CHAPTER 3
REGULATORY REVIEW

Introduction

This chapter provides a general overview of current drinking water regulations under the Oregon Drinking Water Quality Act (OAR 333-061 – Rules for Public Water Systems), as well as anticipated future regulations. The discussion of each regulation is followed by an assessment of historic compliance, or in the case of future regulations, anticipated compliance. Recommended process and monitoring improvements to ensure continued compliance with all existing and anticipated regulatory requirements are discussed where appropriate. This regulatory summary is current as of April 2013. The City WTP is rated by the OHA as a conventional filtration plant. The WTP has been able to successfully produce water that has met all past and current drinking water regulations and also has met the needs of the City of Grants Pass customers.

Review of Current and Future Regulations

Currently enforced national drinking water regulations that have implications for Grants Pass are listed below:

- National Primary Drinking Water Regulations (1975)
- National Secondary Drinking Water Regulations (Secondary Standards) (1979, 1991)
- Phase I, II, and V Regulations for inorganic contaminants, synthetic organic compounds, and volatile organic compounds (1987, 1991, 1992, respectively)
- Surface Water Treatment Rule (1989)
- Interim Enhanced Surface Water Treatment Rule (1999)
- Long Term 2 Enhanced Surface Water Treatment Rule (2006)
- Total Coliform Rule (1989)
- Lead and Copper Rule (1991); being amended in 2013
- Consumer Confidence Reports Rule (1998)
- Stage 1 Disinfectants/Disinfectant By-Product Rule (1998) – supersedes Total Trihalomethane Rule (1979)
- Stage 2 Disinfectants/Disinfectant By-Product Rule (2006)
- Unregulated Contaminants Monitoring Rule 1 (1999) and 2 (2006) and 3 (2012)
- Radionuclides Rule (2000)
- Arsenic Rule (2001)
- Filter Backwash Recycle Rule (2001)

With the exception of the Unregulated Contaminants Monitoring Rule (UCMR), the water quality standards established under these national regulations have been or are planned to be adopted into the Oregon Drinking Water Quality Act (OAR 333-061) by the OHA Drinking Water Program. In addition to implementation, OHA is responsible for enforcing these

national water quality standards. If a system is found to be in violation, OHA will issue a Notice of Violation. If violations are accumulated, the system is considered a "significant non-complier." An administrative order is issued for monitoring violations or a remedial order is issued where plant improvements are required. A schedule for compliance is included in the order. If the schedule is not met, civil penalties are issued, usually in the form of fines. Enforcement of the UCMR is the responsibility of the U.S. EPA.

There are currently drinking water quality standards for 95 primary and 12 secondary contaminants in the State of Oregon (State). Under the Oregon Drinking Water Quality Act, each contaminant has either an established MCL or recommended treatment technique. These contaminants are grouped into the following general categories:

- Inorganic Contaminants,
- Organic (Synthetic and Volatile) Compounds,
- Radiologic Contaminants,
- Disinfectants and Disinfection Byproducts,
- Microbial Contaminants, and
- Secondary Contaminants.

Table 3-1 summarizes the primary and secondary drinking water contaminants regulated under the Oregon Drinking Water Quality Act found in Oregon Administrative Rule 333-061-0030. Some contaminants have a recommended treatment technique in lieu of an MCL. The following is a discussion of these state-regulated contaminants, as well as the federally monitored unregulated contaminants.

Table 3-1
Maximum Contaminant Levels and Action Levels

Contaminant	MCL[1]	Sampling Frequency
Inorganic Contaminants		
Antimony	0.006	Annually
Arsenic	0.01	Annually
Asbestos (fibers >10µm)	7 MFL	9 years
Barium	2.0	Annually
Beryllium	0.004	Annually
Cadmium	0.005	Annually
Chromium (total)	0.1	Annually
Copper	1.3[2]	See text
Cyanide	0.2	Annually
Fluoride	4.0	Annually
Lead	0.015[2]	See text
Mercury	0.002	Annually

Table 3-1 (continued)

Nickel	0.1[3]	Annually
Nitrate (as N)	10.0	Annually
Nitrate and Nitrite (as N)	10.0	Annually
Nitrite (as N)	1.0	Annually
Selenium	0.05	Annually
Thallium	0.002	Annually
Synthetic Organic Compounds		
Acrylamide	TT	Annually, if applicable
Alachlor	0.002	Twice in 3 years
Atrazine	0.003	Twice in 3 years
Benzo(a)pyrene (PAHs)	0.0002	Twice in 3 years
Carbofuran	0.04	Twice in 3 years
Chlordane	0.002	Twice in 3 years
2,4-D	0.07	Twice in 3 years
Dalapon	0.2	Twice in 3 years
Di (2-ethylhexyl) adipate	0.4	Twice in 3 years
Di (2-ethylhexyl) phthalate	0.006	Twice in 3 years
Dinoseb	0.007	Twice in 3 years
Diquat	0.02	Twice in 3 years
Endothall	0.1	Twice in 3 years
Endrin	0.002	Twice in 3 years
Epichlorohydrin	TT	Annually, if applicable
Ethylene dibromide (EDB)	0.00005	Twice in 3 years
Glyphosate	0.7	Twice in 3 years
Heptachlor	0.0004	Twice in 3 years
Heptachlor epoxide	0.0002	Twice in 3 years
Hexachlorobenzene	0.001	Twice in 3 years
Hexachlorocyclopentadiene	0.05	Twice in 3 years
Lindane	0.0002	Twice in 3 years
Methoxychlor	0.04	Twice in 3 years
Oxamyl (Vydate)	0.2	Twice in 3 years
Pentachlorophenol	0.001	Twice in 3 years
Picloram	0.5	Twice in 3 years
Polychlorinated biphenyls (PCBs)	0.0005	Twice in 3 years
Simazine	0.004	Twice in 3 years
2,3,7,8-TCDD (Dioxin)	0.00000003	Risk dependent
Toxaphene	0.003	Twice in 3 years
2,4,5-TP (Silvex)	0.05	Twice in 3 years
Volatile Organic Compounds		
Benzene	0.005	3 years
Carbon tetrachloride	0.005	3 years
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	3 years

Table 3-1 (continued)

p-Dichlorobenzene	0.075	3 years
o-Dichlorobenzene	0.6	3 years
1,2-Dichloroethane	0.005	3 years
1,1-Dichloroethylene	0.007	3 years
cis-1,2-Dichloroethylene	0.07	3 years
Chlorobenzene	0.1	3 years
Dichloromethane	0.005	3 years
1,2-Dichloropropane	0.005	3 years
Ethylbenzene	0.7	3 years
Styrene	0.1	3 years
Tetrachloroethylene (PCE)	0.005	3 years
Toluene	1	3 years
1,2,4-Trichlorobenzene	0.07	3 years
1,1,1-Trichloroethane	0.2	3 years
1,1,2-Trichloroethane	0.005	3 years
Trichloroethylene	0.005	3 years
Vinyl chloride	0.002	3 years
Xylenes (total)	10	3 years
Radionuclides		
Gross alpha	15 pCi/L	4 years
Beta particle/photon activity	4 mrem/yr	4 years
Iodine - 131	3 pCi/L	4 years
Radium-226 + 228	5 pCi/L[3]	4 years
Strontium 90	8 pCi/L	4 years
Tritium	20,000 pCi/L	4 years
Disinfectant Residuals and Disinfection Byproducts		
Bromate	0.01	Quarterly
Chlorite	1.0	Quarterly
Haloacetic Acids	0.06	Quarterly
Dichloroacetic Acid	–	–
Trichloroacetic Acid	–	–
Total Trihalomethanes	0.08	Quarterly
Bromodichloromethane	–	–
Bromoform	–	–
Chloroform	–	–
Dibromochloromethane	–	–
Microbial Contaminants		
Giardia lamblia	TT	–
Cryptosporidium	TT	–
Legionella	TT	–
Heterotrophic plate count	TT	–
Turbidity	TT	See text
Viruses	TT	–

Table 3-1 (continued)

Total Coliform (TC)	< 5% positive	40/month
Fecal Coliform	Confirmed Presence	–
E. Coli	Confirmed Presence	If Total Coliform Test Positive
Secondary Standards		
Color (Color Units)	15	–
Corrosiveness	Noncorrosive	–
Foaming Agents	0.5	–
pH	6.5 to 8.5	–
Hardness (as $CaCO_3$)	250	–
Odor	3 TON[4]	–
Total Dissolved Solids	500	–
Aluminum	0.05 to 0.2	–
Chloride	250	–
Copper	1	–
Fluoride	2.0	–
Iron	0.3	–
Manganese	0.05	–
Silver	0.1	–
Sulfate	250	–
Zinc	5.0	–

Notes
1. Values reported in mg/L unless otherwise specified.
2. Action Level
3. MCL currently being re-evaluated by the EPA
4. Threshold odor number

Surface Water Treatment

All public water systems using surface water sources are required to comply with the Oregon Drinking Water Quality Act's treatment performance and disinfection requirements. Three specific areas are addressed within the Act, including:

- Overall filtration performance,
- Individual filtration performance, and
- Disinfection performance.

These are discussed below in detail.

Overall Filtration Performance Requirements

Current overall filtration performance standards require that the turbidity measurements from the combined filter effluent must be measured in 4-hour intervals by grab sampling or continuous monitoring. Ninety-five percent of these turbidity readings must be less than or equal to 0.3 NTU, and may never exceed 1.0 NTU. In addition, treatment strategies, in

combination with disinfection, must consistently remove or inactivate 99.9 percent (3-log) of *Giardia*, 99.99 percent (4-log) of viruses, and 99 percent (2-log) removal (i.e., no inactivation) of *Cryptosporidium*. Each utility is required to submit a report to the State on a monthly basis and identify any exceptions.

Individual Filter Performance Requirements

Oregon law requires continuous, on-line measurement of turbidity for each individual filter. This data must be recorded every 15 minutes. If there is a failure in the turbidity monitoring equipment, the system may conduct grab sampling every 4 hours in lieu, but for not more than 5 working days following the failure. Each utility is required to submit a report to the State on a monthly basis and identify any exceptions. Exceptions under Oregon law occur when:

1. Individual filter effluent turbidity exceeds 1.0 NTU in two consecutive measurements, 15 minutes apart at any time during the filter operation.
2. Individual filter effluent turbidity exceeds 0.5 NTU in two consecutive measurements, 15 minutes apart, after 4 hours of operation following backwash.
3. Individual filter effluent turbidity exceeds 1.0 NTU in two consecutive measurements, 15 minutes apart, at any time during the filter operation in three consecutive months or for three months in a row.
4. Individual filter effluent turbidity exceeds 2.0 NTU in two consecutive measurements, 15 minutes apart, at any time during the filter operation in two consecutive months or for two months in a row.

Disinfection Performance Requirements

The Oregon Drinking Water Quality Act requires all utilities served by a surface water supply to achieve a minimum of 99.9 percent (3-log) reduction in *Giardia lamblia* cysts, 99.99 percent (4-log) reduction in viruses, and 99 percent (2-log) removal of *Cryptosporidium* cysts during drinking water treatment. Removal credit is awarded to WTPs based on the types of processes provided by the plants. For a conventional filtration plant with filter-to-waste capabilities, such as the Grants Pass WTP, a 2.5-log, 2.0-log, and 2.0-log removal credit is usually granted for *Giardia lamblia*, viruses, and *Cryptosporidium*, respectively. The remaining reduction in pathogenic organisms must come in the form of disinfection or inactivation, or both. For the Grants Pass WTP, a minimum of 0.5-log inactivation of *Giardia* and 2.0-log inactivation of viruses is required prior to the first customer. Due to its longer time requirement for inactivation, *Giardia* inactivation typically governs disinfection through the WTP compared to viruses.

To determine the level of inactivation achieved during chemical disinfection, the EPA developed the "CT" concept. "CT" is the product of disinfectant residual measured at the outlet of a disinfection section and the time in which 10 percent (by volume) of an added tracer passes through the section, known as the T_{10}. To remain in compliance with disinfection performance standards, the following criteria must be met:

1. Disinfection residual must be continuously recorded at the entry point to the distribution system and must never fall below 0.2 mg/L.
2. CT must be calculated every day. To ensure that the values are conservative, the highest flow rate and minimum clearwell volume recorded for the day must be used in the calculation; tracer studies should be used to verify hydraulic efficiencies through the various treatment trains.
3. The CT calculated must be sufficient to meet the needed removal or inactivation levels.
4. The residual disinfectant concentration in the distribution system cannot be undetectable in more than 5 percent of the samples. For simplicity, samples should be collected at coliform bacteria monitoring points.

In Oregon, the OHA also enacted a requirement in the mid 1990s that a minimum of 0.5-log inactivation of *Giardia* and 1.0-log inactivation of viruses must be achieved following filtration and prior to the first customer. The OHA has grandfathered the Grants Pass WTP and allowed a disinfection credit for pre-chlorination through the plant upstream of the clearwell, including basins before filtration and the filters themselves. The City has been proactive in communicating the disinfection profile at the plant to the OHA and has worked with the State to ensure that the evaluation of CT at the plant is accurate. The rating and status of the WTP should remain the same as long as the WTP continues to meets water quality requirements and there are no major projects completed that would alter plant performance. In addition, the plant will be limited to a maximum capacity of 20 mgd. If flow exceeds this limit on a filter-by-filter basis, the WTP status will be reviewed and the ability to count pre-filtration CT could be revoked. In most cases, the OHA offers no disinfection credit for conventional plants prior to filtration even if a chlorine residual is carried through the unit operations preceding filtration.

Historical Compliance

The Grants Pass WTP complies with the Oregon Drinking Water Quality Act. Performance is discussed in the sections that follow.

Overall Filter Performance

Filtered water turbidity is measured at the combined filter effluent before entering the clearwell in the filter gallery. During the period from January 2004 to December 2011, filter effluent turbidity averaged 0.03 NTU. No filter effluent samples during this period exceeded the regulatory maximum of 1.0 NTU. The WTP has been in compliance with this regulation for the past 7 years.

Individual Filter Performance

On-line turbidimeters necessary for monitoring the individual filtered water turbidity have been used at the WTP for many years. Plant staff indicated that none of the individual filter

effluent turbidity thresholds have ever been exceeded since their installation in the early 1990s.

Disinfection Performance

CT achieved through the WTP and through the clearwell is calculated daily according to OHA's guidelines which were originally established in the mid 1990s. Calculations include the daily finished water temperature, chlorine residual of the basin effluent and clearwell effluent measured every hour, pH, and the maximum daily treated water flow. Once calculated, this value is compared to the CT required; if CT achieved is greater than the CT required, then compliance is achieved.

The actual CT value is currently being calculated from a tracer study that was completed in 2003 for the clearwell. A new tracer study was recently completed to verify the T_{10}/T assumed for the WTP upstream of the clearwell. Appendix A includes a detailed summary of the new tracer study. To date, Grants Pass has consistently met CT requirements at the WTP using the calculation methodology approved by OHA. From 2009 to 2011, there was only one instance where the total calculated *Giardia* inactivation through the plant was less than 0.5-log. This occured on October 29, 2009 when a value of 0.49 log was recorded. The WTP has had no violations with regard to disinfection residual monitoring or residual concentrations in the distribution system. Calculated CT values through the plant from year 2009 to 2011 are shown in Figure 3-1. Figure 3-1 also shows the plant's internal benchmark of 0.75-log *Giardia* inactivation. This benchmark is normally achieved except during the spring and fall seasons and during periods with very low raw water temperature.

If OHA decides to change the calculation methodology used by the plant to only allow credit for CT achieved through the clearwell, the plant may be significantly challenged to meet the CT required throughout the year. According to Figure 3-2, from 2009 to 2011, the CT achieved in the clearwell did not result in 0.5-log *Giardia* inactivation for almost 10 percent of the time. This often occurred during the winter months when the water temperature was very cold or during the spring and fall seasons when water demand started to increase, resulting in a higher plant operating flow rate, while the water temperature was still fairly cold. It is likely that the plant could modify its operational procedures during challenging water quality periods to be able to achieve 0.5-log *Giardia* inactivation in the clearwell under all conditions, mostly by operating the plant at a lower flow rate for longer periods.

If the WTP were ever to be rated by OHA as a direct filtration plant instead of a conventional filtration plant, then it would have to achieve a minimum of 1.0-log *Giardia* inactivation through the plant and at least 0.5-log *Giardia* inactivation would have to be achieved post-filtration. As seen from Figure 3-1, achieving 1.0-log *Giardia* inactivation throughout the year would be extremely challenging and may not be possible without significant capital improvements.

Figure 3-1
Overall *Giardia* Inactivation Achieved

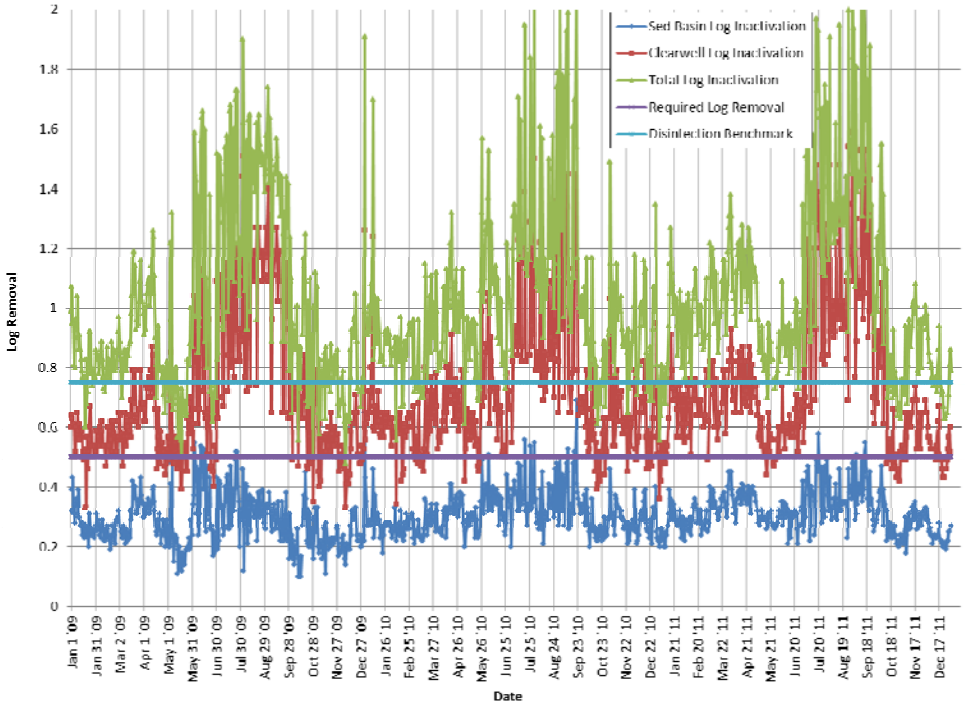
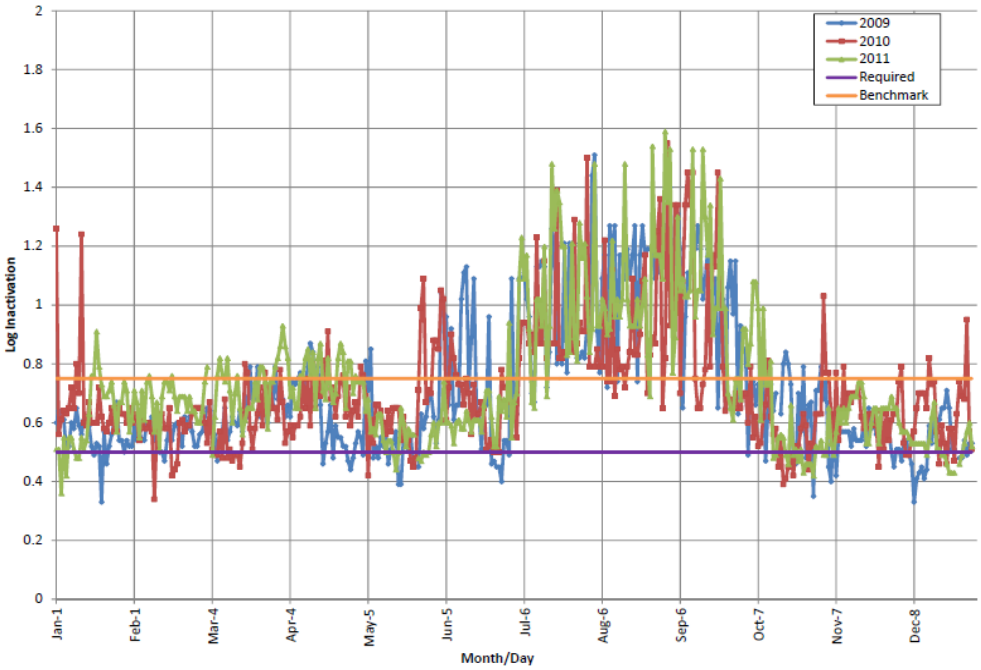


Figure 3-2
***Giardia* Inactivation Through the Clearwell**



Total Coliform Rule

Based on the City's population, the Oregon Drinking Water Quality Act requires the City of Grants Pass to collect a minimum of 40 water samples per month from representative sites throughout the water distribution system. If a routine sample is positive for total coliform, the City must collect a set of three repeat samples: one from the original site, one from a location within five service connections upstream of the original site, and one from a location within five service connections downstream of the original site.

The repeat samples must be collected within 24 hours of notification of the positive result. Further, any routine or repeat coliform positive samples must be analyzed for the presence of fecal coliform or *E. coli* as an indicator organism. When a system learns of the presence of fecal coliform or *E. coli*, the system must notify the State by the end of the same day. In Oregon, the total coliform MCL is violated in any of the following situations:

1. More than one sample collected within a single month is coliform positive, referred to as a non-acute violation.
2. A repeat sample following a total coliform positive contains fecal coliform or *E. coli*, referred to as an acute violation.
3. A repeat sample following a fecal coliform positive or *E. coli* positive contains total coliform, also an acute violation.

The City of Grants Pass monitors all of the water system microbial data, since the City owns and operates its distribution system that receives water produced by the WTP. To date, no information has been identified that indicates the City has violated the Total Coliform Rule. The finished water produced by the WTP has always met the requirements related to maintaining the minimum chlorine residual and booster chlorination is practiced in the distribution system at key locations to ensure that a minimum residual is maintained.

Long-term 2 Enhanced Surface Water Treatment Rule

The purpose of the Long-term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) is to further improve the control of *Cryptosporidium* in drinking water. The LT2ESWTR was published in the *Federal Register* on January 5, 2006. It applies to public water systems serving 10,000 or more people. Compliance with the LT2ESWTR was required in 2008 for the Grants Pass WTP. The LT2ESWTR requirements that potentially will impact the Grants Pass WTP include:

1. Source water sampling to establish concentrations of *Cryptosporidium*, which in turn defines additional treatment requirements for *Cryptosporidium*.
2. Potential additional *Cryptosporidium* inactivation and removal requirements.
3. Incorporation of a multi-barrier disinfection strategy.

To quantify system vulnerability, a 24-month monitoring program for *Cryptosporidium* is required to classify plants into treatment bins associated with source water concentration.

The rule includes a "toolbox" of control measures for meeting treatment requirements including watershed control options, treatment options, filter performance, and challenge tests. Table 3-2 presents the proposed treatment requirements for conventional plants and direct filtration plants based on results from the monitoring program.

Table 3-2
LT2ESWTR *Cryptosporidium* Monitoring Bin Classifications

Bin Number	Sample Results (Crypto oocyst per liter raw water)	Additional Treatment Requirements
1	< 0.075	No additional treatment required
2	0.075 to 1.0	1-log reduction
3	1.0 to 3.0	2-log reduction (1-log from disinfection)
4	> 3.0	2.5-log reduction (1-log from disinfection)

Non-disinfection-related reduction can be achieved through one or more alternatives presented in the LT2ESWTR "toolbox", below.

- Watershed control – 0.5 log.
- Alternative source or intake management – can get lower bin assignment.
- Off-stream storage – 0.5 log, 1.0 log based on hydraulic residence time.
- Pre-sedimentation basin (with coagulation) – 0.5 log
- Lime softening – 0.5 log
- Lower finished water turbidity – 0.5 log for CFE of 0.15 NTU (95 percent of the time), or 1.0 log for individual filter effluent less than or equal to 0.15 NTU (95 percent of the time). Cannot get credit for both.
- Membranes – Demonstrated with integrity testing for membranes that have been challenge-tested by the manufacturer.

In addition to raw water monitoring requirements, the LT2ESWTR requires all systems to perform disinfection profiling. If any modifications are made to the WTP, the WTP will need to work with OHA to establish expectations for the disinfection profile for the plant improvements.

The Rogue River is classified as a Bin #1 supply by OHA and therefore does not require any additional treatment processes for *Cryptosporidium* inactivation or removal. Extensive testing has been done on the Rogue River to validate this classification.

Disinfectants and Disinfection Byproducts

The Federal Total Trihalomethane Rule (TTHM Rule) was published in the *Federal Register* in November 1979; Oregon adopted the MCLs established in this law in September 1982.

The TTHM Rule set an MCL for TTHM of 0.10 mg/L based on a running annual average of quarterly sampling in the distribution system. However, these MCLs were superseded when the State of Oregon adopted the Stage 1 Disinfectants/Disinfection Byproducts Rule (D/DBPR) on July 15, 2000. The Stage 1 D/DBPR added an MCL of 0.060 mg/L for five haloacetic acids (HAA5), and reduced the MCL for TTHMs to 0.080 mg/L. The Stage 2 D/DBPR was promulgated by the EPA on January 4, 2006 and built on the Stage 1 rule by requiring that compliance be based on locational running annual averages (LRAAs) rather than a system-wide average of all sample locations. In addition, the Stage 2 D/DBPR required systems to revisit sample locations and perform more DBP sampling to determine sample locations that are most representative of worst-case DBP water quality. According to the OHA guidelines, the City's schedule for meeting the Stage 2 D/DBP Rule is as follows:

- 10/1/2007: Submit IDSE standard monitoring plan
- 9/30/2009: Complete an initial distribution system evaluation
- 1/1/2010: Submit IDSE report
- 10/1/2013: Begin Stage 2 compliance monitoring

To date, the City has completed the first three tasks and has now begun preliminary sampling of its stage 2 sites in preparation for Stage 2 compliance monitoring.

Monitoring Requirements

The Oregon Drinking Water Quality Act requires monitoring of disinfection byproducts. Compliance is currently based on a system-wide running annual average of quarterly samples, but in 2013 will move to a locational running annual average at each of the four sampling locations. To remain in compliance, the locational running annual average for TTHMs and HAA5s must not exceed 0.08 mg/L and 0.060 mg/L, respectively, at any location. Table 3-3 shows the DBPs and corresponding MCLs.

Table 3-3
Maximum Contaminant Levels for Disinfection Byproducts

Contaminant	Maximum Contaminant Level (mg/L)
Total Trihalomethanes[1] (TTHMs)	0.080
Haloacetic Acids[2] (HAA5)	0.060

Notes
1. "Total Trihalomethanes" includes the sum of concentrations of chloroform, bromodichloromethane, dibromochloromethane, and bromoform.
2. "Haloacetic acids" includes the sum of concentrations of monochloroacetic, dichloroacetic, trichloroacetic, monobromoacetic, and dibromoacetic acids.

Maximum residual disinfectant levels (MRDLs) present in the distribution system are also regulated. These MRDLs are summarized in Table 3-4. Monitoring and compliance for the MRDL of chloramines is similar to that required under the Total Coliform Rule (TCR). Utilities are required to collect these disinfection residual samples at the same locations and frequency as coliform samples.

Table 3-4
Maximum Residual Disinfectant Levels

Disinfectant	Maximum Residual Disinfectant Level (mg/L)
Chlorine	4.0 mg/L as Cl_2
Chloramines	4.0 mg/L as Cl_2
Chlorine Dioxide	0.8 mg/L as ClO_2

In addition to DBP MCLs and disinfectant MRDLs, conventional WTPs that have surface water as a supply are required to remove specific amounts of organic material through their treatment process. The percent of removal required depends on source water TOC and alkalinity. Table 3-5 provides a summary of the removal requirements.

Table 3-5
Percent Required Removal of Total Organic Carbon by Enhanced Coagulation for Plants Using Conventional Treatment

Total Organic Carbon in Raw Water (mg/L)	Source Water Alkalinity (mg/L as $CaCO_3$)		
	0 – 60	60 – 120	> 120
2.0 – 4.0	35	25	15
4.0 – 8.0	45	35	25
> 8.0	50	40	30

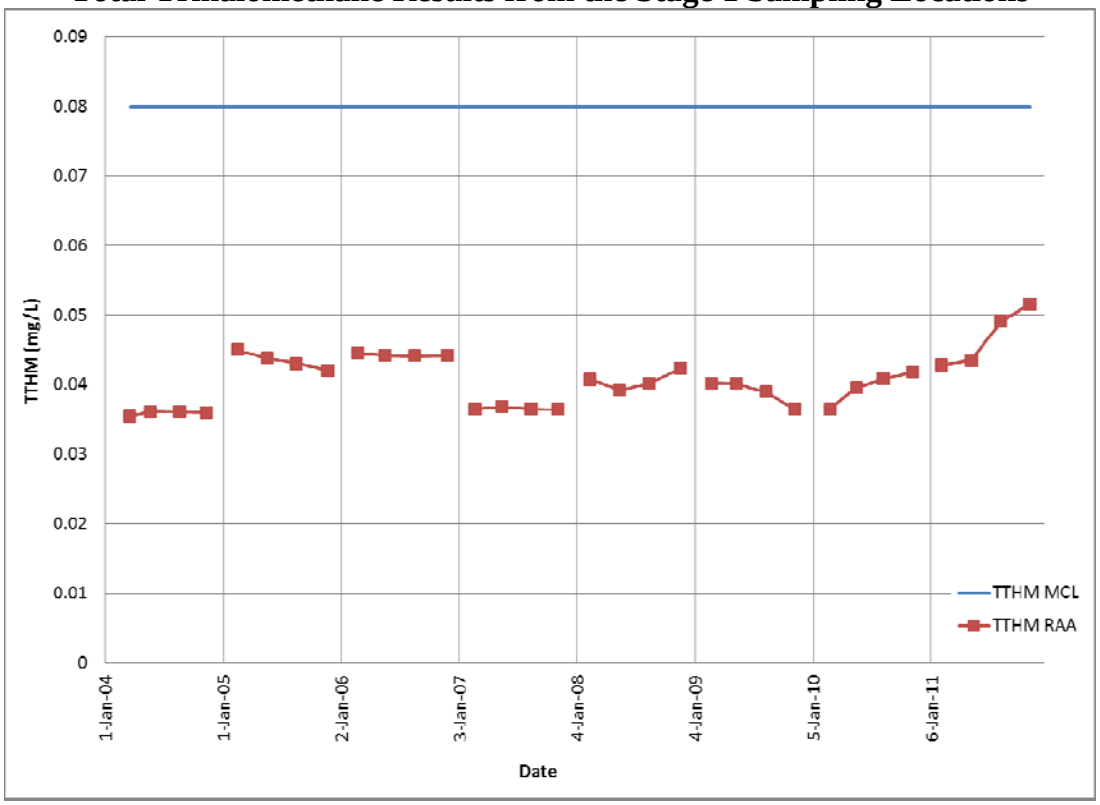
Compliance with this treatment requirement must be calculated as a running annual average on a quarterly basis after 12 months of data are available. Systems having raw water TOC concentrations under 2.0 mg/L are exempt from any TOC removal requirements.

Historical Compliance and Implications for Future Operation

The City of Grants Pass samples for the regulated DBPs at various locations throughout the distribution system. The current sampling protocol for DBPs includes four sites, with one sample representative of the maximum residence time in the distribution system at the Merlin Landfill and the remaining sample locations at the New Hope Pump Station, the Water Restoration Plant, and the Hillcrest Fire Station. The latter three sites are representative of the average residence time through the distribution system. Stage 2 protocol will add three additional sampling sites.

Prior to 2010, the City was only required to take four samples per quarter and that data was used to calculate a RAA for the average of the four samples. Figures 3-3 and 3-4 present DBP monitoring data for TTHMs and HAA5s prior to 2010 which was used to determine compliance with the Stage 1 D/DBP rule.

Figure 3-3
Total Trihalomethane Results from the Stage 1 Sampling Locations



Compliance with Stage 2 D/DBP will require a locational running annual average approach at each of the seven sampling locations and will be determined based on the worst-case location in the distribution system. It is highly likely that the worst-case location for TTHMs and HAA5s will be at the Merlin Landfill. However, due to HAA5s being mainly formed immediately downstream of the clearwell, the LRAA for HAA5s could be in a different location. Figures 3-5 and 3-6 present the LRAA TTHMs and HAA5s monitoring data from 2004 to 2011 at the Merlin Landfill sampling location.

Based on the historical DBP monitoring data, there have been periods when both TTHMs and HAA5s have been elevated above the regulatory limits, but no violations of the Stage 1 D/DBP Rule have occurred. There is no consistent annual pattern of elevated DBPs that would suggest that dramatic changes would have to be made to the treatment process. It is also not clear what influence raw water TOC and TOC removal through the plant has on DBP formation. It is possible that additional plant operating improvements or optimized distribution system operations may be able to ensure compliance with the future Stage 2

Figure 3-4
Haloacetic Acids Results from the Stage 1 Sampling Locations

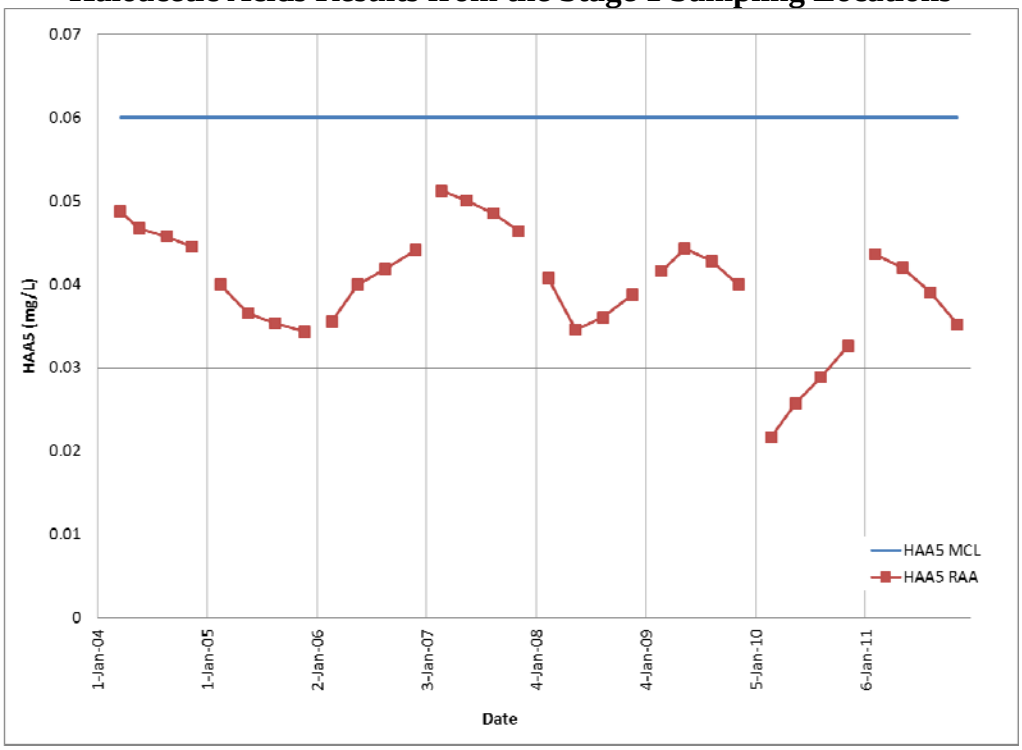


Figure 3-5
Total Trihalomethane Results at the Merlin Landfill

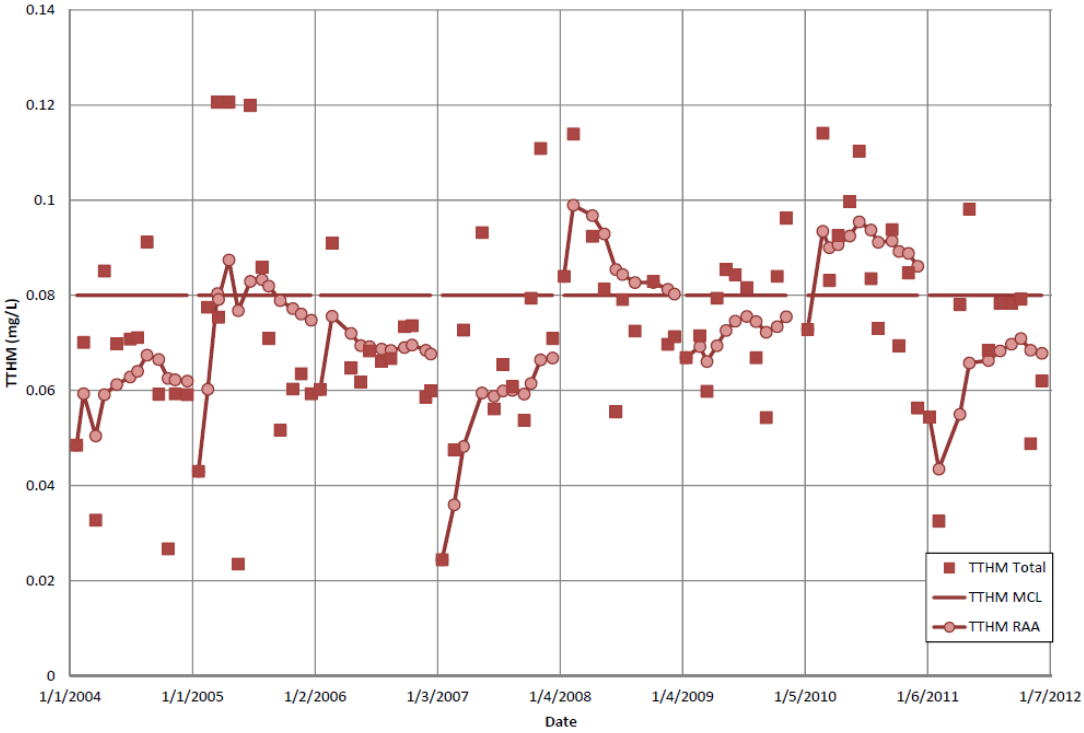
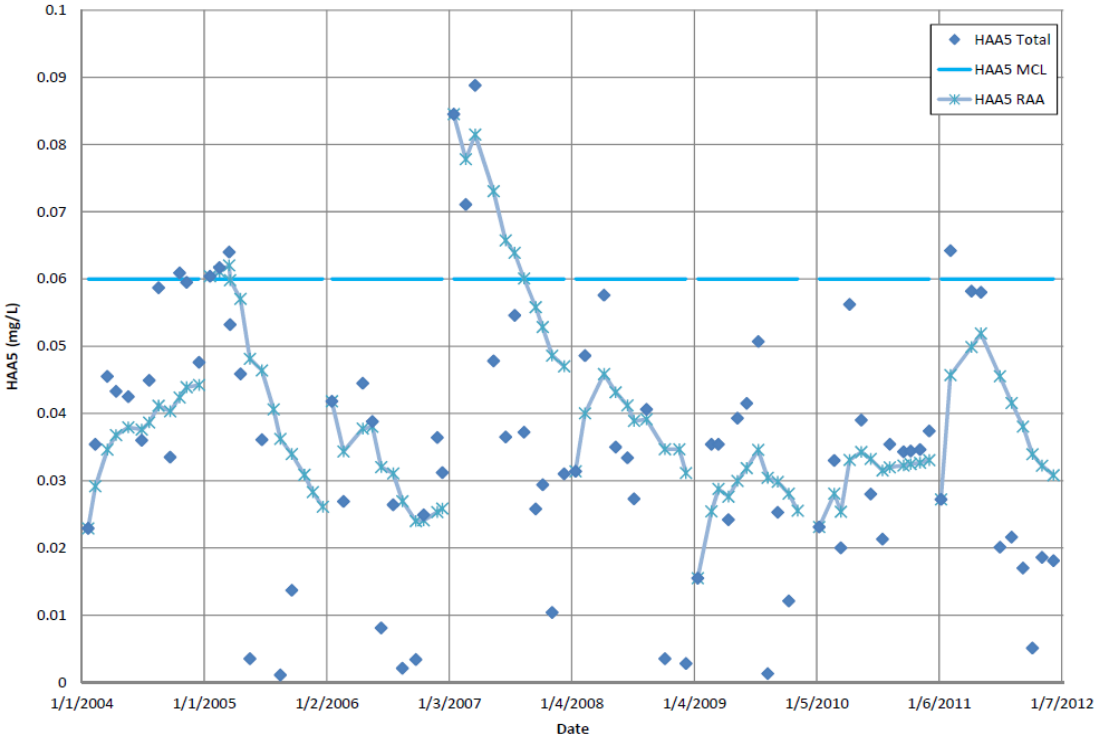


Figure 3-6
Haloacetic Acids Results at the Merlin Landfill



D/DBP Rule. These improvements could be lowering the chlorine residual in the plant and decreasing residence time in the distribution system.

Total Organic Carbon

The Grants Pass WTP monitored raw and finished water TOC monthly from 2004 to 2011 and this data is presented in Figure 3-7. Since the RAA of the raw water TOC was less than 2.0 mg/L, the City is not required to achieve a regulated amount of TOC removal through the plant. Also, the plant has recently had its TOC sampling frequency reduced from monthly to quarterly. The average raw TOC concentration in the Rogue River source from 2004 to 2011 was 1.6 mg/L and historical TOC removal through the plant has averaged 35 percent on an annualized basis. Unless the quality of the source water drastically changes, it is unlikely that TOC removal will be a problem for the Grants Pass WTP.

Lead and Copper and Corrosion Control

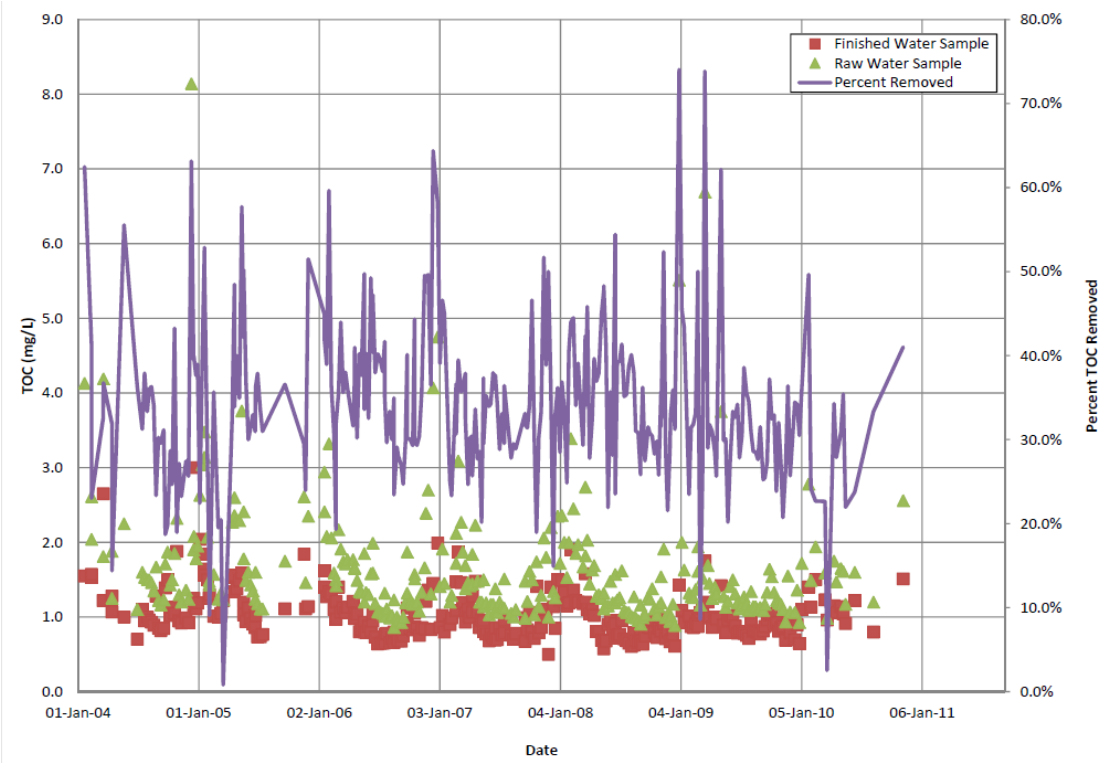
In 1991, LCR was promulgated by the EPA to reduce lead and copper concentrations in drinking water. Oregon adopted the LCR on December 7, 1992, without exception. The Lead and Copper rule established action levels for lead and copper set at 0.015 mg/L and 1.3 mg/L, respectively. Lead and copper regulations, under the Oregon Drinking Water Quality Act, require utilities to implement optimal corrosion control treatment that minimizes the lead and copper concentrations at users' taps, while ensuring that the treatment efforts do not

cause the water system to violate other existing water regulations. It should be noted that an update to the LCR is expected to be promulgated in 2013, though implications to the City's plant are anticipated to be minimal.

Monitoring Requirements

Utilities are required to conduct monitoring for lead and copper from taps in "high risk" homes. Two rounds of initial sampling were required from 1992 to 1994, collected at 6-month intervals. Annual sampling was required after these initial efforts. Following this initial three-year period of sampling, samples are to be taken every three years. The action level for either compound is exceeded when, in a given monitoring period, more than 10 percent of the samples are greater than the action level.

Figure 3-7
Raw and Finished Water Total Organic Carbon Concentrations and Percent Removal



Sampling requirements of the LCR are based on the population served by the utility. For the service area of the Grants Pass WTP, which has a combined population of between 10,001 and 100,000, Oregon law requires 60 initial sampling sites; subsequent monitoring could be reduced to 30 sites provided initial sampling efforts demonstrate that lead and copper action levels are not exceeded. Water systems unable to meet action levels must either integrate corrosion control strategies into their treatment process train or develop an alternate source of water.

Historical Compliance

The Grants Pass WTP has historically produced non-corrosive water, keeping it in compliance with the Lead and Copper Rule since it was enacted in the early 1990s. Due to the WTPs ability to consistently produce water with low corrosiveness as evidenced by low 'at-the-tap' concentrations of lead and copper, OHA has reduced the sampling frequency to once every three years. There appears to be no concerns with future compliance with the Lead and Copper Rule.

Inorganic Contaminants

The goal of the Primary Drinking Water Regulations, with regard to inorganic contaminants, is to control the levels of minerals and metals in drinking water that create health concerns. For most inorganic contaminants, these health concerns result after long-term exposure to the compounds. However, the risks associated with nitrates and nitrites are acute; thus, additional monitoring requirements for nitrates and nitrites are included in Oregon law.

Monitoring Requirements

Monitoring requirements and MCLs for regulated inorganic contaminants are included in Table 3-1. Initial monitoring for nitrite and nitrate was quarterly for a minimum of one year. If all collected samples were below 50 percent of the MCLs for nitrite and nitrate, sampling was reduced to yearly. For water systems that contain asbestos-cement water pipes, samples testing for asbestos fibers must be taken every nine years. Monitoring for and compliance with the new arsenic MCL of 0.010 mg/L was required by January 2006. Concentrations of all other inorganic contaminants must be measured annually. Quarterly follow-up testing is required for any contaminants that are detected above the MCL.

Historical Compliance

The Grants Pass WTP has remained in compliance with regard to all inorganic contaminant MCLs during the period evaluated. Due to the high quality of the source water, the WTP is only required to sample for inorganic contaminants every nine years.

Organic Contaminants

Maximum contaminant levels for 53 different organic contaminants under the Oregon Drinking Water Quality Act were adopted from the Safe Drinking Water Act (SDWA) and are listed in Table 3-1. Monitoring requirements and MCLs for synthetic organic compounds (SOCs) and volatile organic compounds (VOCs) are listed in Table 3-1. The WTP monitors VOCs yearly and SOCs two consecutive quarters every three years per the state requirements. No concentration of regulated VOCs or SOCs above the detection limit is on record in the past five years.

Radiological Contaminants

The original MCLs adopted from the NPDWR by Oregon on September 24, 1982 are still in effect in the Oregon Drinking Water Quality Act today. These rules were revised in October 2002 to include a new MCL for Uranium and to clarify and modify monitoring requirements. Together, these established MCLs seek to minimize the cancer risk associated with long-term exposure to six natural and manmade radiological contaminants.

Monitoring Requirements

Monitoring requirements and MCLs for radiological contaminants are listed in Table 3-1. Monitoring for radionuclides is required once every four years from surface water sources. If gross alpha is measured below 5 picocuries per liter (pCi/L), no radium analyses are required. Only systems with elevated risks, such as impacts by manmade radiation sources, must sample for beta and photon radiation.

Historical Compliance

The City WTP staff analyzes radiological samples every nine years, a reduction in monitoring frequency granted by OHA based on no detection of radiological contaminants. The WTP has fully complied with all OHA radiological standards for the period evaluated, and no elevated gross alpha measurements have ever been observed.

Federally Monitored Unregulated Contaminants

The final UCMR was published by the EPA in the March 12, 2002 *Federal Register*. Under this rule, EPA develops a list of unregulated contaminants every five years. Contaminants on the list are under consideration for eventual regulation but the EPA has insufficient occurrence information for each of them. This rule is administered and enforced by the EPA rather than the State primacy agencies.

Monitoring Requirements

UCMR 1, published in 1999, established a new list of contaminants to be monitored, procedures for selecting a national representative sample of public water systems, and procedures for incorporating the monitoring results into the National Contaminant Occurrence Database. UCMR 1 re-designed the UCM program to incorporate a tiered monitoring approach that divided monitoring of contaminants into three lists:

- List 1 contaminants are monitored by all public water systems serving over 10,000 people and a smaller group of public water systems serving less than 10,000 people;
- List 2 contaminants are monitored by a representative group of 300 randomly chosen public water systems;

- List 3 contaminants are monitored by 200 “vulnerable” systems across the country.

For chemical contaminants, surface water systems monitor quarterly for one year and ground water systems monitor two times six months apart. For microbiological contaminants, systems monitor twice, six months apart. For all chemical constituents in Lists 1 and 2, monitoring must be conducted at the entry point to the distribution system. For microbiological contaminants in List 1, monitoring is conducted near the end of the distribution system and at a representative site within the distribution system. Nationwide sampling for UCMR 1 took place from 2001 to 2003. The list of UCMR 1 contaminants is provided in Table 3-6.

The second monitoring cycle established a new list of contaminants in UCMR 2, promulgated in 2007. The WTP completed its UCMR 2 monitoring, which nation-wide extended from 2008 through 2010. Twenty-five contaminants were listed by the EPA for monitoring under UCMR 2: 10 List 1 contaminants and 15 List 2 contaminants, which are shown in Table 3-6.

UCMR 3 was finalized in May 2012. The City will begin monitoring and reporting the 30 identified contaminants (28 chemical, 2 viruses) in 2013. The program will be running from 2013 to 2015 and have similar sampling and reporting requirements as UCMR 2.

Historical Compliance

The WTP has historically complied with unregulated contaminant monitoring required by the EPA. No contaminants of concern have been detected in the Rogue River supply.

Secondary Standards

The secondary standards for drinking water, listed in Table 3-1, are intended as guidelines that address water quality issues which are related to the taste, odor, aesthetics, and corrosiveness of drinking water. These standards are non-enforceable guidelines for water quality parameters not known to adversely affect human health.

The WTP monitors finished water alkalinity, pH, chlorine, and turbidity on a daily basis as presented in Chapter 2. The WTP has occasionally received customer complaints related to drinking water tastes and odors on an infrequent and seasonal basis. The Grants Pass WTP has historically complied with water regulations addressed by the Secondary Standards.

Filter Backwash Recycling Rule

The final Filter Backwash Recycling Rule (FBRR), promulgated in 2001, applies to all public water systems that use surface water and employ conventional or direct filtration and also recycle water within the plant.

Table 3-6
Unregulated Contaminant Monitoring Program Summary

Unregulated Contaminant Monitoring Rule 1		
List 1	**List 2**	**List 3**
Assessment Monitoring of Contaminants with Available Methods	**Screening Surveys of Contaminants with Methods Just Developed**	**Prescreen Testing of Contaminants Needing Research on Methods**
2,4-dinitrotoluene	1,2-diphenylhydrazine	Lead-210
2,6-dinitrotoluene	2-methyl-phenol	Polonium-210
Acetochlor	2,4-dichlorophenol	Cyanobacteria
DCPA mono-acid degradate	2,4-dinitrophenol	Echoviruses
DCPA di-acid degradate	2,4,6-trichlorophenol	Coxsackieviruses
4,4'-DDE	Diazinon	Helicobacter pylori
EPTC	Disulfoton	Microsporidia
Molinate	Diuron	Caliciviruses
MTBE	Fonofos	Adenoviruses
Nitrobenzene	Linuron	
Perchlorate	Nitrobenzene	
Terbacil	Prometon	
	Terbufos	
	Aeromonas	
	Alachlor ESA	
	RDX	

Unregulated Contaminant Monitoring Rule 2	
List 1	**List 2**
Dimethoate	**Three Parent Acetanilides**
Terbufos sulfone	Acetochlor
Five Flame Retardants	Alachlor
2,2',4,4'-tetrabromodiphenyl ether (BDE-47)	Metolachlor
2,2',4,4',5-pentabromodiphenyl ether (BDE-99)	**Six Acetanilide Degradates**
2,2',4,4',5,5'-hexabromobiphenyl (HBB)	Acetochlor ethane sulfonic acid (ESA)
2,2',4,4',5,5'-hexabromodiphenyl ether (BDE-153)	Acetochlor oxanilic acid (OA)
2,2',4,4',6-pentabromodiphenyl ether (BDE-100)	Alachlor ethane sulfonic acid(ESA)
Three Explosives	Alachlor oxanilic acid (OA)
1,3-dinitrobenzene	Metolachlor ethane sulfonic acid(ESA)
2,4,6-trinitrotoluene (TNT)	Metolachlor oxanilic acid (OA)
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	**Six Nitrosamines**
	N-nitroso-diethylamine (NDEA)
	N-nitroso-dimethylamine (NDMA)
	N-nitroso-di-n-butylamine (NDBA)
	N-nitroso-di-n-propylamine (NDPA)
	N-nitroso-methylethylamine (NMEA)
	N-nitroso-pyrrolidine (NPYR)

Monitoring and Compliance Requirements

This rule requires the three major recycle streams, spent filter backwash water, solids thickener supernatant, and liquids from dewatering processes, to pass through all treatment processes. Therefore, these recycle streams must be returned prior to chemical addition and coagulation. The rule is unclear as to whether FTW water is considered a recycle stream and whether such water can be returned downstream of chemical addition and coagulation. This decision is made between the utility and OHA on a case-by-case basis.

Each utility was required to notify OHA in writing by December 8, 2003, that they practice recycling. This notification included a plant schematic that shows the type and location of recycle streams, typical recycle flow data, highest plant flow in the previous year, design flow of the plant, and OHA-approved operating capacity. Each system must collect and maintain the following information for compliance with this rule:

- Copy of recycle notice to OHA.
- List of all recycle flows and frequency.
- Average and maximum backwash flow and duration.
- Typical filter run duration and how it was determined.
- Type of recycle treatment (if any) and data on recycle stream facilities.

This rule may affect decisions regarding how recycle streams are handled for a new or upgraded WTP.

Historical Compliance

Since the WTP does not recycle any of its residual streams, the FBRR does not apply, but is mentioned for consideration if WTP operational issues drive the plant to recycle some or all of its waste streams in the future. The plant sends its filter backwash water and filter-to-waste to the old mill pond located across the street from the WTP. The old mill pond releases decant or overflow water to Skunk Creek. A NPDES permit has been issued by Oregon DEQ for this discharge stream. Solids from the sedimentation basin are dewatered on-site using geobags and the "pressate" is not recycled within the WTP.

Tastes and Odors

Taste and odor events from the City's water supply are very rare in Grants Pass. Other upstream users of the Rogue River, such as the Medford Water Commission, experience taste and odor episodes on a frequent basis. The common taste and odor reported in Medford is earthy or musty and is commonly caused by excessive algal activity. The conditions in the lower Rogue River in and around Grants Pass are apparently not as conducive to excessive algal activity during the summer and fall as in the upper parts of the watershed. Algae can produce excessive concentrations of MIB and geosmin which are organic compounds that

impart earthy or musty tastes and odors to the water. These compounds do not present a health hazard, but create an aesthetic and public perception problem.

Because of the low historical occurrence of taste and odor in its water supply, the Grants Pass WTP is not equipped with processes capable of removing earthy or musty tastes and odors. The only treatment alternatives for this particular water quality issue include the following:

- Oxidation with ozone
- Adsorption with high doses of powdered activated carbon (PAC)
- Adsorption with granular activated carbon (GAC), either as a filter adsorber or in a separate contactor
- Oxidation using ultraviolet (UV) light combined with addition of hydrogen peroxide

The Medford Water Commission's Duff WTP uses pre-ozonation to combat earthy or musty tastes and odors. Before ozonation was installed, there was a high frequency of taste and odor events and customer complaints received when the City started up the Duff WTP in the summer to handle their peaks in demand. The rest of the year, Medford Water Commission customers receive Butte Spring water that typically does not have taste and odor concerns. The City of Grants Pass should be aware of the potential for taste and odor events in the future and will have to decide if investment in taste and odor control technology in the future will be beneficial to its customers. The City will also have to balance the need for taste and odor control with the risk of re-rating the plant if major process changes are made.

Trace Organics and Emerging Contaminants

Trace organics and contaminants of interest for the Rogue River supply which could become regulated within the next decade include:

- Hexavalent chromium
- Emerging contaminants
- Herbicides and pesticides
- Algal toxins

Concerns about the presence of hexavalent chromium have become elevated in the western United States, especially in California. Currently, only total chromium is regulated at an MCL of 0.1 mg/L (100 ppb). Hexavalent chromium is an identified carcinogen, but it is not currently known what a future MCL might be. It is not anticipated that hexavalent chromium will be a trace metal of concern in the Rogue River supply nor for the WTP.

The water industry's understanding of the treatment technologies needed to remove trace organics and emerging contaminants is in its infancy. These emerging contaminants include EDCs, PhACs and PCPs, all of which may be present in drinking water supplies, especially

those which receive discharges from wastewater treatment plants or stormwater runoff from urban and agricultural areas. Algal toxins are also an emerging trace contaminant of interest in surface water supplies. Most of these compounds are currently not regulated in drinking water, but it is possible that regulations will be promulgated in the future. Therefore, many drinking water providers are taking a close look at their treatment plant's ability to remove or destroy these compounds. Based on limited data searches, it does not appear that the Rogue River has been investigated for the presence of emerging contaminants.

Removal of Emerging Contaminants

Table 3-7 presents a summary of the anticipated performance of different types of drinking water treatment processes for removal of various classes of compounds based on the most recent industry research. Researchers have concluded that, in general, advanced treatment technologies such as activated carbon, high-pressure membrane processes (such as nanofiltration or reverse osmosis), and advanced oxidation (such as ozone or UV with hydrogen peroxide) are effective in the removal of many of these trace contaminants. However, no single treatment process has been demonstrated to be consistently effective in removing all of the emerging contaminants currently targeted due to the wide ranges in their physical and chemical properties.

It is anticipated that future drinking water treatment facilities will likely include one or more advanced treatment modules added to existing and new conventional treatment plants creating multi-barriers to a full range of potential existing and emerging contaminants. The existing Grants Pass WTP does not have any processes which can be considered excellent or good to reliably treat for emerging contaminants. Planning for emerging contaminants is addressed in subsequent chapters of this Facility Plan Update.

Historical Compliance

Grants Pass WTP staff began proactively monitoring for hexavalent chromium by testing samples monthly starting in February 2011, as suggested by EPA. As of March 2011, sampling has been reduced to quarterly per EPA recommendations. Figure 3-8 displays the results of this testing. Concentrations of hexavalent chromium are well below the total chromium MCL of 100 ppb. Chromium and hexavalent chromium are on the list for UCMR 3 testing.

Table 3-7
Unit Processes and Operations Used for Removal of Emerging Contaminants

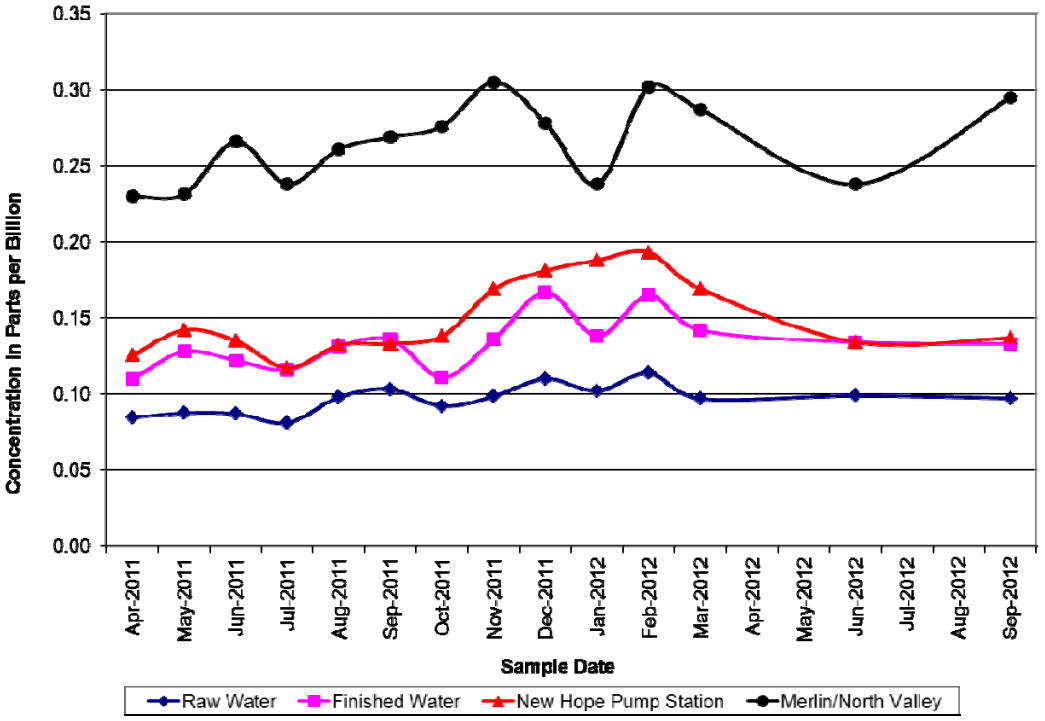
Group	Classification or Use	AC	BAC	O_3 and AOPs	UV and AOPs	CL_2 or ClO_2	Coagulation and Flocculation	Softening and Metal Oxides	NF	RO
EDCs	Pesticides	E	E	L-E	E	P-E	P	G	G	E
	Industrial chemicals	E	E	F-G	E	P	P-L	P-L	E	E
	Steroids	E	E	E	E	E	P	P-L	G	E
	Metals	G	G	P	P	P	F-G	F-G	G	E
	Inorganics	P-L	F	P	P	P	P	G	G	E
	Organometallics	G-E	G-E	L-E	F-G	P-F	P-L	P-L	G-E	E
PhACs	Antibiotics	F-G	E	L-E	F-G	P-G	P-L	P-L	E	E
	Antidepressants	G-E	G-E	L-E	F-G	P-F	P-L	P-L	G-E	E
	Anti-inflammatory	E	G-E	E	E	P-F	P	P-L	G-E	E
	Lipid regulators	E	E	E	F-G	P-F	P	P-L	G-E	E
	X-ray contract media	G-E	G-E	L-E	F-G	P-F	P-L	P-L	G-E	E
	Psychiatric control	G-E	G-E	L-E	F-G	P-F	P-L	P-L	G-E	E
PCPs	Synthetic musks	G-E	G-E	L-E	E	P-F	P-L	P-L	G-E	E
	Sunscreens	G-E	G-E	L-E	F-G	P-F	P-L	P-L	G-E	E
	Antimicrobials	G-E	G-E	L-E	F-G	P-F	P-L	P-L	G-E	E
	Surfactants and detergents	E	E	F-G	F-G	P	P-L	P-L	E	E

E: excellent (> 90%); G: good (70 – 90%); F: fair (40 - 70%); L: low (20 - 40%); P: poor (< 20%). Date and Source: Snyder et. al., 2003

Table Abbreviations

AC – Activated Carbon
AOPs – Advanced Oxidation Process
BAC – Biologically Activated Carbon
Cl_2 – Free chlorine
EDCs – Endocrine Disruptors
PCPs – Personal Care Products
PhACs – Pharmaceuticals
NF – Nanofiltration
O_3 – Ozone
RO – Reverse Osmosis
UV – Ultraviolet Light

Figure 3-8
Hexavalent Chromium Levels for the Grants Pass Water Treatment Plant and Distribution System



Summary

The Grants Pass WTP has consistently met all existing primary water quality regulations for over a decade. There are no major regulatory issues of concern at this time. However, there are some regulatory and water quality issues which the City should consider as part of future plant expansions and improvements:

1. Ensure that the plant continues to be rated as "complete conventional filtration," or its equivalent, to minimize the *Giardia* inactivation requirements.
2. Consider that potential challenges will arise if OHA decides to strictly enforce the post-filtration CT requirements (i.e., to achieve a minimum 0.5-log *Giardia* inactivation in the clearwell at all times).
3. Focus on treatment strategies and optimized plant and distribution system operations to minimize formation of DBPs.
4. Focus on producing a consistent finished water pH and alkalinity to continue complying with the Lead and Copper Rule.
5. Consider treatment process alternatives to reduce or eliminate earthy and musty tastes and odors which may possibly occur in the lower Rogue River during summer and fall based on what currently occurs in Medford.
6. Consider treatment process alternatives that can remove trace organics and emerging contaminants which may be present in the Rogue River or become a regulatory requirement in the future.

The biggest impacts to the plant processes, facility layouts, space requirements, and costs would come from regulatory changes by OHA related to disinfection compliance, complying with the Stage 2 D/DBP Rule, the City's decisions to implement taste and odor control, and control of emerging contaminants. These issues are discussed further in subsequent chapters of this Facility Plan Update.