Report on Red River Valley Water Supply Project Needs and Options

Water Quality Needs — Final Report

Regulatory Overview of the Safe Drinking Water Act

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INTRODUCTION

The Dakota Water Resources Act directed the Secretary of the Interior to prepare a *Report on Red River Valley Water Needs and Options* (Needs and Options Report) to assess the water needs of the Red River Valley in North Dakota. Water quality was identified as one of the needs. This report provides a regulatory overview of the present and foreseeable future water quality requirements established by state and federal laws and regulations for Red River Valley municipal, rural and industrial (MR&I) water systems. It predicts the most likely future water quality standards that will be promulgated under the Safe Drinking Water Act of 1974 (SDWA) for MR&I water systems by 2050. These standards will be used to evaluate present and future conditions of MR&I water systems and to identify water quality needs in the Needs and Options Report.

The principal water uses in the Red River Valley watershed currently are for MR&I and agricultural irrigation purposes. Each use has some unique water quality requirements that have been developed through experience, research, and legislation. The MR&I use and water quality needs are generally met if the requirements of SDWA, as amended, are met as administered by the U.S. Environmental Protection Agency (EPA) and the State of North Dakota. Occasionally, an industrial need may require additional treatment, which is usually done by the industry and not the entity supplying water. If an industry uses water directly from the source such as a stream they usually will treat water in accordance with the level required for their product. Agricultural irrigation water is not covered under the SDWA and is not included in this report.

This document was adapted from Attachment B of the Bureau of Reclamation's "Red River Valley Water Needs Assessment, Phase 1A, MR&I Appraisal Report." Significant data and information were used from the *Safe Drinking Water Advisor: A Compliance Assistance Resource*, published by the American Water Works Association in May 2002.

SAFE DRINKING WATER ACT OVERVIEW

Treated water quality standards for public water supplies are established and regulated under the SDWA and subsequent amendments. The SDWA regulations are divided into two parts: the National Interim Primary Drinking Water Regulations, which are now referred to as the National Primary Drinking Water Regulations (NPDWR) and the National Secondary Drinking Water Regulations (NSDWR). The NPDWR first established enforceable federal guidelines for 23 constituents in 1975, including: 7 organic chemicals, 11 inorganic chemicals, 3 radionuclides, and 2 microbials of concern. The current NPDWR standards are listed on the EPA website at http://www.epa.gov/safewater/mcl.html.

NSDWR are nonenforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards for water systems but does not require systems to comply. However, states may choose to adopt these as enforceable standards. The current NPSWR standards are listed on the EPA website at http://www.epa.gov/safewater/mcl.html#sec.

The 1986 amendments to the SDWA mandated establishment of new drinking water quality and treatment regulations. These included establishment of either maximum contaminant levels (MCLs) or treatment techniques for constituents of concern. In fulfilling this mandate,

EPA implemented a process of developing, proposing, and promulgating drinking water quality regulations for water treatment practices and water utility operations. The EPA developed water quality regulations that include volatile organic chemicals, fluoride, surface water treatment, total coliform bacteria, additional synthetic and inorganic chemicals, disinfectants and disinfection byproducts, arsenic, radionuclides, and groundwater. Table 1 shows the implementation history of major SDWA regulations.

EPA is still developing additional rules, as the collective understanding of the health affects of specific water quality constituents evolves. Those rules having the most impact on water providers of the Red River Valley will be discussed in detail in this report.

The SDWA rules and regulations can be complex, but simply put, water quality standards for specific constituent parameters under NPDWR can be met in one of two ways: (1) by meeting the MCLs or (2) by complying with the requirements of a treatment technique (e.g., the Surface Water Treatment Rule). In addition, water utilities can obtain a variance by installing and using Best Available Technology (BAT). BATs are identified during the establishment of a specific MCL. A water system can meet the regulation standard by employing a specific type of treatment process (technology) as compared to meeting a specific MCL. However, a water system is never required to install BAT to comply with a drinking water regulation. BAT installation is only required if a utility is interested in obtaining a variance or an exemption.

Water quality monitoring is required of a water supplier to assure MCLs or treatment techniques are being met. Most regulations have specific requirements based on the class of water system. This classification system takes into account factors such as water source, population served, and type of water system. The classification of water systems is discussed in the next section of this report. All of these factors affect the type and frequency of monitoring type and frequency of the treated water for MCLs or regulation implementation schedule. The water quality standards for water systems in the Red River Valley are discussed in the following section.

WATER QUALITY REQUIREMENTS FOR PUBLIC WATER SYSTEMS

Public water systems in the Red River Valley are subject to SDWA and the promulgated regulations. A public water system is defined as a system that delivers water through pipes or other conveyances for human consumption and has at least 15 service connections or regularly serves an average of at least 25 individuals daily for at least 60 days out of the year. Some industrial water systems also provide water for human consumption and are therefore included as a type of public water system in this report.

Public Water System Classifications

The water quality requirements (standards) for public water systems depend on how the water system is classified under SDWA regulations. The water system classification is based on water supply source, size of service population, type of population served, and treatment process.

There are three types of water supply sources in the Red River Valley: surface water, groundwater under the direct influence of surface water, and groundwater. The type of water source dictates the required water quality standards. If a water system uses more than one water source type, then more stringent requirements apply. Generally, requirements are more stringent for surface water and groundwater under the direct influence of surface water.

Table 1 - Implementation History of EPA Drinking Water Regulations.

Rule	Published date	Status
NIPDWRs	December 24, 1975	Final
Interim Radionuclides	July 9, 1976	Final
Interim Trihalomethanes (THMs)	November 29, 1979	Final
Revised Fluoride	April 2, 1986	Final
Volatile Organic Compounds (VOCs)	July 8, 1987	Final
Surface Water Treatment Rule and Total Coliform Rule	June 29, 1989	Final
Phase II Synthetic Organic Chemicals (SOCs) and Inorganic Chemicals (IOCs)	January 30, 1991	Final
Lead and Copper	June 7, 1991	Final
Phase II SOCs and IOCs (second group)	July 1, 1991	Final
Phase V SOCs and IOCs	July 17, 1992	Final
Interim Enhanced Surface Water Treatment Rule	December 16, 1998	Final
Stage 1 Disinfectants-Disinfection By-products Rule	December 16, 1998	Final
Final Non-Radon Radionuclides Rule	December 7, 2000	Final
Long-Term 1 Enhanced Surface water Treatment Rule	January 14, 2002	Final
Final Arsenic NPDWR Revision	January 22, 2001	Final
Radon Rule	November 2, 1999	Late 2003
Stage 2 Disinfectants-Disinfection By-products Rule	Mid 2003	Draft
Long-Term 2 Enhanced Surface Water Treatment Rule	Mid 2003	Draft
Sulfate Advisory	Proposed 2003	Final 2005
Proposed Ground Water Rule	May 10, 2000	Final - Mid to late 2003
Final Filter Backwash Recycle Rule	June 8, 2001	Final

Source: AWWA Drinking Water Advisor, May 2002

Water systems are also classified by the size of the service population, and system size cutoffs vary from regulation to regulation. Within SDWA regulations applicability or stringency may be contingent on the size of a system. When this is the case, system size is usually based on the number of people served by the water system. Examples of system service population breakdowns often used in the regulations appear in Table 2. Generally, regulations are less severe for smaller systems. This reflects EPA's recognition that smaller systems have fewer resources and thereby less capability to meet some requirements. This is particularly true of monitoring and testing requirements.

Table 2 - Typical Population Breakdown used in the SDWA Regulations.

System Population
<500
501 - 3,300
3,301 - 10,000
10,001 - 25,000
>25,000

Source: AWWA Drinking Water Advisor, May 2002

The SDWA recognizes there are different "types" of public water systems and that the stringency of SDWA regulations varies based on how water systems are operated. For example, year-around water service from a municipal system is more stringently regulated than infrequent use at a rest area or campground. The distinction was made because it was recognized that the frequency of use of a specific water source affected which water quality standards were of concern. For example, water constituents that are "acute" (biological pathogens can cause immediate illness) are frequently monitored for all types of water systems while constituents such as radionuclides (radiation poisoning which is a long-term exposure concern) is monitored depending on frequency of exposure. Therefore, testing for radionuclides is less stringent at rest areas than in community water systems. The various types of water system classifications and a description of each are listed in Table 3. The Needs and Options Report will generally focus on Community Water Systems that constitute the majority of MR&I systems in the Red River Valley.

Table 3 - Types of Population Served by Public Water Systems.

Type of Public Water System	Description
Community Water System (CWS)	A public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.
Nontransient, Noncommunity Water Systems (NTNC)	These systems regularly serve at least 25 of the same persons over 6 months per year. Examples include schools, factories, and hospitals that have their own water supply.
Transient, Noncommunity Water System (TNC)	These systems do not regularly serve at least 25 of the same people over 6 months each year. Campgrounds, motels, and gas stations are examples.

Source: AWWA Drinking Water Advisor, May 2002

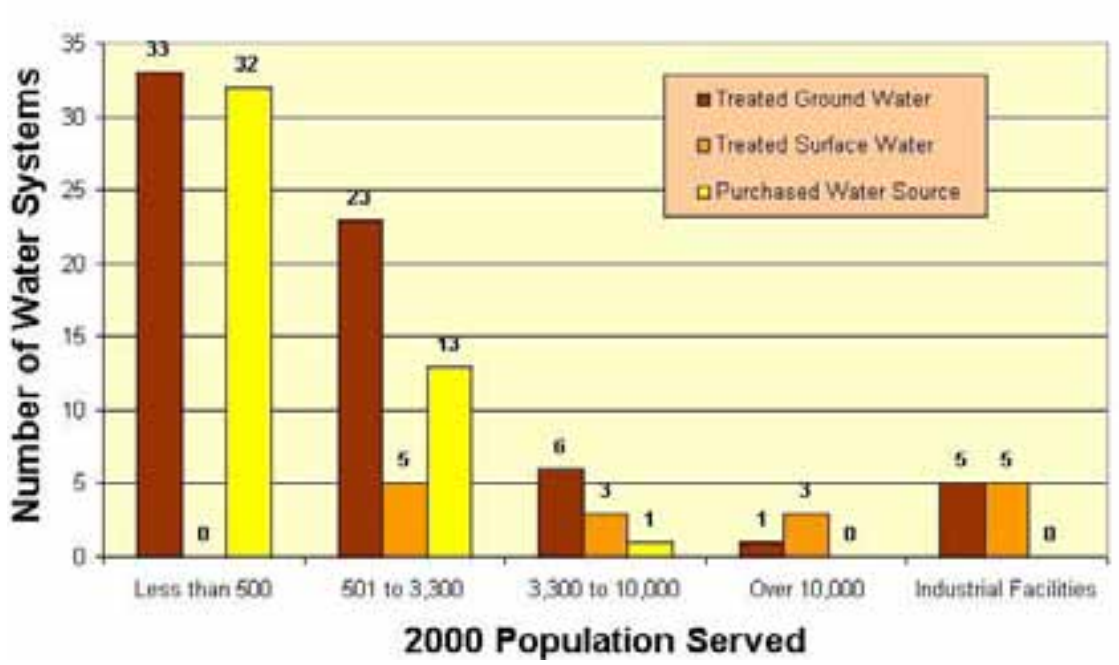

Figure 1 - Public Water System Water Sources in the Red River Valley.

Figure 1 shows the breakdown of public water systems by population served and water source. Industrial water systems are shown separately because they do not necessarily treat to potable water standards, however, some of them may in the future. Generally, a local municipality or rural water system provides their potable water needs.

SDWA REGULATIONS OF CONCERN IN THE RED RIVER VALLEY

All of the SDWA regulations, as tabulated in Table 1, establish the standard for acceptable water quality for public water systems; however, some more recently established or proposed rules are of particular concern because of their possible impact on future operations of MR&I water systems. The situation in the Red River Valley is complicated by overall poor water quality and condition of some of the water treatment facilities.

This section of the report addresses regulations or rules that some public water systems may have problems complying with in the future. The report also identifies two new regulations that have a strong likelihood of being implemented in the future. These current and possible future water quality regulations (standards) will be used to evaluate MR&I water quality needs in the Red River Valley for the Needs and Options Report.

Stage 1 Disinfectants-Disinfection By-products Rule

The Stage 1 Disinfectants-Disinfection By-products Rule (Stage 1 D/DBP Rule) promulgated on

December 16, 1998, established the following requirements:

- Maximum residual disinfectant level goals (MRDLGs) and maximum residual disinfectant levels (MRDLs) for three disinfectants.

- Maximum Contaminant Level Goals (MCLGs) and MCLs for four disinfection byproducts (or disinfection byproduct groups, including a revised MCL for THMs).

- Enhanced coagulation requirements for the removal of Total Organic Carbon (TOC) for surface water systems using conventional treatment.

All CWS and NTNC systems will be required to comply with the Stage 1 D/DBP Rule. Compliance for surface water system serving over 10,000 people began January 2002. Transient noncommunity water systems will be required to comply only with the MRDL for chlorine dioxide.

Stage 1 establishes MRDLGs and MRDLs for three water treatment disinfectants: chlorine, chloramines, and chlorine dioxide. The MRDLGs and MRDL's are set at 4.0 milligrams per liter (mg/L) (measured as $C1_2$ for chlorine and chloramines). For chlorine dioxide, ($C1O_2$), the MRDLGs and MRDLs are 0.80 and 0.8 mg/L (measured as ClO_2), respectively. The MRDLGs are health goals established at a level in which there are no known or anticipated adverse effects on health. The level also includes an adequate margin of safety. These health goals do not reflect benefits from chemical addition for control of waterborne microbial contaminants and are nonenforceable.

Total trihalomethanes (TTHMs), haloacetic acids (HAA5), bromate, and chlorite are the four Disinfectants-Disinfection Byproducts (DBPs) or DBP groups, regulated under the Stage 1 D/DBP Rule. The MCL for TTHMs is 80 micrograms per liter (µg/L), which includes the following four compounds: bromodichloromethane ($CHBrCl_2$), dibromochloromethane ($CHBr_2Cl$), chloroform ($CHCL_3$), and bromoform ($CHBr_3$). HAA5 includes monochloroacetic acid, dichloraocetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid. The MCL for HAA5 is 60 µg/L..

Bromate is formed by ozonation of water containing the bromide ion and is regulated at an MCL of 10 µg/L. Chlorite, a degradation product of chlorine dioxide, is regulated at an MCL of 1.0 mg/L. MCLGs have also been established for these compounds. As with MRDLGs, MCLGs are only health goals and are nonenforceable. A list of MCLGs and MCLs compounds to be regulated appear in Table 4.

The monitoring and compliance requirements under Stage 1 of the D/DBP Rule depend upon the type and size of the system. A running annual average is used to calculate disinfection by-product concentrations for compliance proposes. Water systems will have to meet monitoring and compliance requirements presented in Table 5 by the identified deadlines.

Table 4 - Stage 1 MCLGs and MCLs for Regulated Disinfection By-Products.

Regulated Disinfection By-product	MCLG (mg/L)	MCL (mg/L)
Total trihalomethanes	none	0.080
Haloacetic acids	none	0.060
Bromodichloromethane	0	none
Dibromochloromethane	0.06	none
Bromoform	0	none
Dichloroacetic acid	0	none
Trichloroacetic acid	0.3	none
Chlorite	0.8	1.0
Bromate	0	0.010

Source: AWWA Drinking Water Advisor, May 2002

Table 5 - Stage 1 D/DBP Monitoring for Surface Water Systems.

Compound	Sampling Location	Routine Sampling Frequency[1]
Total Organic Carbon (TOC)	- 1 at water source - 1 finished water prior to continuous disinfection (after filtration for ozonation with biologically active filters)	1 at each location / month
TTHMs and HAA5 [2] (if chlorine used)	- > 10,000 population: 25 percent in DS at Maximum T_R 75 percent throughout DS - 500 - 9,999 population: in DS at maximum T_R - < 500 population: in DS at maximum T_R	- 4 per treatment plant per quarter - 1 per treatment plant per quarter - 1 per treatment plant per year during warmest water temperature month
Alkalinity	1 at water source	1 per month
Chlorite (if CLO_2 used)	- 1 near first customer - 1 in DS at average T_R - 1 in DS at maximum T_R	One – 3 sample set per month
Bromate (if ozone used)	Each entry point to DS	1 per month
Chlorine Dioxide (if CLO_2 used)	Each entry point to DS	Daily
Chlorine and Chloramines (if chlorine used)	Same points as for TCR	Frequency same as TCR

Source: AWWA Drinking Water Advisor, May 2001

T_R = residence time DS = distribution system TCR = total coliform rule

[1] Reduced monitoring is possible for TOC, Alkalinity, TTHM's, HAA5 (except systems serving <500 population), and Bromate if certain conditions are met.

[2] Sampling locations for TTHMs and HAA5 are different for groundwater.

January 1, 2002 — Surface water systems and groundwater systems under the direct influence of surface water serving 10,000 or more people, and NTNC water systems serving 10,000 or more people and TNC water systems using chlorine dioxide must begin demonstrating compliance by this date.

January 1, 2004 — Three types of systems must begin demonstrating compliance by this date: (1) water systems serving fewer than 10,000 people, (2) systems using only groundwater not under the direct influence of surface water, and (3) TNC water systems serving fewer than 10,000 people which use chlorine dioxide.

In addition to MRDLGs, MRDLs, MCLGs, and MCLs treatment techniques for control of DBP precursors under Stage 1 of the D/DBP Rule will force surface water systems to achieve specific TOC percentage removal levels. These include water systems that practice conventional treatment and softening. The percentage removal required will depend on system's source water TOC and source water alkalinity. Table 6 presents the required removal of TOC by enhanced coagulation. Under the enhanced coagulation requirements of the Stage 1 D/DBP Rule, there are alternative ways to demonstrate compliance.

Stage 2 Disinfectants-Disinfection By-products Rule

The proposed Stage 2 Disinfection By-products Rule (Stage 2 DBPR) may be published in mid-2003. The Stage 2 DBPR would require community water systems to comply with the following additional requirements.

- Those water systems that deliver disinfected water (except by ultraviolet (UV) light) would be required to conduct a year-long Initial Distribution System Evaluation to identify new monitoring sites that represent peak DBP levels over the entire system. Systems with 2 years worth of certified data showing DBP levels always below 40 µg/L of total trihalomethanes and 30 µg/L of five haloacetic acids would not be required to conduct the Initial Distribution System Evaluation.

Table 6 - Required Percent Removal of TOC by Enhanced Coagulation.[1]

	Source Water Alkalinity (mg/L) as Calcium Carbonate ($CaCO_3$)		
Source Water TOC (mg/L)	**0-60 (percent)**	**> 60-120 (percent)**	**> 120 (percent) [2]**
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

Source: AWWA Drinking Water Advisor, May 2002

[1] Systems meeting at least one of the alternative compliance criteria in the rule are not required to meet the removal requirements in this table.

[2] Systems practicing softening must meet the TOC removal requirements in this column.

- No later than 8 years after promulgation, systems would be required to comply with the current standards of 80 µg/L TTHM and 60 µg/L HAA5 at each new site as Locational Running Annual Average values. The change from a systemwide Running Annual Average compliance approach to locational compliance points is intended to ensure that all customers get water that meets DBP standards, which the Running Annual Average approach is unable to guarantee. The ultimate impact of these changes is to make compliance more stringent than under the Stage 1 D/DBP Rule.

- Systems would be required to meet (3 years after promulgation) interim step requirements of Locational Running Annual Average levels of 120 µg/L TTHM and 100 µg/L HAA5 at Stage 1 D/-DBP R monitoring sites while also continuing to comply with the Stage 1 Running Annual Average standards.

- Bromate standard would remain at 10 µg/L but the EPA would consider during a 6-year review whether the standard should be reduced to 5 µg/L or lower.

The Stage 2 DBP Rule would only apply to surface water systems serving 10,000 or more people, potentially affecting Grand Forks and Fargo, North Dakota, and Moorhead, Minnesota.

Interim Enhanced Surface Water Treatment Rule

Under the 1989 Surface Water Treatment Rule, water systems are required to achieve a 3-log reduction in *Giardia lamblia* and a 4-log reduction in viruses. The total reduction of viruses is to be accomplished through physical removal and inactivation, although the 1989 Surface Water Treatment Rule does provide criteria for a system to remain unfiltered. A conventional filtration plant is assumed to achieve 2.5-log removal of *Giardia* cysts and 2.0-log removal of enteric viruses if the plant has been determined to be well operated. When a conventional filtration plant meets the Surface Water Treatment Rule (0.5 NTU turbidity limit in 95 percent of the samples taken each month), it meets operational criteria. After obtaining this credit for physical removal, the 0.5-log *Giardia* cyst and 2.0-log enteric virus inactivation is accomplished by disinfection.

The EPA finalized the Interim Enhanced Surface Water Treatment Rule (IESWTR) on December 16, 1998. The rule applies to surface water systems and groundwater systems under the influence of surface water systems serving more than 10,000 people and represents a further tightening of the 1989 Surface Water Treatment Rule.

The Interim Enhanced Surface Water Treatment Rule (IESWTR) added a requirement that all systems achieve a 2-log reduction in *Cryptosporidium*. The IESWTR lowered the turbidity performance standard to 0.3 NTU in 95 percent of the monthly samples, never to exceed 1 NTU. Systems demonstrate compliance with the 2-log *Cryptosporidium* reduction requirement by meeting the reduced turbidity performance standard.

Under the IESWTR, therefore, all surface water systems in the Red River Valley serving over 10,000 people are required to meet a new turbidity limit of 0.3 NTU in 95 percent of samples taken from the combined filter effluent each month, never to exceed 1 NTU.

The IESWTR established a requirement that certain systems determine a microbial benchmark. This benchmark represents the actual level of inactivation being achieved by the utility under prescribed conditions. As described in the IESWTR, when these systems are considering a significant change in their disinfection practice (e.g., to comply with the Stage 1 D/DBP Rule), they must use the microbial benchmark in discussions with the state to assess how the proposed change in disinfection would impact current levels of inactivation.

In addition, under the IESWTR, water systems must monitor individual filters for turbidity. If an individual filter is not performing as described under the IESWTR, the cause must be investigated by the utility and be reported to the state. This can range from a simple plotting of the turbidity data to a full-scale evaluation of the utility and its operation and maintenance procedures.

Disinfection effectiveness under the IESWTR is measured by the CT concept, where C is the disinfectant residual in mg/L and T is the disinfectant contact time in minutes. CT requirements are dependent on the disinfectant type, pH, temperature of the water, and disinfectant residual. The CT concept was first introduced in the 1989 Surface Water Treatment Rule as a means of assessing the inactivation achieved for *Giardia* and viruses.

Long-Term 1 Enhanced Surface Water Treatment Rule

The final Long-Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) was published on January 14, 2002. The rule applies to surface water systems and groundwater systems under the direct influence of surface water systems serving less than 10,000 people. The LT1ESWTR builds off of the IESWTR and contains four categories of specific requirements.

2-log Crytosporidium removal is achieved by having a combined filter effluent turbidity of less than or equal to 0.3 NTU in at least 95 percent of measurements taken each month, never to exceed 1 NTU. Systems must be in compliance by January 11, 2005.

Enhanced filtration requirements also require that the turbidity level in each representative sample not exceed 1.0 NTU and that each filter is continuously monitored with a reading every 15 minutes. The water system must report their turbidity reading to the primary agency every month. Systems must be in compliance by January 11, 2005.

CWS and NTNC water systems must evaluate impacts on microbial risk before changing disinfection practices by benchmarking microbial inactivation of *Giardia*, including collecting data on disinfection residual concentration, water temperature, pH, and contact time data once per week on the same calendar day for 52 weeks. Systems using chloramines, ozone, or chorine dioxide for primary disinfection must also calculate inactivation of viruses. A state may deem a profile unnecessary under certain circumstances. Compliance dates are July 1, 2003 – July 1, 2004 for systems with more than 500 people and January 1, 2004 – January 1, 2005 for systems with less than 500 people.

All new water reservoirs constructed after March 15, 2002, must be covered. Unfiltered water systems must meet updated watershed control requirements. There are no uncovered water reservoirs in the Red River Valley. The compliance date for this rule is January 14, 2005.

Long-Term 2 Enhanced Surface Water Treatment Rule

The Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) will be proposed in 2003. Under LT2ESWTR all large and medium systems serving over 10,000 population that filter surface water or use groundwater under the direct influence of surface water would conduct an initial 2-year round of source water monitoring to characterize *Cryptosporidium* occurrence using EPA Method 1622/23 with no less than 10L samples. The results would determine into which of four treatment technique compliance "bins" a system is placed. Systems could avoid such monitoring, however, if they have at least 2 years of *Cryptosporidium* data that is "equivalent in sample number, frequency, and quality (e.g. volume analyzed and percent recovery) to data that would be collected" under LT2ESWTR for bin classification purposes. Also, systems would be exempt from LT2ESWTR's initial monitoring for bin classification if they would provide *Cryptosporidium* treatment equivalent to Bin 4 (2.5 log treatment, including inactivation), in addition to conventional treatment required under the IESWTR.

Systems serving fewer than 10,000 people (small systems) would begin 1 year of source water monitoring for *E. coli* 2 years after larger systems (serving greater than 10,000) start their *Cryptosporidium* monitoring. Small systems would then have to monitor for *Cryptosporidium* if their *E. coli* levels exceed certain trigger levels.

Based on bin type, a system may need to provide additional treatment for the reduction of *Cryptosporidium*. The following presents the bin classifications in the draft LT2ESWTR and the associated *Cryptosporidium* level.

- (Bin 1) *Cryptosporidium* less than 0.075 oocysts per liter would require no further action;
- (Bin 2) *Cryptosporidium* concentration greater than 0.075 oocysts per liter but less than 1.0 oocysts per liter would require 1-log additional reduction;
- (Bin 3) *Cryptosporidium* concentration greater than 1.0 oocysts per liter but less than 3.0 oocysts per liter would require 2.0 additional log reduction (with 1-log through inactivation);
- (Bin 4) *Cryptosporidium* concentration greater than 3.0 oocysts per liter would require 2.5 log additional reduction (again with one log through inactivation).

If a system is classified in a “bin” requiring *Cryptosporidium* reduction, this would require reduction in addition to what is required and being achieved under the IESWTR.

Inactivation for *Cryptosporidium* for purposes of the above treatment requirements would be defined to include ozone, chlorine dioxide, UV, membranes, bag/cartridge filters and in-bank filtration. There would be a toolbox of management and treatment approaches included in the LT2ESWTR for meeting the required *Cryptosporidium* log reduction requirements.

Three years after the final regulation is published, uncovered, finished water reservoirs must be covered, or the effluent from the uncovered finished water reservoir must be treated to achieve a 4-log virus inactivation, or the state must determine that existing risk mitigation activities are adequate.

In the deliberations associated with development of Stage 2 DBPR, the EPA went on record supporting the use of UV light to inactivate *Cryptosporidium*. While still an unfamiliar technology among U.S. water suppliers and state regulators, it has quickly emerged as the best new technology for inactivating pathogens while producing no DBPs.

Filter Backwash Rule

The Filter Backwash Recycle Rule (FBRR) was approved as a final rule on June 8, 2001, by the EPA. The FBRR requires returning backwash water to the head of the treatment plant. FBRR applies to public water systems that use surface water or ground water under the direct influence of surface water to practice conventional or direct filtration, and to recycle spent filter backwash, thickener supernatant, or liquids from dewatering processes.

Ground Water Rule

SDWA, as amended, requires the EPA to develop regulations specifying the use of disinfectants for groundwater systems "as necessary." To meet these requirements, EPA worked with stakeholders to develop the Ground Water Rule (GWR), which was proposed in May 10, 2000. EPA had hoped to finalize the GWR by the end of 2000, so that the compliance dates would match the Stage 1 D/DBPR, but the agency has yet to send the final rule to the Office of Management and Budget for review. It will probably be the last of the pending rules to be finalized. Publication of the final rule is not expected until mid- to late-2003.

The proposed rule would establish multiple barriers to protect against bacteria and viruses in groundwater supplies and would establish a targeted strategy to identify groundwater systems at high risk for fecal contamination. The proposal would apply to all public groundwater systems that have at least 15 service connections or regularly serve at least 25 individuals daily for at least 60 days out of the year. This potentially would affect all public water systems that use groundwater in the Red River Valley. The GWR also would apply to any system that mixes surface water and groundwater if groundwater is added directly to the distribution system and provided to consumers without treatment. The proposal would not apply to privately owned wells.

The proposed rule includes the following major components:

- System sanitary surveys would be conducted by the state to identify significant deficiencies. The surveys would be every 3 years for community systems and every 5 years for noncommunity systems;

- One-time hydrogeologic sensitivity assessments by states for undisinfected systems that do not provide 4-log virus inactivation/removal;

- Monthly source water microbial monitoring by systems that do not disinfect and draw from hydrogeologically sensitive aquifers or one time monitoring if fecal indicators within the system's distribution system have been detected;

- Corrective action within 90 days or on a state-approved schedule by any system with significant deficiencies or positive microbial samples indicating fecal contamination; and

- Compliance monitoring for systems that disinfect to ensure that they reliably achieve 4-log inactivation or removal of viruses. The schedule would be once daily for systems serving under 3,300 people and continuously for larger systems.

Generally, the proposed rule would gather utilities into the groundwater treatment technique requirements through a multitude of triggers, including sanitary surveys and microbial monitoring. The treatment technique requirements would correct the deficiency, provide an alternative source, and/or provide 4-log virus inactivation. The development of this final regulation will be very contentious and hotly debated, due to a lack of data.

Arsenic Rule

The new Arsenic Rule was promulgated on January 22, 2001, and made final on October 31, 2001. The new rule lowered the MCL from 50 µg/L to 10 µg/L. The effective date of the 10 µg/L MCL for arsenic was February 22, 2002. The new standard is in effect legally, as well as for purposes of Consumer Confidence Report requirements. The compliance deadline is January 23, 2006, for all public water systems; however, extensions are available to water systems under a number of different circumstances.

Monitoring requirements for the revised arsenic MCL will be consistent with the Standardized Monitoring Framework adopted by EPA under the Phase II/V regulations. This means that all surface water systems must complete monitoring for determining compliance with the revised arsenic MCL by December 31, 2006, and all ground water systems must complete monitoring for determining compliance with the more stringent MCL by December 31, 2007. This lower limit could be significant in the Red River Valley because a number of existing water systems served by groundwater have arsenic levels above the 10 µg/L level.

Radon Rule

The Radon Rule was first proposed by the EPA in 1991, but it was delayed due to concern over the effects of the rule. EPA republished a revised Radon Rule on November 2, 1999. EPA currently proposes a MCL maximum contaminant level of 300 pCi/L and an alternative MCL of 4,000 pCi/L, which are applicable only to community water systems. The proposal also would set a maximum contaminant level goal of zero for radon.

Originally, EPA considered a MCL of 100 pCi/L to be feasible for treating radon, but cost and benefit considerations compelled the agency to propose the less-stringent standard. Nationwide, and probably higher in the Red River Valley, an estimated 39 percent of community groundwater systems are expected to exceed the MCL. The proposal also would designate high-performance air stripping, granular activated carbon, and point-of-entry granular activated carbon units as compliance technologies for small systems.

However, the proposal allows systems to avoid complying with the MCL and instead comply with the alternate MCL, if they would participate in a state-run multimedia mitigation program or would run their own multimedia mitigation program. Such programs would have to:

- Include public involvement during their development,
- Set quantitative goals for mitigating the overall radon risk in existing and new homes,
- Identify strategies for meeting those goals, and
- Track and report progress.

In reference to the Red River Valley, it should be noted that an alternative standard would be difficult, because the North Dakota Department of Health is not developing a state Multi Media Mitigation Plan. Interested systems would need to develop and receive approval for their own plans. EPA is expected to promulgate the final radon rule regulations in late 2003. However, potential legislative activity could further delay or change the final rule.

Sulfate Rule

Sulfate is listed on the EPA's drinking water Contaminant Candidate List (CCL) which was published March 1998. Under the 1996 amendments to the SDWA, EPA was to include sulfate in a group of five or more contaminants from the CCL and would determine whether or not a regulation was appropriate. During 2002 EPA published preliminary determinations that regulations for nine constituents from the CCL, including sulfate, were not warranted. EPA indicated that they may develop an advisory for sulfate. Final determinations should be published sometime in 2003.

This could be a significant regulatory issue for water systems in the Red River Valley because of the relatively high sulfate levels in Red River Valley groundwater. This could also be a problem in the Sheyenne River if an outlet to Devils Lake would be constructed. Present operational plans for the outlet include limiting sulfate level to 450 mg/L, which is very close to the proposed 500 mg/L MCL.

National Secondary Drinking Water Regulations

NSDWR have been promulgated to regulate chemicals that affect the aesthetic qualities of water such as taste, odor, and appearance. EPA recommends secondary standards to water systems but does not require systems to comply. Secondary standards address such constituents as aluminum, chloride, color, copper, corrosivity, fluoride, foaming agents, iron, manganese, odor, pH, silver, sulfate, total dissolved solids and zinc. The current NSCWR standards are listed on the EPA website at http://www.epa.gov/safewater/mcl.html#sec.

Future Regulations or Rules

The following regulations or rules have not been proposed formally by EPA, but they could eventually have an impact on operation of water systems. The next section of the report will identify whether any or all of these water quality or treatment concerns listed below are included in the Red River Valley water system assessments.

Distribution System Water Quality

The Federal Advisory Committee Act (FACA) committee that met during 1999-2000 for the development of the Stage 2 DBP Rule and the LT2ESWTR recommended that "EPA should

review and evaluate available data and research on those aspects of distribution systems that may create or pose risks to public health….The FACA committee also concluded that, with this evaluation, EPA should initiate a process with stakeholder participation for addressing requirements for cross-connection control and backflow prevention, and distribution systems issues related to significant health risks."

On August 2001, EPA released nine "white papers" addressing various aspects of drinking water distribution systems. These white papers represent the beginning of EPA's effort to develop a distribution system regulation. The topics for the nine white papers are:

- Intrusion
- Cross-connection control
- Aging infrastructure and corrosion
- Permeation and leaching
- Nitrification
- Biofilms/growth
- Covered storage
- Decay in water quality over time
- New or repaired water mains

While it is early in the process for the development of a distribution system rule, the following list includes the types of activities that utilities may need to implement or investigate under a distribution system rule.

- Determine distribution system operation and water quality goals
- Monitor operation and water quality performance
- Conduct hydraulic monitoring and modeling
- Eliminate dead ends and prioritize rehabilitation/replacement projects to address water quality
- Develop an understanding of distribution system storage facility operation, including tank/reservoir turnover and mixing issues
- Maintain cross-connection control and backflow prevention programs
- Minimize distribution system detention time
- Keep system clean (unidirectional flushing)
- Implement corrosion control programs

Small Surface Water Treatment – Microbial Control

In the future EPA will require that advanced treatment technologies be employed in all surface water treatment plants, including water systems serving less than 500 people. This is not required now or proposed, but this is the direction EPA is headed regarding microbial control.

Disinfection of Groundwater for all Water Systems

In the future EPA will require disinfection of all water systems using groundwater, even if they have no history of microbial problems.

SUMMARY OF CURRENT AND FUTURE SDWA REGULATIONS OF CONCERN

The Needs and Options Report will assess Red River Valley MR&I systems to determine if any have current or future water quality needs. These water quality needs are actually deficiencies that will be documented in the Needs and Options Report and addressed in Red River Valley Water Supply Project alternatives. In some cases an alternative raw water supply or an alternative treated source of water will be included as a feature in an alternative to address a water quality problem. Table 7 lists the major SDWA regulations or standards that will be used to evaluate the MR&I systems in the Red River Valley. These standards will include both current and proposed standards if there is a high likelihood that a current standard will be modified in the future.

NSDWR are not included in Table 7 because they are not enforceable by the EPA. These will be evaluated during water system assessments to determine if individual water systems have any specific cosmetic (such as skin or tooth discoloration) or aesthetic (such as taste, odor, or color) water quality concerns. Sulfate was specifically discussed in the previous section, but is not included in Table 7. Sulfate will be evaluated with the other the other secondary standards, as discussed.

Distribution system water quality is a potential regulatory issue on the horizon; however, it is very early in the development process. Therefore, the potential water quality concerns will not evaluated in the water system assessments. The Red River Project is primarily a water supply project. Replacement of existing distribution systems is outside the scope of the project. Microbial control in small surface water systems through advanced treatment and disinfection in all groundwater water systems will be required and included in the water system assessment process.

Generally, MR&I water systems will be evaluated based on the MCLs and the treatment techniques listed in Table 7. MR&I systems which do not meet one or more of the listed standards will require some type of corrective action. The rules listed below also include requirements for monitoring, testing, and reporting water quality. While these actions increase the operational costs of MR&I systems, they are not a capital cost and will not be documented in the study.

Table 7 - Summary of Current and Future SDWA Regulations of Concern

Rule or Contaminant	Final Rule or MCL	Proposed Rule or MCL	Rule or MCL to be used in the Needs and Options Report
National Primary Drinking Water Regulations - General Inorganic Chemicals Organic Chemicals Radionnuclides Microorganisms Disinfectants Disinfection By-products	Final	None	Current rule
Interim Enhanced Surface Water Treatment Rule	Final as of December 16, 1998	Proposed Rule 1994	Current rule or more stringent requirement in subsequent rule
Long-Term 1 Enhanced Surface Water Treatment Rule	Final as of January 14, 2002	None	Current rule or more stringent requirement in subsequent rule
Long-Term 2 Enhanced Surface Water Treatment Rule	None	Mid 2003	None
Stage 1 Disinfectants-Disinfection By-products Rule	Finals as of December 16, 1998	Proposed Rule 1994	Current rule or more stringent requirement in subsequent rule
Stage 2 Disinfectants-Disinfection By-products Rule	Final rule anticipated mid - 2003	Proposed Rule – anticipated mid-2002	Use Stage 2 Disinfectants-Disinfection By-products Rule as proposed
Final Non-Radon Radionuclides Rule	Final as of December 7, 2000	None	Current rule
Radon Rule	Proposed November 2, 1999	Final Rule – Late 2003	Use Radon Rule as proposed
Final Arsenic NPDWR Revision	Final as of January 22, 2001	None	Current rule
Ground Water Rule	Proposed May 10, 2000	Final Rule – mid to late 2003	Assume all MR&I Systems required to disinfect
Filter Backwash Recycle Rule	Final as of June 8, 2001	Proposed Rule 2000	Current rule

Source: AWWA Drinking Water Advisor, May 2002