

Executive Summary

General

The Auburn Water District (AWD) and Lewiston Water Division (LWD) provide drinking water obtained from Lake Auburn to their customers. In 1989, EPA promulgated new drinking water regulations called the Surface Water Treatment Rule (SWTR). For the first time, the SWTR mandated filtration of all surface water supplies except under certain conditions. If the required conditions were met or could be met, then a waiver of filtration could be obtained. AWD/LWD qualified for a waiver and have operated for over 10 consecutive years successfully meeting the filtration waiver requirements. This success is based on utilization of a high quality water supply and maintenance of a high degree of watershed control.

Now, a new series of regulations are on the horizon that will have a significant impact on AWD and LWD, similar to the impact of the SWTR regulations promulgated in 1989. These new regulations – termed the Stage 2 Disinfectants/Disinfection Byproducts Rule and the Long Term 2 Enhanced Surface Water Treatment Rule – are anticipated to be final in January 2006, and to take effect in 2012.

This study will position AWD/LWD so that proper planning and budgeting for any needed improvements required to meet the new regulations can be performed in a timely manner. A key aspect of the evaluation is to assess current water quality trends and the likelihood that the criteria for maintaining a filtration waiver, based on current and anticipated regulations, can be met over the planning horizon (20-25 years). Accordingly, if new facilities are required, they will not become obsolete before they have reached their useful life.

This study on the long-term compliance for AWD/LWD includes:

- Updated water demand projections for AWD and LWD for the year 2025.
- A water quality assessment.
- An evaluation of regulatory compliance specifically focusing on the anticipated future drinking water regulations.
- A treatment alternatives evaluation, to ensure compliance with these future regulations.
- A conceptual cost comparison evaluation for each of the treatment alternatives including non-filtration and filtration options.
- A recommended plan and schedule.

Water Demand Projections

Although recent historical growth trends in water demand have been level or declining, both communities have been actively planning commercial and industrial expansion and expect that the resultant new growth in jobs may also result in an increase in population and water demand. Accordingly, for 2025 projections, to be used for preliminary planning needs and not facility design purposes, it was the consensus of AWD and LWD staff that an approximate 1.0 percent average annual growth rate for water consumption should be used up to year 2025. For this study, water demand projections for AWD/LWD were combined to represent the total demand for both communities. Accordingly, estimated future average day demand and maximum day demand estimates for both systems are 10.4 mgd and 16.9 mgd (See Table 2-3), respectively.

Source Water Quality

There are numerous water quality, reporting, watershed and site specific criteria under the SWTR that must be met in order to maintain a waiver of filtration. Two key source water quality conditions relate to coliform and turbidity as follows:

- Coliform levels at the point of withdrawal at Lake Auburn must be less than 20 per 100 ml (20/100 ml) as fecal coliform or less than 100/ml as total coliform in 90% of the measurements made each month for the previous six months as a running average.
- For turbidity, the levels at the point of withdrawal at Lake Auburn must not exceed 5 NTU for more than two events per year and not more than 5 events in ten years. The primary agency may waive a turbidity event if it determines that the event or the circumstances leading to the event exceeding 5 NTU are unusual and unpredictable.

A review of AWD/LWD source water quality data indicates that the above criteria has been consistently met with one exception. For the six month running average for the period ending December 31, 2004, AWD/LWD were 87% compliant with respect to source water coliform; this was below the 90% criteria required for compliance. The latter violation of drinking water requirements could result in the requirement to filter the Lake Auburn supply. Since the occurrence, AWD/LWD have been implementing an action plan to identify and mitigate the source(s) of fecal contamination.

Distribution Water Quality

The SWTR has disinfection and site specific criteria that must be met to maintain a waiver of the filtration requirement. The disinfection criteria include:

- Meeting a CT criteria that results in the inactivation of 99.9% (3-log) of *Giardia* and 99.99% (4-log) of viruses prior to the first customer.

- Maintaining a point of entry disinfectant residual (free chlorine) of 0.2 mg/l or greater.
- Maintaining a detectable chlorine residual in the distribution system.
- Maintaining redundant chlorination equipment or automatic supply shut off capability.

A review of the AWD/LWD data has shown a consistent compliance with all of the above criteria. In addition, there are site specific conditions and other SDWA criteria in the distribution system that must be met including:

- Compliance with the Total Coliform Rule.
- Compliance with the Disinfection Byproduct Regulations.

The current stage 1 disinfection byproduct rule as it applies to AWD/LWD requires that representative quarterly samples at sites in the distribution system not exceed 80 ppb as Trihalomethanes (THMs) and 60 ppb as HAAs as a running system-wide average of the preceding four quarters.

- Compliance with the Lead and Copper Rule.

A review of the AWD/LWD distribution system water quality data has shown a consistent compliance with all of the above criteria with the exception of a short period of time in the AWD system when the running quarterly annual average for Haloacetic Acids (HAAs) exceeded the 60 ppb limit for this parameter. As a result of the difficulty in meeting the HAA criteria, AWD converted to the use of chloramines as a secondary disinfectant (distribution system only) near the end of 2003. The positive impact of this change can be seen in Figure 2-5.

LWD is the process of constructing facilities to implement a conversion to chloramines in early 2006. LWD's HAA levels have been approaching the 60 ppb limit. It is expected, however, that the conversion to chloramines in LWD will result in significantly lower HAAs and a small reduction in THMs.

CDM performed a review of Auburn's lead and copper compliance data and corrosion control practices given that the Auburn Water District has recently undergone the conversion to chloramines for control of disinfection by-product formation. A technical memorandum summarizing the findings and recommendations is included as Appendix A.

Future Water Quality Regulations

As required by the 1996 Safe Drinking Water Act (SDWA) Amendments, EPA has been developing a series of interrelated regulations to control microbial pathogens

and disinfection byproducts (DBP) in drinking water. These regulations have collectively come to be called the microbial/disinfection byproducts (M/DBP) rules.

The next set of rules to be issued by the EPA for surface water systems are the Stage 2 Disinfectant/Disinfection Byproducts Rule (Stage 2 D/DBPR) and the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). In January 2006, the final version of these rules will be promulgated in tandem, like the 1998 Stage 1 Disinfectants/DBP Rule (D/DBPR) and Interim Enhanced Surface Water Treatment Rule (IESWTR), in order to balance the risks between microbial pathogens and DBPs.

The status of AWD/LWD with respect to the new Stage 2 D/DBPR and LT2ESWTR rules is shown in table below.

Regulation	Regulation Status	Specific Provision	AWD and LWD Status
Stage 2 Disinfectants / Disinfection Byproducts Rule (D/DBPR2)	<ul style="list-style-type: none"> Proposed by USEPA on August 18, 2003 Final Jan. 2006 (Est.) Anticipate Compliance Required by 2012-2014 	<ul style="list-style-type: none"> Initial Distribution System Evaluation (IDSE) required – requires selection of new sites to assure critical TTHM and HAA5 locations are captured. Rule features same DBP levels but for a Locational Running Annual Average (LRAA). 	<ul style="list-style-type: none"> Auburn and Lewiston will likely comply with this regulation based on existing sites/trends and use of chloramines.
Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)	<ul style="list-style-type: none"> Proposed by USEPA on August 11, 2003 Final Jan. 2006 (Est.) Anticipate Compliance Required by 2012-2014 	<ul style="list-style-type: none"> A treatment technique rule – establishes removal and/or inactivation requirements for <i>Cryptosporidium</i>. 	<ul style="list-style-type: none"> AWD/LWD has been collecting data on <i>Cryptosporidium</i> – none detected to date. Source water monitoring will determine which “bin” AWD and LWD will fall into as a filtered supply and what level of <i>Cryptosporidium</i> inactivation required as an unfiltered supply.

Alternatives Evaluation

As discussed above, compliance with the new Stage 2 D/DBPR is anticipated based on both AWD and LWD utilizing chloramines as a secondary disinfectant.

Accordingly, no further evaluation is required regarding the latter rule. For the LT2 ESWTR, however, there is a requirement for unfiltered supplies to use two primary disinfectants to inactivate *Cryptosporidium*. Alternately, filtration could also be provided as an approach to compliance. Therefore, since the current treatment with chlorine alone will not be sufficient, compliance with the LT2 ESWTR will require an alternatives evaluation to determine the new treatment process required. The screening and comparison of alternatives for both non-filtration and filtration options are discussed below.

Non-Filtration Options

CDM established various combinations of disinfectants for meeting the treatment requirements (Note: more than one primary disinfectant is required for unfiltered supplies). In a series of tables (Tables 4-2 to 4-5), the three primary disinfectants, ultraviolet light (UV), ozone (O), or chlorine dioxide (CD) were screened for meeting

the *Cryptosporidium* treatment requirement. Several alternative disinfectant combinations were eliminated in the first round of screening based on meeting certain threshold criteria. The remaining viable alternatives were compared in a second round of screening to determine advantages and disadvantages for use with the existing Auburn and Lewiston systems including cost. In addition, to provide an equal basis for comparing the capital and annual costs for each alternative, present worth costs were developed.

From the screening process, alternative UVP-1B emerged as the preferred alternative. It makes use of a new UV system to provide 2-log *Cryptosporidium* inactivation and 2-log *Giardia* inactivation while the existing transmission mains and chlorine completes the treatment by providing for 1-log *Giardia* inactivation and 4-log virus kill. Accordingly, Alternative UVP-1B is the most cost effective process while also reducing the chlorine amounts; thus reducing DBP formation as well.

Filtration Options

Another option for compliance with the LT2 ESWTR is to provide filtration. The filtered water quality is at a higher level than the unfiltered water quality; thus a direct comparison to non-filtration options would be misleading. After an initial screening based on lake water quality, two primary types of filtration technologies are presented: direct filtration with deep-bed gravity filters (Alternatives D-1 and D-2) and membrane filtration (Alternative M-1). Among the filtered options, membrane filtration option, M-1 offers a clear capital and O&M advantage over the direct filtration with ozone options D-1 and D-2.

Recommendations

As previously discussed, the preferred alternative for achieving compliance with the LT2 ESWTR is UVP-1B. Under UVP-1B, the conversion to chloramines would still be accomplished at the existing facilities at the end of the transmission mains. However, the UVP-1B alternative does not meet all the needs of AWD with regard to facilities planning. Instead, AWD would prefer to convert to chloramines at or near their pumping station at Lake Auburn and eliminate the existing chloramination facilities at the Auburn Water Office Garage at the end of the transmission main. In addition, this would also allow AWD's transmission main to be used for distribution of water to customers; it would no longer be used for treatment. LWD is currently installing their facilities for chloramination (under construction) at the Main Street Pumping Station at the end of their transmission main. Accordingly, to serve the needs of both communities, the recommendation is to combine Alternatives UVP-1A and UVP-1B, thus forming Alternative UVP-1A/B.

In combining the two alternatives, LWD and AWD would share in the new UV and chemical facilities at Lake Auburn. AWD would build a baffled contact tank at Lake Auburn and then convert free chlorine to chloramines before water is conveyed from the site. LWD would continue to use their transmission main for chlorine contact

time (1-log Giardia inactivation and 4-log virus inactivation) and convert free chlorine to chloramines at the end of their transmission main at the Main Street Pumping Station. In addition, the new joint facilities would be constructed to include chemical rooms, a laboratory, office space, a conference room, electrical, low lift pumping and process equipment, and supplemental standby power (supplementing the existing standby power), as well as space for additional chemicals and a contact tank should LWD choose in the future to move their chloramination operation to the Lake Auburn treatment facility.

An opinion of probable construction costs has been prepared based on the conceptual design presented in Table 5-1 and the treatment schematic outlined in Figure 5-1. The conceptual project construction cost estimate in 2005 dollars (ENR 7355 - April 2005) for the treatment facilities is approximately \$5.5 million with an additional \$1.4 for engineering services for a total project cost of \$6.9 million. The cost of land or easements has not been included.

Future Filtration

It is probable that someday changes in regulations or lake water quality might require filtration of Lake Auburn water. Accordingly, it would be prudent to consider how the addition of future filtration would fit into the recommended Alternative UVP-1A/B. Membrane filtration is by far the lowest cost alternative for the filtration treatment of Lake Auburn water. Membrane filtration can be added as a unit process in the process train for Alternative UVP-1A/B as shown in Figure 5-2.

Although the add-on of membrane filtration will certainly result in a large capital expenditure, reuse of the low lift pumping, chemical storage facilities, laboratory and administration building constructed under Alternative UVP-1A/B would reduce the overall cost of a new filtration facility. The membrane filtration construction costs were estimated between \$25.4 and \$33.8 million in 2005 dollars. These numbers, developed based on typical unit costs per million gallons, are conservative for preliminary budgeting purposes. The total project cost would be approximately \$30 to \$40 million with engineering. It is estimated the reuse of facilities from Alternative UVP-1A/B would reduce the membrane filtration construction cost by \$4.08 million (2005) dollars.

Implementation Schedule

The proposed implementation schedule for treatment facilities for AWD and LWD includes proceeding with preliminary design, final design and construction phases. The objective of the schedule would be to comply with the anticipated timetable of the LT2ESWTR. The rule requires a *Cryptosporidium* monitoring report two years after the rule's promulgation and implementation (compliance) 6 years after the rule's promulgation. The recommended schedule would begin preliminary design in July 2006 and complete construction and startup by July 2010, 18 months ahead of the January 2012 compliance date.