CHAPTER 6

WATER QUALITY AND REGULATORY REQUIREMENTS

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This chapter presents information on water quality in the South Santiam River and wastewater treatment requirements for the City of Lebanon's Wastewater Treatment Plant (WWTP). South Santiam River water quality and the WWTP's treatment requirements are closely related issues since the Department of Environmental Quality (DEQ) bases their regulations on an evaluation of the impact of discharges on the receiving stream. In addition to examining South Santiam water quality and existing wastewater treatment requirements, this chapter summarizes the treatment criteria for agricultural reuse and the anticipated future treatment requirements for discharge to the South Santiam River.

SOUTH SANTIAM RIVER FLOW

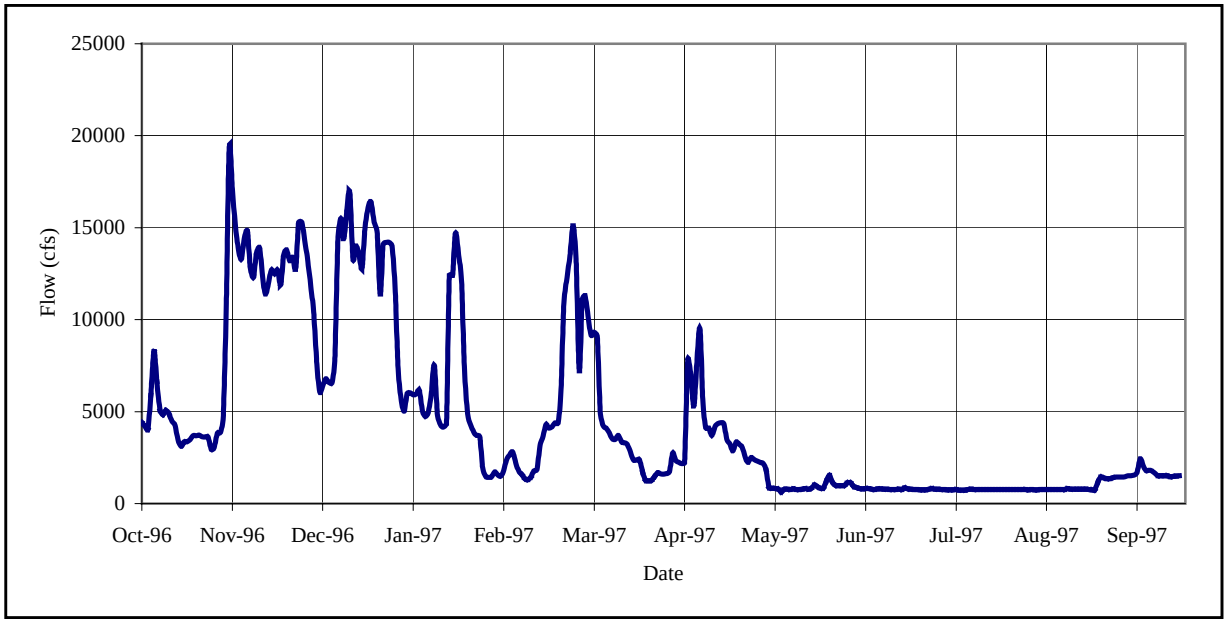
Flow data for the South Santiam River is available from the U.S. Geological Survey (USGS) Water Data Reports for their Waterloo (River Mile 23.3) and Foster Dam (River Mile 37) monitoring stations. An additional USGS monitoring station on the Lebanon Santiam Canal (River Mile 20.6) measures flow that is diverted from the South Santiam River just upstream of Lebanon. The daily flow data were available from 1968 to present for the Foster Dam and Waterloo station. Data from years prior to 1968 are influenced by the construction of upstream dams at Foster Reservoir and Green Peter Reservoir. Data on flows in the Lebanon-Santiam Canal have been collected since 1992. Figure 6-1 shows the daily variation of flow in the South Santiam River at the Waterloo monitoring station for the water year 1998-99. Table 6-1 summarizes the monthly mean, maximum, and minimum flows for the Waterloo monitoring station between the years 1968 and 1997.

Table 6-1. Monthly Flow Data for the Waterloo Monitoring Station, 1968-97

Month	Average Flow, cfs	Maximum Flow, cfs	Minimum Flow, cfs
January	5,612	9,338	713
February	3,913	10,430	597
March	3,328	9,649	865
April	3,019	6,529	1,059
May	2,349	4,148	792
June	1,600	4,300	616
July	795	1,527	514
August	799	1,239	568
September	1,411	2,769	849
October	2,157	5,530	852
November	4,865	9,509	827
December	6,562	12,910	1,126

The WWTP discharges to the South Santiam River at River Mile 17.4. Based on analysis of USGS flow data from the Waterloo and Lebanon-Santiam Canal monitoring stations, the annual 7Q10 for the South Santiam River at the WWTP outfall is approximately 450 cfs. The Waterloo 7Q10 was adjusted to reflect diversions through the canal. This is the minimum seven-day average flow with a return frequency of 10 years.

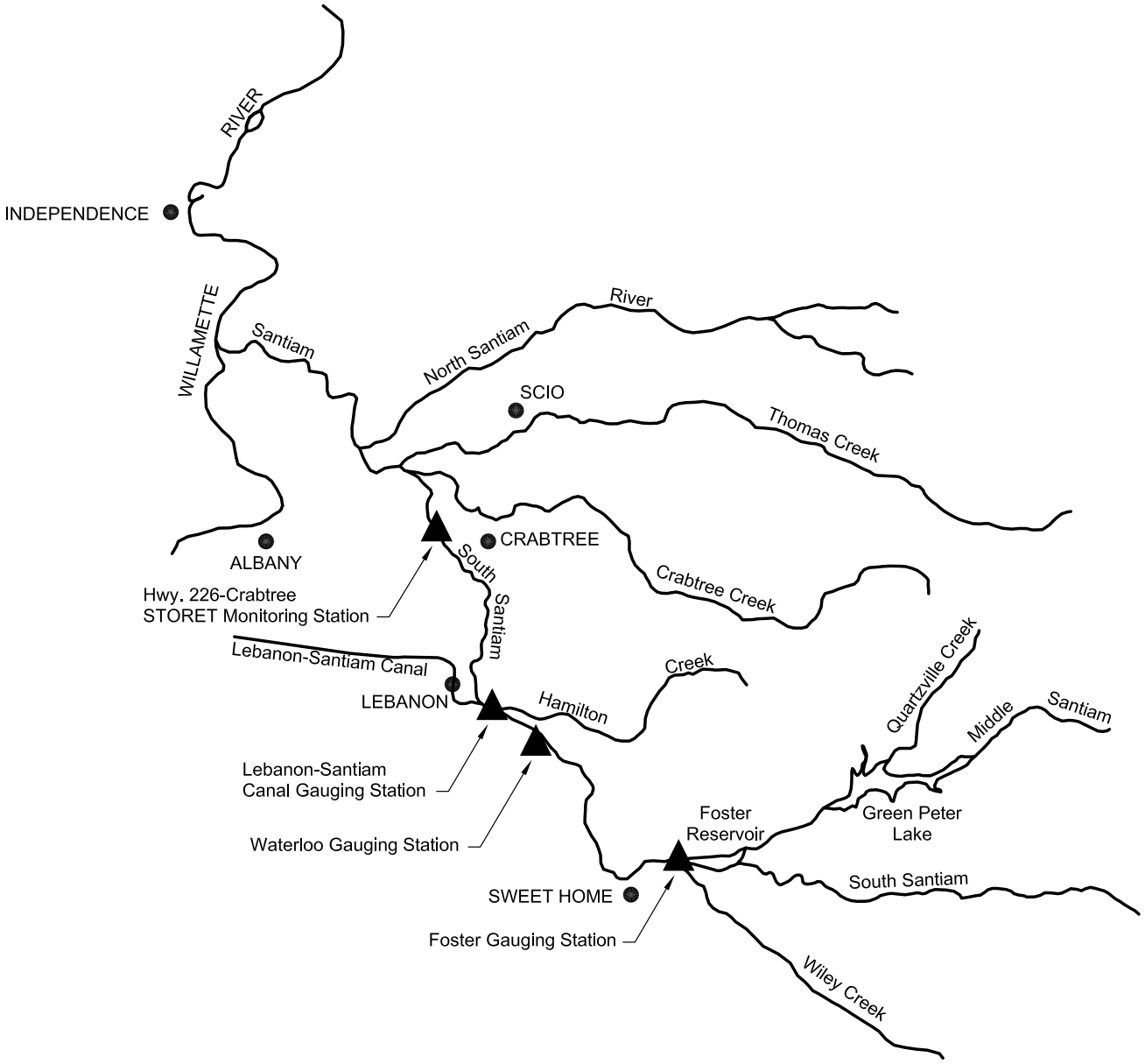
Figure 6-1. South Santiam River Flow at Waterloo



SOUTH SANTIAM RIVER WATER QUALITY

South Santiam River water quality data was obtained from the DEQ's STORET database and USGS monitoring data. Data on 30 water quality parameters from the STORET database was available for the South Santiam River at the Highway 226 crossing near Crabtree at River Mile 7.6. This information was collected as periodic grab samples between 1989 and 1998. The USGS monitoring station at Foster Dam has monitored daily river temperature from 1973 to present. A map of the South Santiam River showing the monitoring locations is presented as Figure 6-2.

The South Santiam River is on DEQ's 2002 303(d) list of streams that do not meet water quality standards. The parameter of concern is temperature. DEQ measurements indicate that the temperature standards are regularly exceeded on the South Santiam from Waterloo to the confluence with the North Santiam River. For streams that do not meet water quality standards, DEQ is required to develop Total Maximum Daily Loads (TMDLs). TMDLs are measured load allocations that ensure that a 303(d) listed water body will comply with water quality standards. The target date for completion of the South Santiam TMDL is in 2004.



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SCALE IN MILES

Figure 6-2

SOUTH SANTIAM RIVER

WATER QUALITY AND
FLOW MONITORING STATIONS

WEST YOST & ASSOCIATES

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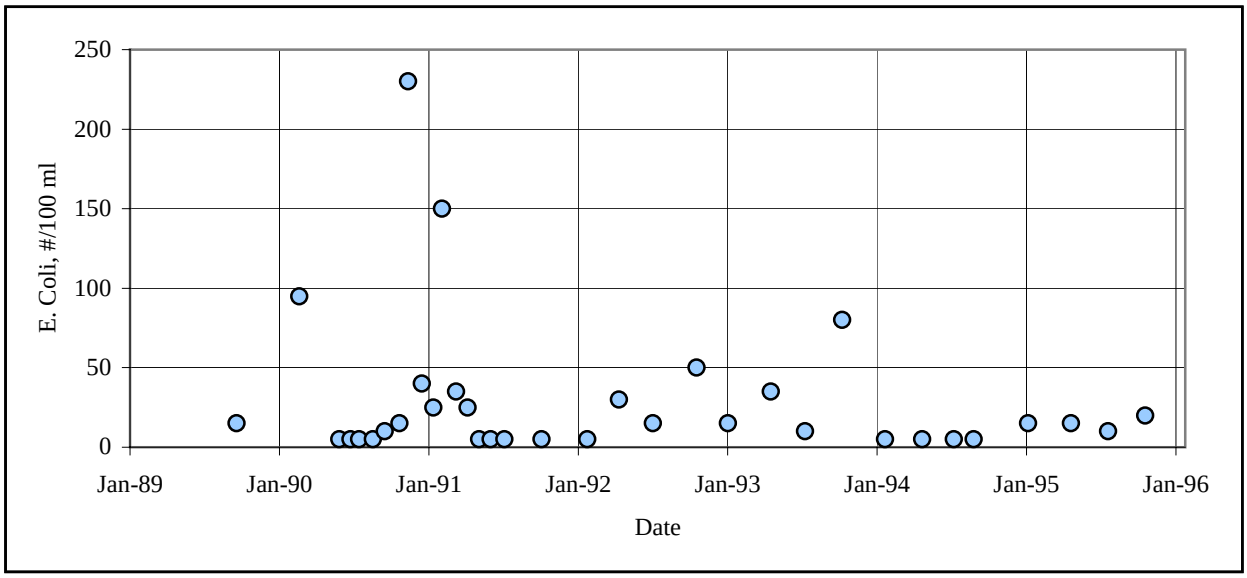
In addition to the water quality parameters related to the 303(d) listing, there are other water quality concerns related to the mixing zone for the WWTP such as ammonia and chlorine toxicity. The following sections present information on specific water quality conditions for the purpose of evaluating the overall water quality in the South Santiam River.

Bacteria

Bacteria concentrations are monitored in Oregon's rivers in order to protect public use of the waterways for water contact recreation. For bacteria, the measure of water quality has typically been the presence of organisms from the coliform group commonly associated with fecal sources (fecal coliform). In 1996, the fecal coliform based bacteria standards were revised to focus on the organism E. coli. The water quality standard is now a 30-day log mean of 126 E. coli organisms per 100 mL, with no single sample exceeding 406 E. coli organisms per 100 mL. Figure 6-3 presents the E. coli bacteria measurements taken between 1989 and 1995. As shown on the chart, the E. coli levels did not exceed the single sample maximum of 406 E. coli organisms per 100 mL, but single samples did exceed the 30-day log mean standard on two occasions. Since measurements were only taken once per month, it is not clear whether the river would violate the 30-day standard if more frequent data were available. Also, the high bacteria data predate significant improvements upstream in Sweet Home that have reduced raw sewage overflow since 1994.

Figure 6-3. South Santiam River Bacteria Measurements (1989-1995)



Temperature

For temperature, the water quality standard on the South Santiam River is a seven day average maximum daily temperature of 64.4 degrees F between May 15 and October 15 and 55.4 degrees F for the rest of the year. DEQ data collected at the Highway 226 crossing (River Mile 7.6) indicate that a high percentage of grab sample temperatures exceeded the temperature

standard. Since the Lebanon Wastewater Treatment Plant is a source of thermal load to the South Santiam River, the City was required to develop a temperature management plan in 2002 as a part of the NPDES permitting process. The City has been monitoring the temperature of the river and effluent from the treatment plant since then. Implementation of the temperature management plan will be conducted as a part of the planned improvements for the treatment plant. The river temperature data collected by the City and the seven-day moving average of the maximum upstream river temperature are presented in Figures 6-4 and 6-5 respectively. Figure 6-5 also shows the seven-day moving average of the maximum effluent temperature along with the temperature standards for the river.

High water temperatures adversely affect salmonid fish, such as trout and salmon, as well as other cold-water aquatic species. Temperatures in the mid-to-high 70 degree F range can be lethal to adult salmonids. Temperatures in the mid 60 degree F to low 70 degree F range cause physiological stress which, when combined with other survival pressures, can increase mortality. Table 6-2 summarizes temperature limits for Spring Chinook and Coho salmon.

Temperature is also important because it controls the solubility of dissolved oxygen (DO) in water. As temperature increases, the DO saturation concentration decreases and it becomes more difficult to maintain adequate DO levels for fish.

Table 6-2. Temperature Preference for Spring Chinook and Coho Salmon

Life-stage	Spring Chinook	Coho
Egg incubation	42.1°F to 55.0°F	39.9°F to 55.9°F
Juvenile rearing	50.0°F to 58.6°F	53.2°F to 58.3°F
Adult migration	37.9°F to 55.9°F	45.0°F to 60.1°F
Spawning	42.1°F to 55.0°F	39.9°F to 48.9°F
Upper lethal limit	71.6°F	77.0°F

Source: DEQ, 1995

Current South Santiam River Water Quality. As illustrated in the Figure 6-4 and 6-5, water temperatures regularly exceed sixty-five degrees F during the summer. Even the seven day average maximum temperature peaked at nearly sixty seven degrees F in 2001. The annual temperature cycles appear to have remained relatively steady during monitoring period.

To provide upstream context for the temperature data, Table 6-3 presents the average monthly water temperatures for the South Santiam River just downstream of the Foster Lake dam at River Mile 37. When compared to Figure 6-4 and 6-5, this data illustrates that river temperatures increase as the water travels downstream. This trend is most apparent during the summer months. Table 6-3 also includes the monthly extreme high temperature from the Foster Lake monitoring station.

Figure 6-4. South Santiam River Grab Sample Water Temperature, F (2000-2003)

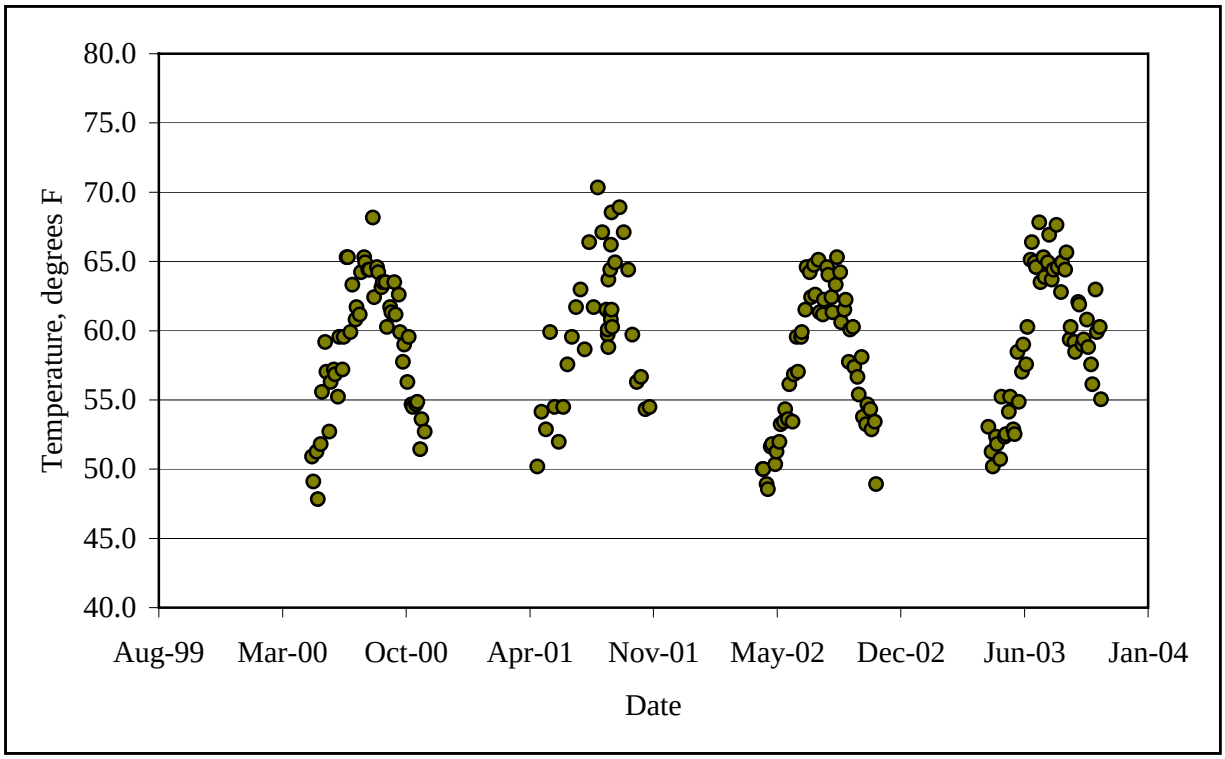


Figure 6-5. Moving Average Upstream River Temperature Continuous Monitoring Summer 2001

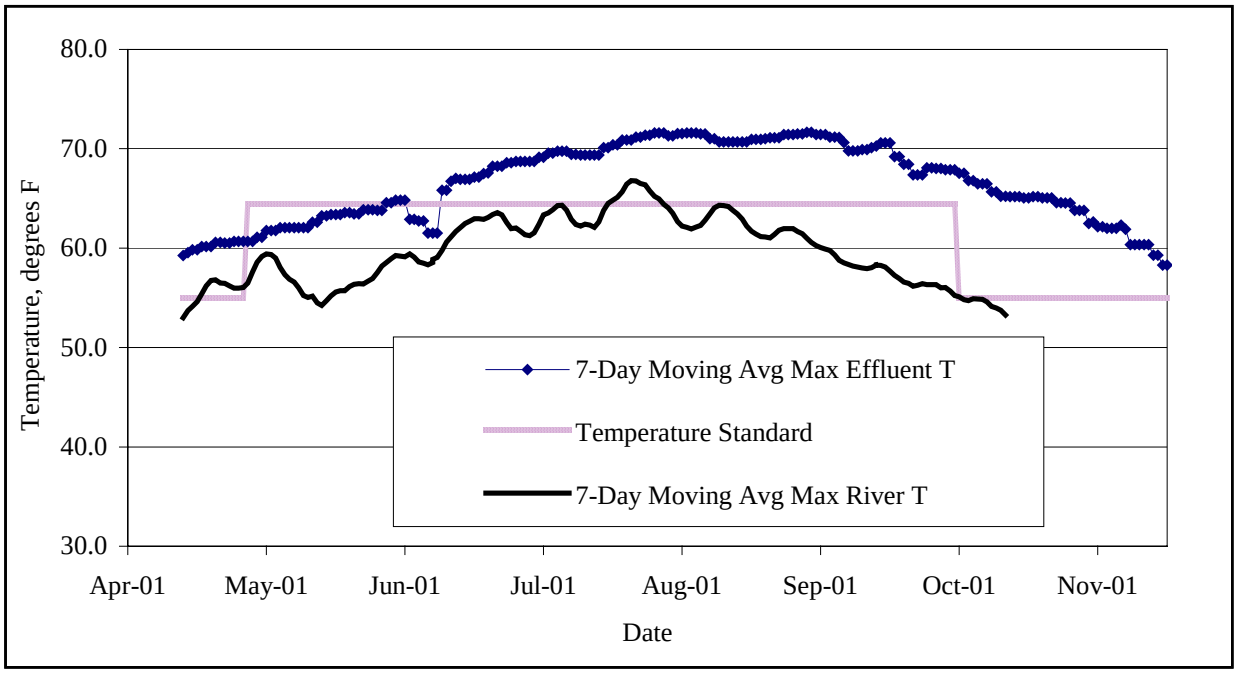


Table 6-3. Monthly Temperatures at Foster Dam, F (1973-1998)

Month	Monthly Average Temperature	Monthly Extreme High Temperature
January	43.0	47.7
February	43.2	49.6
March	45.0	53.8
April	47.2	55.8
May	50.5	59.6
June	52.3	60.1
July	54.8	60.1
August	55.0	60.1
September	53.5	59.8
October	51.7	59.4
November	48.9	55.8
December	44.7	50.4
Summer[a]	53.0	59.9
Winter[b]	45.3	52.2
Annual	49.2	56.1

[a]The six-month period May through October.
[b]The six-month period November through April.

Temperature Standard. The purpose of the temperature standard is to protect designated temperature-sensitive, beneficial uses, including specific salmonid life cycle stage in waters of the State. The temperature standards are outlined in OAR 340-041-0028. Since Lebanon is located on the South Santiam River within the area designated for salmon and trout rearing and migration habitat, the temperature standard during the critical period (the dry weather season when stream flows tend to be low and air temperatures are high) is 18 degrees C or 64.4 degrees F. This portion of the South Santiam River is also designated as habitat for salmon and steelhead during their life cycle stages from spawning through fry emergence for the period of October 15 through May 15. During this period, the temperature standard is set at 13 degrees C or 55.4 degrees F.

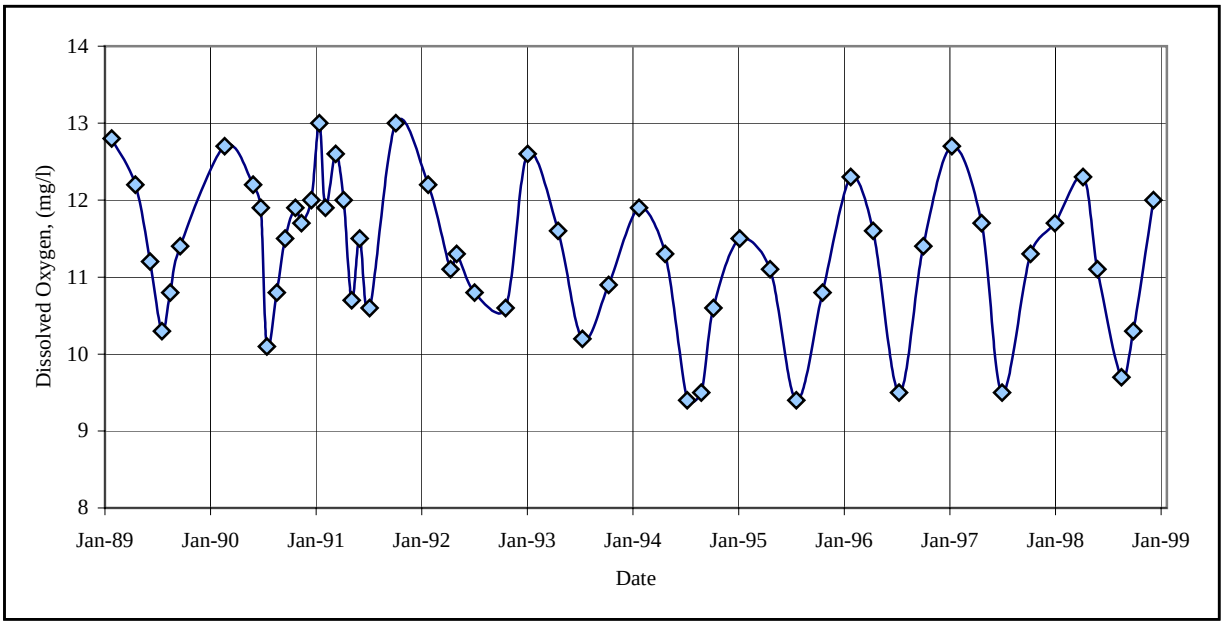
The temperature standard includes restrictions on the allowable thermal impacts from a point source discharge such as the Lebanon WWTP. Prior to the completion of a TMDL for the South Santiam River, the allowable thermal impact is limited to a cumulative increase of no greater than 0.3 degrees C or 0.5 degrees F above the applicable temperature criteria after mixing with either 25-percent of the stream flow or, or the temperature mixing zone, whichever is more restrictive. Following the development of a temperature TMDL, thermal load allocations will restrict the discharge to a cumulative increase of no greater than 0.3 degrees C or 0.5 degrees F above the applicable criteria after complete mixing in the water body, at the point of maximum impact. There are also some exclusions to these requirements such as during periods of extremely hot weather (daily maximum air temperature exceeds the 90^{th} percentile value of annual maximum seven-day average maximum air temperatures) and extreme low river flow conditions (stream flows less than the statistical seven-day average lowest daily flow rate with a ten year return frequency).

Dissolved Oxygen

Since temperature is a water quality parameter of concern on the South Santiam River, DO levels must also be scrutinized since the solubility of oxygen decreases at higher temperatures. Salmonid fish are very sensitive to low DO levels—particularly during the early stages of development. The numeric DO standards consider two factors: whether salmonid fish are present and, if present, whether the fish are in the critical spawning, egg development, and fry emergence stages.

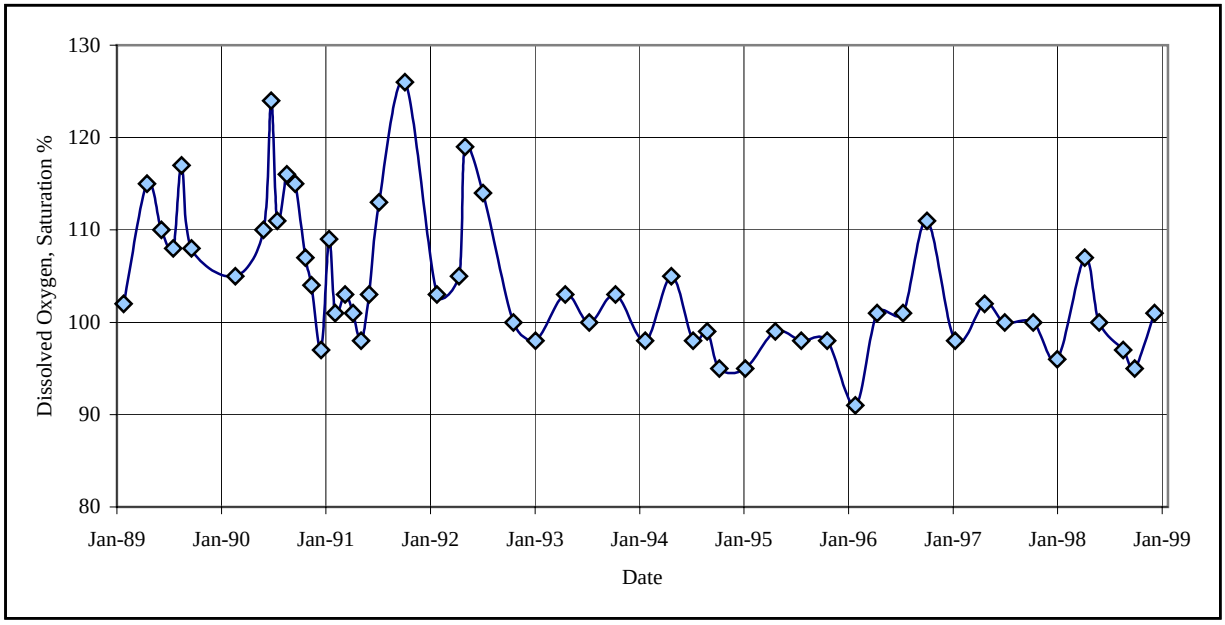
Current South Santiam River Water Quality. Measured values for DO concentration and DO saturation at the STORET sampling site are shown in Figures 6-6 and 6-7 respectively. The shallow, fast-moving river has a large capacity for re-aeration as indicated in Figure 6-7 by frequent DO concentrations over 100 percent saturation. Average levels of DO saturation appear to be well over 100 percent for both the summer (May through October) and winter (November through April) months prior to 1993. Since 1993, the DO saturation levels appear to hover around 100 percent. The lowest measured level of dissolved oxygen saturation was 91 percent in January 1996.

Figure 6-6. South Santiam River Dissolved Oxygen Levels 1989-1998



As expected, Figure 6-7 illustrates that the DO concentrations at this sampling station decrease with seasonal increases in stream temperature. Winter DO concentrations regularly approach 13 mg/L while summer DO concentration regularly fall to 9.5 mg/L. Although data from other monitoring sites on the river are not available, DO concentrations are also likely to decrease moving downstream on the South Santiam River due to increasing water temperature. The downstream declines in DO levels are also likely to be much more noticeable during the summer months.

Figure 6-7. South Santiam River Dissolved Oxygen Saturation Percentage 1989-1998



Dissolved Oxygen Standard. The DO standard for the South Santiam River is summarized in Table 6-4. The South Santiam River is classified as a cold water resource. A relatively recent addition to the DO standard is consideration of intergravel DO. Streams that have experienced a high degree of siltation can be in compliance with the DO standard for the water column, but have intergravel DO concentrations low enough to impair salmonid egg development. Silt can fill the voids between the larger cobbles and gravels and reduce the rate of transfer of both oxygen and water.

Table 6-4. Dissolved Oxygen and Intergravel Dissolved Oxygen Standards

Class	Concentration and Period[a] (All Units Are mg/L)				Use/Level of Protection
	30-D	7-D	7-Mi	Min	
Salmonid Spawning		11.0[b,c]	8.0[d]	9.0[c] 6.0[e]	Principal use of salmonid spawning and incubation of embryos until emergence from the gravels. Low risk of impairment to cold-water aquatic life, other native fish and invertebrates. The IGDO criteria represents an acute threshold for survival based on field studies.
Cold Water	8.0[f]		6.5	6.0	Principally cold-water aquatic life. Salmon, trout, cold-water invertebrates, and other native cold-water species exist throughout all or most of the year. Juvenile anadromous salmonids may rear throughout the year. No measurable risk level for these communities.
Cool Water	6.5		5.0	4.0	Mixed native cool-water aquatic life, such as sculpins, smelt, and lampreys. Waterbodies includes estuaries. Salmonids and other cold-water biota may be present during part or all of the year but do not form a dominant component of the community structure. No measurable risk to cool-water species, slight risk to cold-water species present.

Class	Concentration and Period[a] (All Units Are mg/L) 30-D	7-D	7-Mi	Min	Use/Level of Protection
Warm Water	5.5			4.0	Waterbodies whose aquatic life beneficial uses are characterized by introduced, or native, warm-water species.
No Risk	No change from background				The only DO criterion that provides no additional risk is "no change from background." Waterbodies accorded this level of protection include marine waters and waters in wilderness areas.

[a]30-D = 30-day mean minimum as defined in OAR 340-41-0001.
7-D = 7-day mean minimum as defined in OAR 340-41-0001.
7-Mi = 7-day minimum mean as defined in OAR 340-41-0001.
Min = Absolute minimum for surface samples when applying the averaging period, spatial median of IGDO.
[b]When Intergravel DO levels are 8.0 mg/L or greater, DO levels may be as low as 9.0 mg/L, without triggering a violation.
[c]If conditions of barometric pressure, altitude, and temperature preclude achievement of the footnoted criteria, then 95 percent saturation applies.
[d]Intergravel DO action level, spatial median minimum.
[e]Intergravel DO criterion, spatial median minimum.
[f]If conditions of barometric pressure, altitude, and temperature preclude achievement of 8.0 mg/L, then 90 percent saturation applies.
Note: Shaded values present the absolute minimum criteria, unless the Department believes adequate data exists to apply the multiple criteria and associated periods.

Groundwater Regulations

One of the alternatives considered in this plan is to discharge treated effluent from the Lebanon wastewater treatment plant via rapid infiltration and subsequent subsurface discharge to the river. The City has evaluated a potential site for discharge of treated effluent at a gravel quarry located across the South Santiam River from the current outfall. This infiltration site has adequate hydraulic capacity for the anticipated flows from the Lebanon Wastewater Treatment Plant. According to the infiltration tests conducted during high and low groundwater levels, the near surface groundwater gradient is always towards the river (Kennedy/Jenks Consultants, November 2002 and April 2003). As a result, the deeper groundwater resources that are routinely used for drinking water supply were not affected even when mounding of the near surface groundwater table was observed during these tests.

Discharges into groundwater are regulated by state and federal agencies to ensure protection of groundwater quality. The state groundwater standards are described in OAR 340-040 and these regulations could be used for permitting a program for infiltration and subsurface discharge to the river. The City would likely either comply with OAR 340-040 or obtain a variance from the Environmental Quality Commission. The primary compliance issues would be meeting drinking water standards for nitrate-N (10mg/L), turbidity (1 TU) and bacteria (<1 E. coli organisms per 100 mL) or meeting background water quality for the local groundwater, whichever is lower (Kennedy/Jenks Consultants, March 2004). However, these groundwater regulations may not apply to the rapid infiltration alternative under consideration, as the deeper resources used for drinking water are not affected by subsurface discharge to the river. Groundwater monitoring would be conducted to verify that no contamination of the deeper groundwater resource occurs.

It is important to note that approvals from a number of state and federal agencies would be required during the process of implementing a system for subsurface discharge to the river. In addition to the DEQ, the other key regulatory agencies include the Oregon Division of State Lands, the US Army Corps of Engineers, NOAA Fisheries, and the US Fish and Wildlife Service. The Oregon Health Division and Oregon Department of Geology and Mineral Industries may also need to participate in the implementation of a subsurface discharge program. Since the City has received positive responses and encouragement from these regulatory agencies during the feasibility analysis stage, it is reasonable to expect that the necessary approvals can be obtained.

Nuisance Phytoplankton

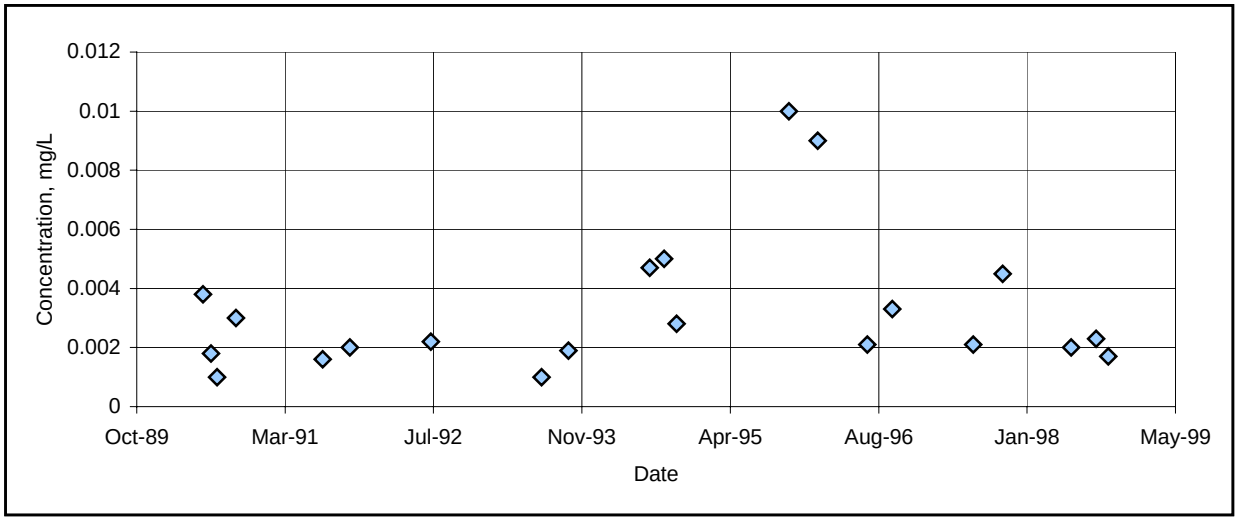
Algae can cause the following water quality problems:

- Low DO levels. During nighttime respiration, algae consumes DO.
- High pH levels. During daytime photosynthesis, dissolved carbon dioxide (a weak acid) is consumed, raising pH levels.
- Diurnal swings in DO and pH. The cycling between daytime photosynthesis and nighttime respiration causes daily fluctuations in pH and DO.

Many factors contribute to excessive algae growth, including high water temperatures, sunlight, low stream flows and velocities, and high nutrient concentrations. Algae require inorganic carbon, nitrogen, phosphorus, silica, and various trace elements in the presence of light to synthesize algal phytoplankton. Of these, nitrogen and phosphorus are the only essential elements that are possible to control. A typical relationship for production of algal biomass shows that seven times as much nitrogen as phosphorus is necessary for algal growth. The nutrient that will control the amount of algal growth is the "limiting" nutrient.

Current South Santiam River Water Quality. Concentrations of chlorophyll-a, a photosynthetic pigment found in algae, are used to estimate the degree of algal growth in a water body. The action limit for identifying rivers where phytoplankton may impair beneficial uses is an average value of 0.015 mg/L of chlorophyll-a. Based on STORET data from the Highway 226 monitoring station, the chlorophyll-a levels in the South Santiam River are well below this standard. Figure 6-8 shows the measurements of chlorophyll-a between 1989 and 1998. Excessive algae growth is not a problem on the South Santiam River and nutrient concentrations will likely not be limited during the current planning period.

Figure 6-8. South Santiam River Chlorophyll-a Concentrations 1989-1998



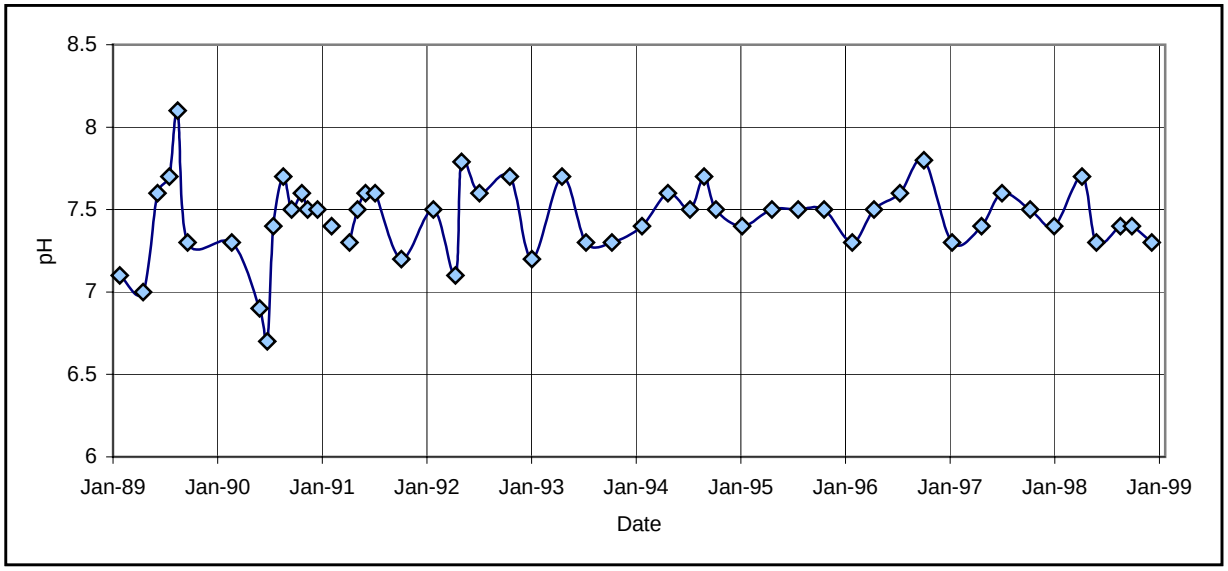
pH

Water quality data on pH for the South Santiam is available from the STORET sampling site at Highway 226 near Crabtree. Figure 6-9 illustrates the pH measurements taken between 1986 and 1995. Typical pH measurements fall between 7 and 8, although one measurement shows the pH level falling to 6.7 and another shows the level as high as 8.1. However, all of the pH measurements are above the 6.5 minimum and below the 8.5 maximum stipulated by the water quality standards. Since pH problems are often caused by excessive algae growth, it is not unexpected to find that pH levels are well within water quality standards.

Toxic Substances

The presence of toxic substances such as chlorine, ammonia, and metals in the WWTP effluent creates the potential for water quality issues at the edge of the plant's regulatory mixing zone. The DEQ requires that levels of toxic substances shall not exceed the criteria established by the EPA and published in Quality Criteria for Water (1986) outside of the regulatory mixing zone (RMZ). Lebanon's NPDES permit defines the RMZ as the portion of the South Santiam River beginning 10 feet upstream and continuing 100 feet downstream from the point of discharge to the river. The Zone of Initial Dilution (ZID) is defined as within 10 feet of the point of discharge. The concentration of toxic substances within the RMZ but outside of the ZID must be maintained below the acute (lethal) toxicity criteria and the concentration outside the RMZ must be below the chronic (sub-lethal) toxicity criteria. Therefore, in order to demonstrate compliance with these requirements, the City needs to monitor the dilution of toxic substances that are discharged from the WWTP outfall.

Figure 6-9. South Santiam River pH Measurements 1989-1998



Chlorine Toxicity. The chronic and acute toxicity limits for chlorine are 0.011 mg/L and 0.019 mg/L, respectively. Since the WWTP disinfects with a sodium hypochlorite solution prior to discharge, chlorine toxicity is a potential concern. If chlorination is continued, dechlorination would be required to eliminate chlorine toxicity.

Ammonia Toxicity. To establish the applicable water quality criteria for ammonia, representative in-stream pH, temperature, and background ammonia data are necessary. This information is combined with pH, temperature, and ammonia data for the plant effluent to evaluate ammonia toxicity at the edge of the regulatory mixing zone. At this time, the necessary data for an ammonia toxicity evaluation is primarily in the form of periodic grab samples. The DEQ conducted continuous monitoring of temperature in the South Santiam River downstream of the plant at Highway 226 during the summer of 2000 and the City conducted detailed river and effluent data collection in 2001 for their temperature management plan. The DEQ data from the summer of 2000 indicated higher river temperatures.

The data reported in this chapter and data available from the plant monitoring records allows for an assessment of ammonia toxicity. Assuming that a new outfall diffuser will incorporate about one quarter of the 7Q10 river flow in the mixing zone plume, the dilution available at the plant's design ADWF of 3 mgd is nearly 26:1. Using this dilution factor, Table 6-5 summarizes the ammonia toxicity evaluation. The evaluation is based on dry weather season measurements. This evaluation indicates that with improved mixing, ammonia toxicity can be eliminated.

Table 6-5. Preliminary Ammonia Toxicity Evaluation

Parameter	Value
Dilution available in regulatory mixing zone	26:1
South Santiam River Background	
Maximum temp, F (summer 2000)	70.9
Maximum grab sample pH	8.1
Average grab sample river alkalinity, mg/L	17
Maximum grab sample NH_3, mg/L	0.13
Lebanon WWTP Effluent	
90^{th} percentile grab sample temperature, F (summer 2001)	69.6
90^{th} percentile grab sample pH	7.4
Average alkalinity, mg/L	11.2
90^{th} percentile ammonia, mg/L	11.6
Ammonia concentration at edge of RMZ, mg/L	0.578
Chronic ammonia toxicity criteria, mg/L	0.709

Other Toxic Substances. DEQ's approach to dealing with toxic pollutants other than chlorine and ammonia, such as metals, is through the industrial pretreatment program (IPP). Since the City of Lebanon does not have any industrial waste generators, the development of local limits for toxic pollutants has not been necessary.

TREATMENT CRITERIA

Minimum treatment requirements for wastewater discharges in the Willamette Basin are established in OAR 340-41-345. Based on these minimum requirements, the DEQ has developed a waste discharge permit for the Lebanon WWTP. This section reviews the plant's current discharge permit as well as outlines possible future treatment criteria for two potential treatment requirement scenarios.

Current Discharge Permit

The plant's current discharge permit was issued in February 2000 and expires in December 2004. The requirements of the current permit are summarized in Table 6-6. The complete NPDES permit for the Lebanon WWTP and the associated Mutual Order and Agreement (MAO) are included in Appendix B. The current permit does not restrict the discharge of nutrients into the river.

Table 6-6. Current Treatment Requirements

Parameter	Average Effluent Concentration, mg/L		Mass Load Limits, ppd		
	Monthly	Weekly	Monthly Average	Weekly Average	Daily Maximum
June 1 - October 31					
$CBOD_5$	10	15	250	380	500
TSS	10	15	250	380	500
November 1 - May 31					
$CBOD_5$	25	40	1,500	2,200	3,000
TSS	30	45	1,800	2,700	3,600
Other parameters (year-round)					
pH	Shall be within the range of 6.0 to 9.0.				
Ammonia-N	Shall not exceed a monthly average concentration of 0.94 mg/L and a daily maximum concentration of 1.89 mg/L.				
$CBOD_5$ and TSS removal efficiency	Shall not be less than 85 percent monthly average when monthly average flows exceed 3.0 mgd removal efficiency shall not be less than 75 percent monthly average.				
Total chlorine residual	Shall not exceed a daily average of 0.01 mg/L and a daily maximum concentration of 0.02 mg/L.				
E. coli bacteria	Shall not exceed 126 organisms per 100 ml monthly geometric mean. No single sample shall exceed 406 organisms per 100 ml.				

Reuse Treatment Requirements

Effluent reuse regulations restrict use according to the degree of treatment and quality. Table 6-7 summarizes the treatment requirements for different levels of reclaimed water. The reuse alternatives considered in subsequent chapters assume that reclaimed water for irrigation will be treated to Level III standards. The WWTP can produce Level III water with additional disinfection.

Table 6-7. Treatment and Monitoring Requirements for Use of Reclaimed Water State of Oregon

Requirement	Treatment Level			
	I	II	III	IV
Treatment, processes				
Biological treatment	Required	Required	Required	Required
Disinfection	-	Required	Required	Required
Clarification	-	-	-	Required
Coagulation	-	-	-	Required
Filtration	-	-	-	Required
Effluent only				
Total coliform (organisms/100 mL)				
Two consecutive samples	No limit	240	No limit	No limit
7-day median	No limit	23	2.2	2.2
Maximum	No limit	No limit	23	23
Sampling frequency	Not required	1 per week	3 per week	1 per day

Requirement	Treatment Level			
	I	II	III	IV
Turbidity (NTU)				
24-hour mean	No limit	No limit	No limit	2
5% of time during a 24-hr period	No limit	No limit	No limit	5
Sampling frequency	-	-	-	Hourly
Application				
Public access	Prevented (fences, gates, locks)	Controlled (signs, rural, or nonpublic lands)	Controlled (signs, rural, or nonpublic lands)	No direct public contact during irrigation cycle
Buffers for irrigation	Surface: 10 feet Spray: Site-specific	Surface: 10 feet Spray: 70 feet	10 feet	None required
Impoundments				
Unrestricted	Not allowed	Not allowed	Not allowed	Posted, discharge requires permit
Restricted	Not allowed	Not allowed	Posted, discharge requires permit	Posted, discharge requires permit
Landscape	Not allowed	Posted, discharge requires permit	Posted, discharge requires permit	Posted, discharge requires permit
Agricultural use restrictions:				
Food crops	Not allowed	Not allowed	Not allowed	Unrestricted
Processed food crops	Not allowed	Advisory notice[a]	Advisory notice	Unrestricted
Orchards and vineyards	Not allowed	No ground contact[b]	No ground contact[b]	Unrestricted
Fodder, fiber, and seed crops not for human ingestion	Aerosol restriction[c]	Advisory notice[a]	Advisory notice[a]	Unrestricted
Pasture for animals	Not allowed	Grazing restriction[d]	Grazing restriction	Unrestricted
Sod	Not allowed	Advisory notice	Advisory notice	Unrestricted
Ornamental nursery stock	Not allowed	Advisory notice	Advisory notice	Unrestricted
Christmas trees	Not allowed	Advisory notice	Advisory notice	Unrestricted
Firewood	Not allowed	Advisory notice	Advisory notice	Unrestricted
Commercial timber	Aerosol restriction[c]	Advisory notice	Advisory notice	Unrestricted

[a]Advisory Notice Only: The Oregon State Health Division recommends that there should be no irrigation of this level of effluent for 3 days before harvesting.

[b]Surface irrigation where edible portion of crop does not contact the ground, and fruit or nuts shall not be harvested off the ground.

[c]DEQ may permit spraying if it can be demonstrated that public health and the environment will be adequately protected from aerosols.

[d]Surface or spray irrigation. No animals will be on the pasture during irrigation.

NTU – nephelometric turbidity unit.

Anticipated Treatment Requirements

Based on an assessment of existing water quality in the river, future treatment requirements at the plant should be similar to the existing permit. If Lebanon's existing permit is not modified, the mass discharge limits will not change. Any increases in the mass discharge limits would require approval from the Environmental Quality Commission. Therefore, to ensure continued compliance with the permitted mass load limits, the WWTP will need generally to improve treatment performance as flows and loads increase. Specifically, to comply with a fixed mass discharge limit while flows increase over time, the plant will have to produce effluent with relatively lower BOD and TSS concentrations. Table 6-8 presents a comparison between the concentration limits identified in the permit and the concentration needed to meet the mass discharge limits based on year 2024 flows.

As indicated in Table 6-8, the WWTP must produce an effluent with concentrations below the permitted limits in order to comply with the mass load limits. Since concentrations well below 10 mg/L are challenging to achieve using standard secondary treatment processes, planning for future liquid stream facilities must provide for adequate treatment performance. There may be opportunities to obtain a waiver from the DEQ for mass load limits during a maximum month wet weather flow period, but otherwise treatment performance will likely need to be enhanced as necessary to maintain compliance.

While numerous streams in Oregon are water quality limited for nutrients, data from the South Santiam River does not indicate that a nutrient limit will be necessary during the planning period of this facilities plan. Chlorophyll-a levels (Figure 6-9) are well below the DEQ action limit. Equally significant are the other indicators of algae including dissolved oxygen and pH. When algae growth is significant, large swings in dissolved oxygen and pH are detected.

Table 6-8. Allowable Effluent Concentration Analysis

Flow Condition	Year 2024 Flow, mgd	Permitted Concentration mg/L		Concentration Required to Meet Permitted Mass Discharge Limit mg/L	
		CBOD	TSS	CBOD	TSS
ADWF	3	10	10	10	10
MMDWF	7	10	10	4	4
AWWF	8	25	30	23	27
MMWWF	12	25	30	15	18

It is uncertain how the state and EPA will implement the temperature standard and what restrictions will be placed on the discharge. It is conceivable that cooling could be required and alternatives that include discharge while the river exceeds the temperature standard should include an evaluation on the cost of such a requirement. New permits being issued by DEQ for streams that are temperature limited include a heat load limit that is based on the average design flow and the difference between the effluent temperature and temperature standard. Load increases will not be granted without a permit modification, which would likely be difficult to obtain.