this rule and other related rules. Printed copies of informational materials may be requested from the Safe Drinking Water Hotline at 1-800-426-4791. Many documents may be viewed and downloaded from the following EPA Internet addresses:

<http://www.epa.gov/safewater/mdbp/mdbp.html>

<http://www.epa.gov/safewater/mdbp/implement.html>

<http://www.epa.gov/safewater/mdbp/lt1eswtr.html>

Other national guidance products are under development for this rule. The best place to access these documents as they become available is on the Internet at the web addresses provided above. Listed below are existing publications that are of general use to surface water systems. Some of the EPA guidance documents were developed for the Interim Enhanced Surface Water Treatment Rule, and are therefore oriented toward larger systems and the more stringent regulations that apply to them. However, the technical background provided by these documents applies just as well to smaller surface water systems. This appendix will be updated as new materials dealing specifically with LT1ESWTR become available.

Guidance Manual for Conducting Sanitary Surveys of Public Water Systems; Surface Water and Ground Water Under the Direct Influence (GWUDI) of Surface Water, EPA 815-R-99-016, April 1999. [a.k.a. "Sanitary Survey Guidance Manual"]

Guidance Manual for Compliance with the Interim Enhanced Surface Water Treatment Rule: Turbidity Provisions, EPA 815-R-99-010, April 1999. [a.k.a. "Turbidity Guidance Manual"]

Disinfection Profiling and Benchmarking Guidance Manual, EPA 815-R-99-013, August 1999. [a.k.a. "Profiling and Benchmarking Manual"]

Optimizing Water Treatment Plant Performance Using the Composite Correction Program, EPA 625/6-91/027 Revised August 1998. [a.k.a. "CCP Manual"]

Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources, US EPA, 1991. [a.k.a. "SWTR Guidance Manual"]

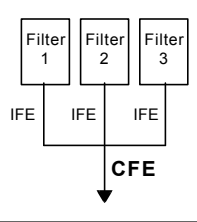
The following EPA Quick Reference Guide on the Long Term 1 Enhanced Surface Water Treatment Rule is provided as a handy reference as a supplement to this survival guide.

Long Term 1 Enhanced Surface Water Treatment Rule: A Quick Reference Guide

Overview of the Rule

Title	Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) 67 FR 1812, January 14, 2002, Vol. 67, No. 9
Purpose	Improve public health protection through the control of microbial contaminants, particularly <i>Cryptosporidium</i> . Prevent significant increases in microbial risk that might otherwise occur when systems implement the Stage 1 Disinfectants and Disinfection Byproducts Rule.
General Description	Builds upon the requirements of the 1989 Surface Water Treatment Rule (SWTR). Smaller system counterpart of the Interim Enhanced Surface Water Treatment Rule (IESWTR).
Utilities Covered	Public water systems that use surface water or ground water under the direct influence of surface water (GWUDI) and serve fewer than 10,000 people.

Major Provisions

Control of <i>Cryptosporidium</i>	<ul style="list-style-type: none"> ▶ The maximum contaminant level goal (MCLG) is set at zero. ▶ Filtered systems must physically remove 99% (2-log) of <i>Cryptosporidium</i>. ▶ Unfiltered systems must update their watershed control programs to minimize the potential for contamination by <i>Cryptosporidium</i> oocysts. ▶ <i>Cryptosporidium</i> is included as an indicator of GWUDI.
Combined Filter Effluent (CFE) Turbidity Performance Standards 	<p>Specific CFE turbidity requirements depend on the type of filtration used by the system.</p> <p>Conventional and direct filtration:</p> <ul style="list-style-type: none"> ▶ ≤ 0.3 nephelometric turbidity units (NTU) in at least 95% of measurements taken each month. ▶ Maximum level of turbidity: 1 NTU. <p>Slow sand and diatomaceous earth (DE) filtration:</p> <ul style="list-style-type: none"> ▶ Continue to meet CFE turbidity limits specified in the SWTR: <ul style="list-style-type: none"> • 1 NTU in at least 95% of measurements taken each month. • Maximum level of turbidity: 5 NTU. <p>Alternative technologies (other than conventional, direct, slow sand, or DE):</p> <ul style="list-style-type: none"> ▶ Turbidity levels are established by the State based on filter demonstration data submitted by the system. <ul style="list-style-type: none"> • State-set limits must not exceed 1 NTU (in at least 95% of measurements) or 5 NTU (maximum).

For additional information on the LT1ESWTR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at www.epa.gov/safewater/mdbp/lt1eswtr.html; or contact your State drinking water representative.

¹ This frequency may be reduced by the State to once per day for systems using slow sand/alternative filtration or for systems serving 500 persons or fewer regardless of the type of filtration used.

Turbidity Monitoring Requirements

Combined Filter Effluent	<ul style="list-style-type: none"> ▶ Performed at least every 4 hours to ensure compliance with CFE turbidity performance standards.¹
Individual Filter Effluent (IFE) (for systems using conventional and direct filtration only)	<p>Since the CFE may meet regulatory requirements even though one filter is producing high turbidity water, the IFE is measured to assist conventional and direct filtration treatment plant operators in understanding and assessing individual filter performance.</p> <ul style="list-style-type: none"> ▶ Performed continuously (recorded at least every 15 minutes). ▶ Systems with two or fewer filters may conduct continuous monitoring of CFE turbidity in place of individual filter effluent turbidity monitoring. ▶ Certain follow-up actions are required if the IFE turbidity (or CFE for systems with two filters) exceeds 1.0 NTU in 2 consecutive readings or more (i.e., additional reporting, filter self-assessments, and/or comprehensive performance evaluations (CPEs)).

Disinfection Profiling and Benchmarking Requirements

Community and non-transient non-community public water systems must evaluate impacts on microbial risk before changing disinfection practices to ensure adequate microbial protection is maintained. This is accomplished through a process called disinfection profiling and benchmarking.

What are the disinfection profiling and benchmarking requirements?

- ▶ Systems must develop a disinfection profile, which is a graphical compilation of weekly inactivation of *Giardia lamblia*, taken on the same calendar day each week over 12 consecutive months. (Systems using chloramines, ozone, or chlorine dioxide for primary disinfection must also calculate inactivation of viruses). Results must be available for review by the State during sanitary surveys.
- ▶ A State may deem a profile unnecessary if the system has sample data collected after January 1, 1998—during the month of warmest water temperature and at maximum residence time in the distribution system—indicating TTHM levels are below 0.064 mg/L and HAA5 levels are below 0.048 mg/L.
- ▶ Prior to making a significant change to disinfection practices, systems required to develop a profile must calculate a disinfection benchmark and consult with the State. The benchmark is the calculation of the lowest monthly average of inactivation based on the disinfection profile.

Additional Requirements

- ▶ Construction of new uncovered finished water reservoirs is prohibited.

Critical Deadlines and Requirements

For Drinking Water Systems

March 15, 2002	Construction of uncovered finished reservoirs is prohibited.
July 1, 2003	No later than this date, systems serving between 500-9,999 persons must report to the State: <ul style="list-style-type: none"> ▶ Results of optional monitoring which show levels of TTHM < 0.064 mg/L and HAA5 < 0.048 mg/L, OR ▶ System has started profiling.
January 1, 2004	No later than this date, systems serving fewer than 500 persons must report to the State: <ul style="list-style-type: none"> ▶ Results of optional monitoring which show levels of TTHM < 0.064 mg/L and HAA5 < 0.048 mg/L, OR ▶ System has started profiling.
June 30, 2004	Systems serving between 500 and 9,999 persons must complete their disinfection profile unless the State has determined it is unnecessary.
December 31, 2004	Systems serving fewer than 500 persons must complete their disinfection profile unless the State has determined it is unnecessary.
January 1, 2005	Surface water systems or GWUDI systems serving fewer than 10,000 people must comply with the applicable LT1ESWTR provisions (e.g., turbidity standards, individual filter monitoring, <i>Cryptosporidium</i> removal requirements, updated watershed control requirements for unfiltered systems).

For States

January 2002	As per the IESWTR, States begin first round of sanitary surveys (at least every 3 years for community water systems and every 5 years for non-community water systems).
October 14, 2003	States are encouraged to submit final primacy applications to EPA.
January 14, 2004	Final primacy applications must be submitted to EPA unless granted an extension.
December 2004	States must complete first round of sanitary surveys for community water systems (as per the IESWTR).
January 14, 2006	Final primacy revision applications from States with approved 2-year extension agreements must be submitted to EPA.
December 2006	States must complete first round of sanitary surveys for non-community water systems (as per the IESWTR).

Public Health Benefits

Implementation of the LT1ESWTR will result in . . .	<ul style="list-style-type: none"> ▶ Increased protection against gastrointestinal illnesses from <i>Cryptosporidium</i> and other pathogens through improvements in filtration. ▶ Reduced likelihood of endemic illness from <i>Cryptosporidium</i> by an estimated 12,000 to 41,000 cases annually. ▶ Reduced likelihood of outbreaks of cryptosporidiosis.
Estimated impacts of the LT1ESWTR include . . .	<ul style="list-style-type: none"> ▶ National total annualized cost: \$39.5 million. ▶ 90% of affected households will incur an increase of less than \$1.25 per month. ▶ One percent of affected households are likely to incur an increase of more than \$10 per month.