MEMORANDUM

To:	Oregon Department of Environmental Quality	**Date:**	April 25, 2018
From:	Dale Richwine - REI	**cc:**	Dan Huff Gerald Fisher J.W. Ring Mark P. Strandberg
Subject:	Molalla WWTP Permit Modification Request		

1 SUMMARY

The City of Molalla (the "City" or "Molalla") is submitting this request to modify its NPDES Permit, Permit #101514, (the "Permit"). To aid in this process, a proposed modified permit (the "Modified Permit") was developed to bridge the period of time until the permit for the new wastewater treatment plant can be developed. The Modified Permit is attached to this memorandum. In its permit modification request, Molalla is requesting the following changes to the Permit:

- Allow summer season discharge during the months of May, June and October
- Allow for summer season (May 1 – October 31) mass limits to be based on Willamette River water quality standard of 10-mg/L BOD_5 and 10-mg/L TSS
- Allow for wet season (November 1 – April 30) mass limits to be based on Willamette River water quality standard of 30-mg/L BOD_5 and 30-mg/L TSS
- Allow for summer season (May 1 – October 31) mass limits to be based on the dry weather design flow for the existing treatment plant of 2.3-mgd
- Allow for winter season (November 1 – April 30) mass limits to be based on the wet weather design flow for the existing treatment plant of 4.1-mgd
- Maintains the 350-cfs river flow discharge limitation
- Replaces the 18°C discharge limitation with an Excess Thermal Load allocation for each of the months May, June and October as allowed by the Molalla River TMDL

This technical memorandum provides the technical basis for each of these changes to the permit.

2 DRAFT INTERIM PERMIT

The Modified Permit is based on the design of the current treatment plant and establishes discharge limits as allowed by the Willamette Basin Water Quality Standards specified in OAR 340-041-0340 and the Molalla-Pudding River TMDL.

2.1 BASIS OF FLOWS

The Modified Permit limits that Molalla is requesting are based on the design flows for the City's existing wastewater treatment plant. The 2007 Construction Drawings for Wastewater Treatment Plant Improvements for the City of Molalla, Oregon were the design basis for the last

upgrade to the liquids treatment facilities. The flows from the Design Data Sheet (Drawing G3) are shown in ***Table 1***.

FLOW DATA Existing and Projected Flows	2005	2015	2025
ADWF – Average dry weather flow	0.80 mgd	1.1 mgd	1.4 mgd
MMDWF – Max month dry weather flow	1.28 mgd	1.7 mgd	2.3 mgd
AWWF – Average wet weather flow	1.30 mgd	2.3 mgd	3.0 mgd
MMWWF – Max month wet weather flow	2.04 mgd	3.1 mgd	4.1 mgd
PDF – Peak day flow	7.06 mgd	8.5 mgd	10.3 mgd

Table 1: Current Treatment Plant Design Basis

Using this design data as the basis for existing plant design, the dry season design flow is the 2025 MMDWF of 2.30-mgd and the wet season design flow is the 2025 MMWWF of 4.1-mgd. These values were used to calculate the mass limits for Molalla's requested permit modification.

2.2 Requested Permit Limits

Schedule A of an NPDES permit provides the discharge limits for the permit. The proposed Schedule A for the Modified Permit with the proposed permit limits is provided below. This memorandum provides the rationale for these limits in the following sections.

SCHEDULE A: WASTE DISCHARGE LIMITS

Outfall 001 –Permit Limits

a. May 1 – October 31: During this period the permittee must comply with the limits in Table A1 while discharging to waters of the state.

b. November 1 – April 30: During this period the permittee must comply with the limits in Table A1 while discharging to waters of the state.

c. During the term of this permit, the effluent quality must comply with the limits in the following table:

Table A1: Permit Limits

Parameter	Units	Average Monthly	Average Weekly	Daily Maximum
BOD_5 (May 1 – October 31)	mg/L	10	15	-
	lbs/day	190	290	380
	% removal	85	-	-
TSS (May 1 – October 31)	mg/L	10	15	-
	lbs/day	190	290	380
	% removal	85	-	-
BOD_5 (November 1 – April 30)	mg/L	30	45	-
	lbs/day	1000	1500	2000
	%	85	-	-
TSS (November 1 – April 30)	mg/L	30	45	-
	lbs/day	1000	1500	2000
	%	85	-	-
pH[b]	SU	Between 6.0 and 9.0		
Design Effluent Flow Dry Season	MGD	2.30	-	-
Design Effluent Flow Wet Season	MGD	4.10		
Total Residual Chlorine[c]	mg/L	0.07	-	0.18
E. coli[ad]	MPN/100 ml	126	-	406
Ammonia	mg/L	16.7	-	25.9
Dilution	Discharge may not commence until gauged stream flow exceeds 350-cfs and will cease when the average stream flow for the previous seven-day-period is less than-350-cfs.			
Excess Thermal Load (May)[e]	Shall not exceed a 7-day moving average of the daily excess thermal loads of 77.95 million kcals/day.			
Excess Thermal Load (June)[e]	Shall not exceed a 7-day moving average of the daily excess thermal loads of 72.38 million kcals/day.			
Excess Thermal Load (July, August, September)	No Thermal Load Available – Effluent temperature must be less than 16°C.			
Excess Thermal Load (October)[e]	Shall not exceed a 7-day moving average of the daily excess thermal loads of 42.43 million kcals/day.			

Notes:

a. No single *E. coli* sample may exceed 406 organisms per 100 mL; The permittee may take at least 5 consecutive re-samples at 4-hour intervals beginning within 48 hours after the original sample was taken and the geometric mean of the 5 re-samples is less than or equal to 126 *E. coli* organisms/100 mL to demonstrate compliance with the limit.
b. May not be outside the range of 6.0 to 9.0 S.U.
c. DEQ has established a minimum Quantitation Limit of 0.05 mg/L for Total Residual Chlorine. In cases where the average monthly or maximum daily limit for Total Residual Chlorine is lower than the Quantitation Limit, DEQ will use the reported Quantitation Limit as the compliance evaluation level.
d. Reported as a monthly geometric mean.
e. Refer to Table B3 for formula to calculate Excess Thermal Load.

d. Additional information for the limits in Table A1 above.

i. Average dry weather design flow to the facility equals 2.3 MGD and mass load limits from May 1 to October 31 are based on 2.30 MGD. Average wet weather design flow to the facility equals 4.1 MGD and mass load limits from November 1 to April 30 are based on 4.10 MGD

3 SEASONAL DISCHARGE LIMITATIONS

Molalla is requesting that the seasonal discharge limitation be removed in the Modified Permit, allowing discharge during the summer season (May 1 – October 31) within strict guidelines to ensure river water quality is maintained. The current Permit does not provide the ability to discharge during the summer season months of May 1 – October 31. This restriction has no basis in the Willamette Basin water quality standards nor in the Molalla River TMDL and has no technical relationship to water quality. Water quality will be protected by limiting the plant discharge based on river flow to protect the river's dissolved oxygen levels and by including temperature limits based on Excess Thermal Loads that will provide protection from temperature increase in accordance with the Molalla-Pudding River TMDL.

4 MASS LIMIT INCREASE

The discharge limits in the Molalla's permit should be based on the water quality standards for the Willamette Basin. There is currently no TMDL on the Molalla for dissolved oxygen (DO), but to ensure DO sag downstream of the discharge will not be an issue, the mass limits for this permit are derived as Technology-Based Effluent Limits (TBELs).

4.1 Technology-Based Effluent Limits

TBELs must be met at the outfall. The applicable TBELS for the Molalla WWTP are the more stringent of the federal secondary treatment standards and the Oregon basin standards, adjusted as necessary for the type of treatment system.

Table 2 shows a comparison of the federal secondary treatment standards and Oregon basin standards and also lists bacteria standards. Basin standards and bacteria standards are not strictly speaking TBELs; however, they function as such when they have to be met at the end of the pipe.

Table 2
Comparison of Federal Secondary Treatment and Basin Design Standards

Parameter	Federal Secondary Treatment Standards		Applicable Willamette River Design Standards (OAR 340-041-0340)
	30-Day Average	7-Day Average	30-Day Average
5-Day BOD or cBOD (See note 1)	30 mg/L or 25 mg/L	45 mg/L Or 40 mg/L	During periods of low stream flows (approximately May 1 to October 31): Treatment resulting in monthly average effluent concentrations not to exceed 10 mg/l of BOD and 10 mg/l of SS or equivalent control During the period of high stream flows (approximately November 1 to April 30): A minimum of secondary treatment or equivalent control
TSS	30 mg/L	45 mg/L	
pH	6.0 – 9.0		6.5 – 8.5 Note: Basin standards for pH do not have to be met at the outfall and can instead be met at the edge of the mixing zone.
% Removal	85% BOD_5 and TSS		Not Specified

1. Federal regulations allow the replacement of BOD_5 limits with $CBOD_5$ (Carbonaceous BOD) limits. For wastewaters with significant nitrogen content, basing permit limitations on $CBOD_5$ instead of BOD_5 eliminates the impact of nitrification on discharge limitations and compliance determinations. EPA sets $CBOD_5$ concentration limits 5 mg/L less than BOD_5.

The more stringent of the federal or Oregon TBELS are applicable to the permit. These are summarized in ***Table 3***.

Table 3
Summary of Technology-Based Effluent Limits for the Molalla WWTP

Effluent Parameter	Concentration		Percent Removal	Comments
	Monthly	Weekly		
BOD5	10 mg/L	15 mg/L	85%	Low Stream Flow: approximately May 1 – October 31
BOD5	30 mg/L	45 mg/L	85%	High Stream Flow: approximately November 1 – April 31
TSS	10 mg/L	15 mg/L	85%	Low Stream Flow: approximately May 1 – October 31
TSS	30 mg/L	45 mg/L		High Stream Flow: approximately November 1 – April 31
pH	Must not be outside the range of 6.0 and 9.0			

The limits for BOD_5 and TSS shown in ***Table 3*** are concentration-based limits. The following equation is used to develop the monthly average mass load:

> Monthly Avg. Mass Load = POTW design flow x Conc. - based limit x 8.34 lbs/gal
>
> The weekly average and maximum daily mass loads are developed from the monthly average by multiplying by 1.5 and 2, respectively.

The permittee's low stream flow (summer season) mass load limits for BOD_5 and TSS limits (monthly and weekly average and daily maximum) are based on the current WWTP's average dry weather design flow of 2.3 MGD and a concentration of 10 mg/L. Utilizing the equation presented above, the low stream flow (summer season) calculations for BOD_5 and TSS are:

> Monthly Average: 2.3 MGD x 10 mg/L x 8.34 = 191.8 lbs/day rounded off to 190 lbs/day
> Weekly Average: 190 lbs/day monthly average x 1.5 = 285 lbs/day (rounded to 290 lbs/day)
> Daily Maximum: 190 lbs/day monthly x 2 = 380 lbs/day

The facility's high stream flow (winter season) mass limits (monthly and weekly average and daily maximum) for TSS are based on an average wet weather design flow of 4.1 MGD and a concentration of 30 mg/L. The high stream flow (winter season) calculations are:

> Monthly Average: 4.1 MGD x 30 mg/L x 8.34 = 1025.82 lbs/day (rounded off to 1000 lbs/day)
> Weekly Average: 1000 lbs/day x 1.5 = 1500 lbs/day
> Daily Maximum: 1000 lbs/day monthly x 2 = 2000 lbs/day

All mass load limitations are rounded to two significant figures, consistent with the number of significant figures associated with flow measurements with this facility, and with the accuracy of TSS and BOD_5 measurements of 10 or greater. The rounding to two significant figures resulted in slight reductions to the mass load limitations in the permit modification request.

4.2 Antidegradation Evaluation

This permit modification increases the mass load for BOD_5 and TSS for the high stream flow discharge period (winter season) and allows for discharge during the low stream flow discharge period (summer season) when river flows measured at the Canby station are greater than 350-cfs. An antidegradation evaluation on the impact on river dissolved oxygen from the BOD_5 discharge was performed by Geosyntec showing the river dissolved oxygen staying above 95% saturation through its course to the Canby station. The antidegradation evaluation also considered the

impact of the plant's effluent TSS on river TSS. This evaluation showed no significant impact to the river dissolved oxygen from the increased winter season discharge and the summer season discharge when river flows are greater than 350-cfs. This Technical Memorandum is provided in ***Attachment A***.

4.3 Water Quality-Based Effluent Limits

The water quality based effluent limits for pH, ammonia and chlorine residual remain the same as the current permit. Temperature limits are discussed in a following section.

5 SUMMER SEASON TEMERATURE ALLOCATION

The Molalla River is water quality limited for temperature. The Molalla-Pudding Subbasin Total Maximum Daily Load (TMDL) and Water Quality management Plan (WQMP) was developed in December 2008 to establish temperature allocations to the Molalla River for temperature. Sampling was performed along the river at the sampling locations shown in ***Figure 1***[1]. Sample location Number 13 is at the Molalla River at Hwy 211 bridge which is located at River Mile (RM) 19. The Molalla WWTP discharge is at RM-20.

A detailed evaluation of the TMDL and temperature allocations was performed to determine the temperature allocation available for the Molalla WWTP for discharge during the early and late summer season. This forms the basis for the Excess Thermal Load (ETL) values in the requested Modified Permit.

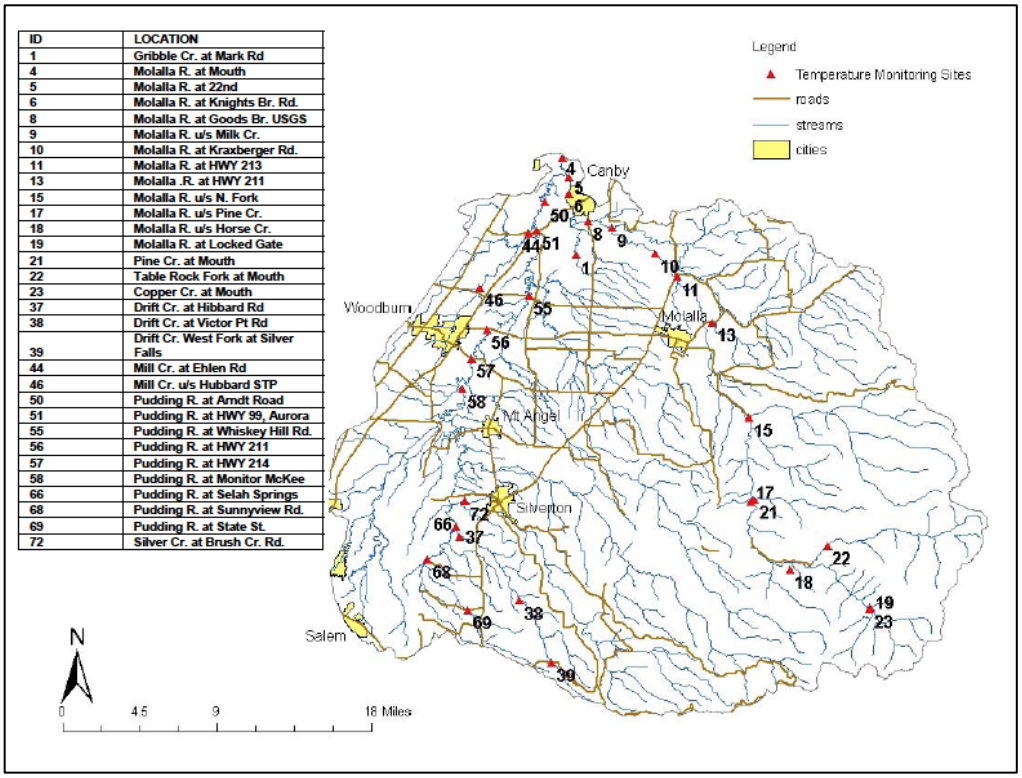

Figure 1: Molalla River Sampling Locations

[1] ODEQ, 2008. Molalla-Pudding Subbasin TMDL & WQMP. December. Figure 2-1

5.1 Water Quality Standards

Both narrative and numeric temperature criteria apply in the Molalla-Pudding Subbasin. Numeric criteria are shown in ***Figures 2[2] and 3[3].*** These figures indicate where the salmonid spawning through fry emergence, salmonid rearing and migration, and the core cold water habitat criteria apply.

The Biologically Based Numeric Criteria (BBNC) for the Molalla River for each of the beneficial uses identified are as follows:

- Salmon and Steelhead Spawning 13.0 °C (55.4 °F) - OAR 340-041-0028((4)(a) - The seven-day-average maximum temperature of a stream identified as having salmon and steelhead spawning may not exceed 13.0 degrees Celsius (55.4 degrees Fahrenheit)
- Core Cold Water Habitat 16.0 °C (60.8 °F) - OAR 340-041-0028((4)(b) - The seven-day-average maximum temperature of a stream identified as having core cold water habitat may not exceed 16.0 degrees Celsius (60.8 degrees Fahrenheit);
- Salmon and Trout Rearing and Migration 18.0°C (64.4°F) - The seven-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration may not exceed 18.0 degrees Celsius (64.4 degrees Fahrenheit);

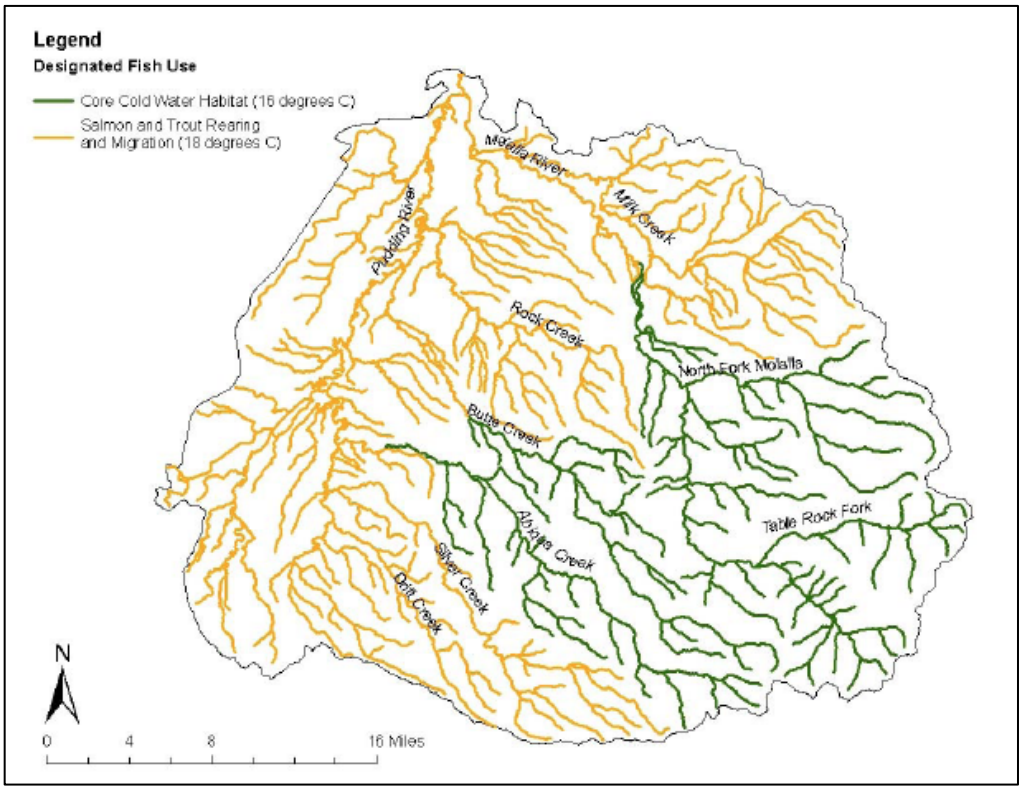

Figure 2: Molalla-Pudding Subbasin Designated Fish Use Distribution of Anadromous Salmonids

[2] ODEQ, 2008. Molalla-Pudding Subbasin TMDL & WQMP. December. Figure 2-4
[3] ODEQ, 2008. Molalla-Pudding Subbasin TMDL & WQMP. December. Figure 2-5

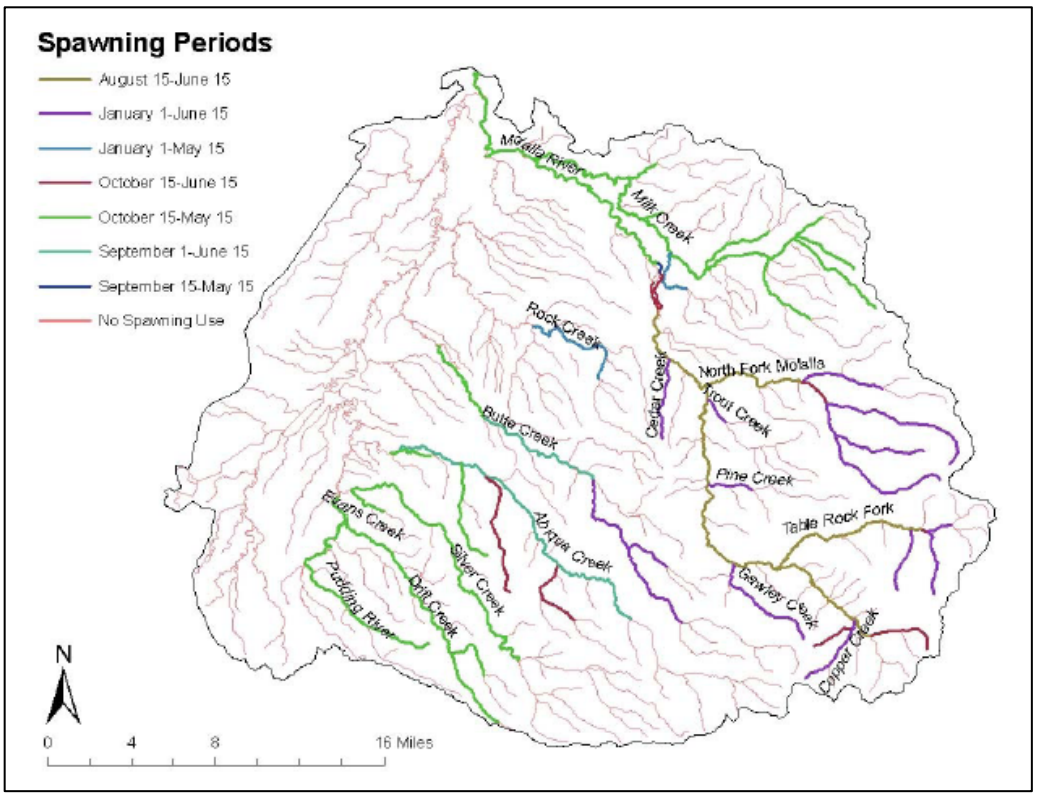

Figure 3: Molalla-Pudding Subbasin Designated Spawning Use Distribution of Anadromous Salmonids

5.2 SEASONAL VARIATION

The temperature during the wet weather season is not an issue as stated in the 2008 Molalla-Pudding Subbasin TMDL(TMDL)[4]:

> This TMDL comprises allocations that apply year-round and explicit WLAs that apply for defined periods within the year. WLAs to point sources on the Pudding River and its tributaries apply from June 1 – September 30. WLAs to point sources on the Molalla River and its tributaries (except for the Pudding River) apply from May 1 – October 31. DEQ refers to these two periods as the critical periods for the Pudding and Molalla portions of the subbasin, respectively. Outside of the critical periods, temperature data collected in 2001, 2002, 2004, 2007 (Molalla River only), and 2008 (Molalla River only) indicate no reasonable potential for temperature criteria to be exceeded. Point sources discharging outside of the applicable critical period are given an implicit heat load allocation sufficient to cover their current conditions of discharge. If future data were to indicate that temperature criteria were exceeded outside of the critical periods, WLAs to existing point sources would be extended through the end of the month of the last temperature criteria exceedance. DEQ would also calculate explicit WLAs for facilities given implicit heat load allocations for current conditions in this TMDL. From mid-June to mid-September, stream temperatures in the Molalla-Pudding Subbasin exceed biologically based rearing and migration criteria. Between late June (potentially as early as mid-May) and mid-October stream temperatures in the Molalla River portion of the subbasin exceed core cold water habitat criteria and spawning criteria. Maximum stream temperatures throughout the subbasin occur from late July to late August.

[4] ODEQ, 2008. Molalla-Pudding Subbasin TMDL & WQMP. December. Pages 2-14 – 2-15

And continued:

> For the Molalla River, although DEQ data were not collected into the latest of four applicable spawning seasons (i.e. after October 15), temperatures collected through October 12 indicate exceedance of the 13 ºC criteria in mid-October is possible. Figure 2 - 16 through Figure 2 - 19 illustrate the summer 2004 temperature conditions in the Molalla River and two tributaries. By late June, the temperatures at the mouth of the Molalla River exceed the criterion by more than 5ºC. Upstream of the confluence with North Fork, temperatures in the Molalla River begin to climb above the criterion in late June and remain well above the core cold water and spawning criteria until late September. Two tributaries to the Molalla River, Table Rock Fork (Figure 2 - 18) and Pine Creek (Figure 2 - 19), indicate a similar pattern, with temperatures beginning to exceed the core cold water criterion in mid-July and remaining above the core cold water and spawning criteria until late September.
>
> For many point sources the most challenging time to comply with the allocations in the TMDL will occur when low stream flow coincides with cooler applicable stream temperature criteria, usually in late summer to early fall. For nonpoint sources, allocations have no season-specific applicability because the activities that will lead to compliance with the TMDL (e.g. channel and riparian restoration) are on-going processes.

The TMDL states three important conclusions in the sections of the TMDL cited above. These are:

1. There are no temperature issues during the winter season of November 1 through April 30.
2. The temperature criteria for the Molalla subbasin exceeds "biologically based rearing and migration from mid-June to mid-September.
3. The temperature criteria for the Molalla subbasin exceeds "core cold water habitat criteria and spawning criteria" from late June (potentially as early as mid-May) through mid-October.

5.3 Oregon Administrative Rules for Temperature Discharges

The Oregon Administrative Rules (OAR) for temperature discharges is specified in OAR 340-041-0028. This rule identifies the Biologically Based Numeric Criteria (BBNC) that sets the water quality temperature criteria based on beneficial use to support salmonids. Fish maps have been developed for the Molalla-Pudding basins to show the specific uses for each river and tributary segment. These were shown in ***Figures 2*** and ***3***, above. The section of the river in which the Molalla WWTP discharges is designated as core cold water habitat and salmon and steelhead spawning. The criteria for each of these beneficial uses is noted in OAR 340-041-0028 (4) as follows:

> (4) Biologically Based Numeric Criteria. Unless superseded by the natural conditions criteria described in section (8) of this rule, or by subsequently adopted site-specific criteria approved by EPA, the temperature criteria for State waters supporting salmonid fishes are as follows:
> (a) The seven-day-average maximum temperature of a stream identified as having salmon and steelhead spawning use on subbasin maps and tables set out in OAR 340-041-0101 to 340-041-0340: Tables 101B, and 121B, and Figures 130B, 151B, 160B, 170B, 220B, 230B, 271B, 286B, 300B, 310B, 320B, and 340B, may not exceed 13.0 degrees Celsius (55.4 degrees Fahrenheit) at the times indicated on these maps and tables;
> (b) The seven-day-average maximum temperature of a stream identified as having core cold water habitat use on subbasin maps set out in OAR 340-041-101 to 340-041-340: Figures 130A, 151A, 160A, 170A, 220A, 230A, 271A, 286A, 300A, 310A, 320A, and 340A, may not exceed 16.0 degrees Celsius (60.8 degrees Fahrenheit);

> (c) The seven-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration use on subbasin maps set out at OAR 340-041-0101 to 340-041-0340: Figures 130A, 151A, 160A, 170A, 220A, 230A, 271A, 286A, 300A, 310A, 320A, and 340A, may not exceed 18.0 degrees Celsius (64.4 degrees Fahrenheit);

The above reverence sets the water quality criteria. The OAR then specifies how the temperature criteria is to be implemented in each of the river basins. In the implementation of the temperature criteria, a Human Use Allowance (HUA) is allowed. The implementation of the human use allowance is specified in OAR 340-041-0028 (12) as follows.

> (12) Implementation of the Temperature Criteria.
> (a) Minimum Duties. There is no duty for anthropogenic sources to reduce heating of the waters of the State below their natural condition. Similarly, each anthropogenic point and nonpoint source is responsible only for controlling the thermal effects of its own discharge or activity in accordance with its overall heat contribution. In no case may a source cause more warming than that allowed by the human use allowance provided in subsection (b) of this rule.
> (b) Human Use Allowance. Insignificant additions of heat are authorized in waters that exceed the applicable temperature criteria as follows:
> (A) Prior to the completion of a temperature TMDL or other cumulative effects analysis, no single NPDES point source that discharges into a temperature water quality limited water may cause the temperature of the water body to increase more than 0.3 degrees Celsius (0.5 Fahrenheit) above the applicable criteria after mixing with either twenty five (25) percent of the stream flow, or the temperature mixing zone, whichever is more restrictive; or
> (B) Following a temperature TMDL or other cumulative effects analysis, waste load and load allocations will restrict all NPDES point sources and nonpoint sources to a cumulative increase of no greater than 0.3 degrees Celsius (0.5 Fahrenheit) above the applicable criteria after complete mixing in the water body, and at the point of maximum impact.
> (C) Point sources must be in compliance with the additional mixing zone requirements set out in OAR 340-041-0053(2)(d).
> (D) A point source in compliance with the temperature conditions of its NPDES permit is deemed in compliance with the applicable criteria.

The implementation of the human use allowance provides the basis for the development of permit limits as excess thermal loads. A TMDL has been developed for the Molalla River. The portion of this OAR that outlines how the human use allowance is to be implemented for the City of Molalla is section (12)(b)(B). This states that following a temperature TMDL, there can be a cumulative increase of no greater than 0.3 degrees Celsius after mixing in the water body. The cumulative affects analysis was developed in the Molalla-Pudding River TMDL and is documented in the following section.

5.4 Molalla River TMDL

The Molalla-Pudding Subbasins Total Maximum Daily Load and Water Quality Management Plan (WQMP) was published in December 2008. This document provides the basis of the temperature allocations for the Molalla River. The TMDL[5] documents how the TMDL allocations were provided on the Molalla River as follows:

> For point sources of heat such as wastewater treatment plants, waste load allocations have been developed that limit the increase in temperature of the receiving stream (due to the point source effluent) to a portion of an allowance for "human use." The heat loads allocated to point sources in the Molalla- Pudding Subbasin are those

[5] ODEQ, 2008. Molalla-Pudding Subbasin TMDL & WQMP. December. Executive Summary, Page 3

loads that would cause no more than a 0.2ºC increase when fully mixed in the stream above the applicable criterion (which may be the NTP). Available data indicated that existing discharges from point sources to the Molalla River caused less than a 0.2°C in-stream temperature increase, and they were allocated heat loads equivalent to the heat load from their current discharge. For non-point sources, the load allocation is the heat load that would result if system potential vegetation were allowed to develop in the riparian zone. Representation of system potential vegetation followed the methodology used in the Willamette Basin temperature TMDL, which takes into account factors such as soils, slope, elevation, historical vegetation, and geomorphology. Non-point sources are allocated a heat load equivalent to a 0.05°C increase in-steam above the applicable criterion. A heat load equivalent to the remaining 0.05°C increase allowed for human use is allocated to reserve capacity to accommodate for future growth.

Chapter 2 of the TMDL[6] documents the temperature allocations for the TMDL. The point sources of heat are described on page 2-21 of the TMDL as follows:

POINT SOURCES OF HEAT
There are approximately 75 stormwater permits, at the time of this writing, active in the Molalla-Pudding subbasin, including both construction and industrial permits. In previous TMDLs, including the Willamette Basin TMDL, DEQ has generally considered heat load from stormwater to have no reasonable potential to cause temperature criteria violations. For that reason, DEQ has not assigned explicit wasteload allocations(WLAs) for sources discharging only stormwater, but these sources receive implicit heat load allocations sufficient to cover current conditions of discharge. Source locations, other than stormwater permits, are illustrated in Figure 2 - 20. In addition to stormwater permits, there are five individual and two general NPDES permitted sources in the Molalla watershed that are potential sources of heating (Table 2 - 9). There are nine individual and three general permitted sources in the Pudding watershed, but five of those sources do not discharge during the critical period in which explicit wasteload allocations apply, June 1 – September 30. Sources that do not discharge during the applicable critical periods are not assigned explicit wasteload allocations (WLAs), but rather receive implicit heat load allocations sufficient to cover current conditions of discharge. Those point sources that do not discharge during the critical periods, with one exception, are not described in this section. The Molalla Wastewater Treatment Plant (WWTP) does not discharge during the Molalla River critical period (May 1 – October 31), but the Protecting Cold Water criterion does apply during a portion of the spawning season when the WWTP does discharge. For that reason, the Molalla WWTP is described in this section and the potential heating effects of the WWTP are evaluated following the Wasteload Allocations section.

5.4.1 Temperature Waste Load Allocations on the Molalla River

There are five individual and two general NPDES permitted point sources in the Molalla watershed that are potential sources of heating. These are summarized in ***Table 4***. The map of point sources shown in ***Figure 7***[7] shows the location of the seven dischargers in the Molalla subbasin.

Table 4
Molalla Subbasin NPDES Dischargers
(Taken from Molalla-Pudding TMDL Table 2-9)

Facility Name	Permit Type	Permit Description	Receiving Stream	River Mile	Season
City of Molalla WWTP	NPDES-DOM-Da	Sewage disposal; less than 1 mgd with lagoons	Molalla River	20	Nov. 1 – April 30
Molalla Municipal Water Treatment Plant	GEN02	Industrial wastewater; NPDES filter backwash	Molalla River	21.6	Year round

[6] ODEQ, 2008. Molalla-Pudding Subbasin TMDL & WQMP. December. Page 2-21
[7] ODEQ, 2008. Molalla-Pudding Subbasin TMDL & WQMP. December. Figure 2-20

Table 4 (cont)
Molalla Subbasin NPDES Dischargers
(Taken from Molalla-Pudding TMDL Table 2-9)

Canby Utility Board – Canby Water Treatment Plant	NPDES-IW-B16	Non-process wastewater; infiltration and filter gallery backwash	Molalla River	3.5	Year round
Sunstone Circuits, LLC	NPDES-IW-N	Process wastewater NEC (includes remediated groundwater)	Mill Creek	5.3	Year round
Sanders Wood Products, Inc. (RSG Forest Products)	NPDES-IW-B19	Timber and wood products – sawmills, log storage, instream log storage	Molalla River	17.3	Year round
Arrow Auto Group, Inc.	GEN17A	Industrial wastewater; NPDES wash water	Molalla River	10.2	Year round
Chevron Environmental Management Co.	NPDES-IW-B16	Non-process wastewater; groundwater remediation	Molalla River	20	Year round

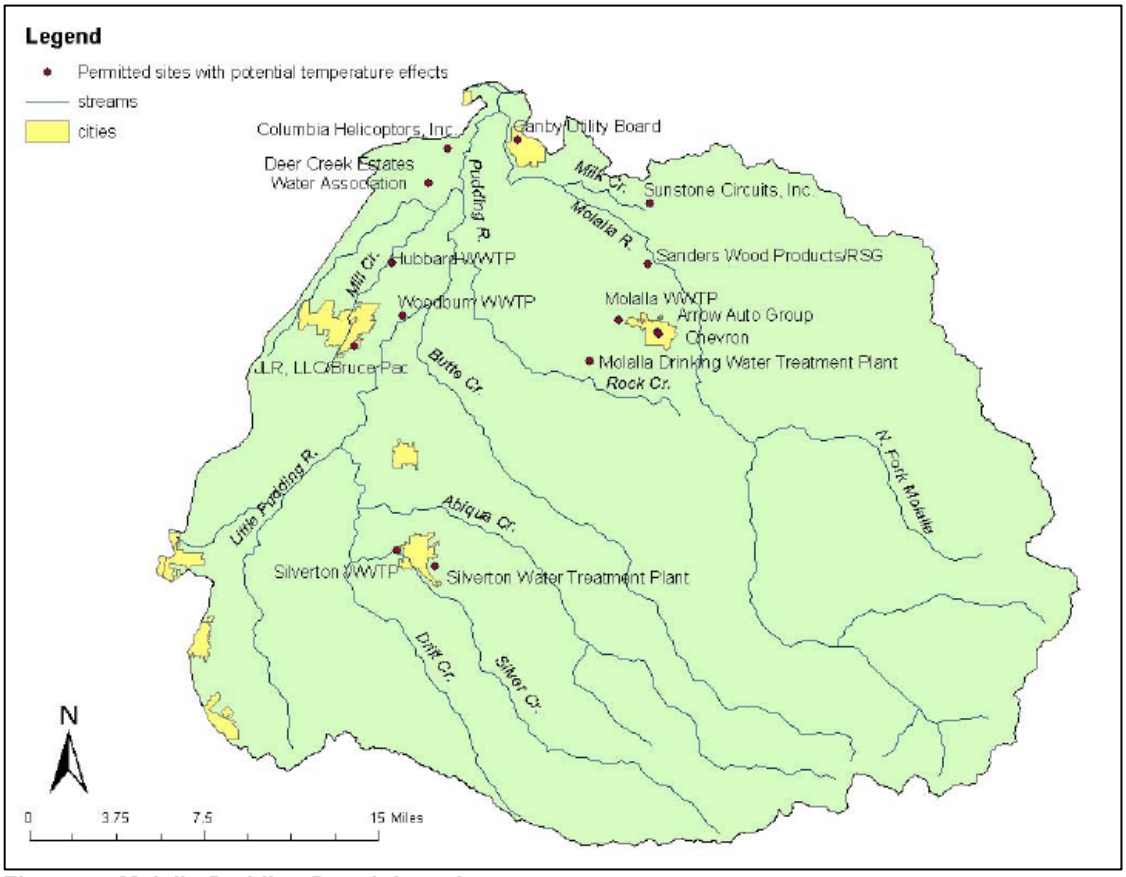

Figure 7: Molalla-Pudding Permit Locations

A description of each point source discharger to the Molalla subbasin is provided in the TMDL. A summary of the point sources, the heat wasteload and their temperature allocations are summarized below. This information is a summary of the information provided on each of the point source discharger allocations in the TMDL on Pages 2-24 – 2-16.

- City of Molalla WWTP – No discharge from May 1 – October 31. There are no thermal load limits set in the permit because discharge was limited to the winter season.
- Sunstone Circuits – Permitted design flow is 0.042-mgd with typical flows of 0.021-mgd. has an ETL allocation of 1.3-million kcals/day. This equates to a stream temperature increase of 0.04°C in Mill Creek and applies May 1 – October 31.
- Sanders Wood Products – Effluent flows range from 0.37 to 0.48-mgd, including stormwater, at the outfall from the settling pond that flows to a drainage ditch. The drainage ditch contributes to and receives overflow from far ponds. The ditch does not visibly flow into the Molalla River, but ends in a low ponded area. Effluent from the facility does not visibly flow into the Molalla River during the dry season. If connection of the drainage ditch with the Molalla River were to occur during late summer rains, for example, temperature in the drainage ditch surface water would likely be influenced by overflow from agricultural ponds, as well. Despite an uncertain connection of facility discharge to the Molalla River and uncertainty about temperature measurements in the facility effluent, DEQ assigned an allocation for the facility because of potential temperature effects from the facility during the late summer/early fall when rains begin, and Molalla River flow is still low. The allocation applies May 1 – October 31. Outside of the critical period (May 1 – October 31), the facility did not receive an explicit wasteload allocation, but rather an implicit heat load allocation sufficient to cover current conditions of discharge.

  DEQ evaluated potential heating effects from the facility's discharge. Time periods evaluated were late summer and early fall when there is a more likely connection between the drainage ditch into which the facility discharges and the Molalla River. In the analysis of the facility's potential heating effects, DEQ used the measured temperatures from the settling pond during the months when overflow into the drainage ditch is more likely. These were summarized in Table 2-24 of the TMDL as shown below:

Table 2 - 24: Potential heating effects of Sanders Wood Products effluent discharge at river mile 17 on the Molalla River.
DEQ has assumed maximum effluent temperatures as no effluent temperature data are available.

Month Evaluated	Point Source Discharge (cfs)	Maximum Temperature (°C)	Monthly 7Q10 Stream Discharge or Minimum Flow Requirements (cfs)	Applicable Temperature Criteria (°C)	Effect on River Temperature at 100% mix (°C)
August	0.155 (0.1 MGD)	24 (75.2 °F)	23	20.7 (69.3 °F)	0.02 (0.04 °F)
September	0.155 (0.1 MGD)	23 (73.4 °F)	19	18.0 (64.4 °F)	0.04 (0.07 °F)
October	0.155 (0.1 MGD)	20 (68 °F)	25	13.0 (55.4 °F)	0.04 (0.07 °F)
September	0.65 (0.48 MGD)	23 (73.4 °F)	19	18.0 (64.4 °F)	0.16 (0.3 °F)

  This facility received a heat load allocation equivalent to a stream temperature increase between 0.04°C and 0.16°C depending on the actual flow that occurs. This was based on extremely conservative assumptions made in the late summer, in the month of September.
- Canby Utilities – No wasteload allocation as backwash water has no reasonable potential for heat contribution
- Chevron Environmental Management – This is a groundwater remediation site. The treated groundwater is discharged to the Molalla River by way of the City of Molalla stormwater system, Creamery Creek and Gribble Creek. The discharge is intermittent

from 0.029 to 0.057-mgd. The median groundwater temperature is estimated to be 14.8°C and the maximum 19.9°C. This facility received a heat load allocation equivalent to a 0.02°C stream temperature increase applicable May 1 – October 31.

- Molalla Drinking Water Plant - The permit allows discharge of filter backwash and settling basin water to the Molalla River at river mile 21.6. Backwashing occurs 6 to 8 times per month with a typical discharge of 45,000-gallons. The backwash settling pond drains into a ditch which enters a slough. In the summer months, the drainage water tends to infiltrate, resulting in no visible surface discharge to the Molalla River. This facility receives a heat load allocation equivalent to a 0.022°C rise in ambient river temperature, applicable May 1 – October 31.
- Arrow Auto Group - Based on the size of the discharge from Arrow Auto Group, DEQ considers the discharge to have no reasonable potential to increase stream temperature in the Molalla River.

Five of the above facilities were determined to have an impact on the temperature of the Molalla River. These are the City of Molalla WWTP, Molalla Municipal Drinking Water Treatment Plant, Sanders Wood Products, Inc., Sunstone Circuits, LLC. and Chevron Environmental Management. The portion of the 0.2°C human use allowance for the river was calculated in the TMDL. The calculated HUA for each of the dischargers is summarized in ***Table 5*** for each month of the summer season between May 1 and October 30 as determined in the TMDL. This shows that there is allocation remaining for each month except for September. This is due to the total remaining allocation being given to Sanders Wood Products as a conservative measure. The flows and temperatures for this allocation are intermittent and estimated as discussed above an in the TMDL.

Table 5
Molalla River Current Human Use Allowance Allocation (°C) in the TMDL

Month Evaluated	Molalla WWTP	Molalla Drinking Water Plant	Sanders Wood Products	Sunstone Circuits, LLC.	Chevron Environmental Management	Total HUA Allocation
May	0	0.000	0.00	0.04	0.02	0.060
June	0	0.010	0.00	0.04	0.02	0.070
July	0	0.016	0.00	0.04	0.02	0.076
August	0	0.017	0.02	0.04	0.02	0.097
September	0	0.022	0.16	0.04	0.02	0.242
October	0	0.022	0.04	0.04	0.02	0.122

A summary of the calculations is provided in the following section.

5.4.2 Determination of Available Temperature Wasteload Allocation on Molalla River

The TMDL provided waste load allocations for temperature to the dischargers into the Molalla River. The Molalla River wasteload allocations are described in the TMDL[8] as follows:

> Molalla River Wasteload Allocations
> DEQ evaluated or calculated wasteload allocations for facilities with potential heating effects on the Molalla River (Table 2 - 21). DEQ allocated only the heat load that conservative calculations indicated the facilities would contribute under presumed worst-case conditions (e.g. maximum discharge and effluent temperatures). DEQ did

[8] ODEQ, 2008. Molalla-Pudding Subbasin TMDL & WQMP. December. Page 2-45

not complete a cumulative effects analysis for Molalla River point sources because the two point sources (Molalla Municipal Drinking Water Treatment Plant and Sanders Wood Products) that are permitted to discharge to the Molalla River during the critical period (May 1 – October 31) are small relative to 7Q10 stream flows, and the discharge from the facilities may not even reach surface water for most or all of the applicable TMDL period. The potential discharge quantities of these sources relative to stream flow and calculations of potential stream heating are included in the following descriptions of the WLAs for each of these sources.

DEQ estimated the maximum NTP values for the Molalla River before and after the two-week model period by the same method as for the Pudding River model, but with a larger margin-of-safety. The larger margin-of-safety takes into account the larger uncertainty associated with the Molalla River model and that only two years of continuous stream temperatures were available (2002 and 2004) to estimate current conditions. Rather than subtracting the average differences between current calibration condition (CCC) temperatures and NTP temperatures (for the model period) from the 90th percentile of observed current temperatures, DEQ subtracted the maximum difference between CCC modeled temperatures and NTP temperatures from the median of observed temperatures. Table 2 - 22 summarizes the NTP temperatures derived at three locations on the Molalla River where continuous stream temperatures were measured and presents examples of two interpolated values at river mile 17 and 21.6, where point sources are located. The details of the analysis and NTP temperatures estimated for other time periods are presented in Appendix E.

Table 2 - 21: Sources DEQ evaluated for potential heat loads to the Molalla River.

Facility Name	Permit Type	Permit Description	Receiving Stream	River Mile	Season
City of Molalla WWTP	NPDES-DOM-Da	Sewage disposal; less that 1 MGD, with lagoons.	Molalla River	20	Nov. 1 – April 30
Molalla Municipal Drinking Water Treatment Plant	GEN02	Industrial wastewater; NPDES filter backwash	Molalla River	21.6	Year round
Sanders Wood Products, Inc. (RSG Forest Products)	NPDES-IW-B19	Timber and wood products – sawmills, log storage, instream log storage	Molalla River	17.3	Year round
Sunstone Circuits, LLC	NPDES-IW-N	Process wastewater, Not Elsewhere Classified	Milk Creek	5.3	Year round

Table 2 - 22: Molalla River applicable NTP temperatures August 1 - 15.

	Molalla River at Hwy. 213 (RM 15)	Molalla River Mile 17	Molalla River at Hwy. 211 (River Mile 19)	Molalla River Mile 21.6	Molalla River u/s North Fork (River Mile 26.5)
Maximum difference CCC – NTP (T °C)	2.8	NA	2.8	NA	2.8
median observed 7DADM August 1 - 15 Temperature (T °C)	23.9	NA	23.1	NA	21.3
7DADM NTP Temperatures August 1 -15 (T °C)	**21.1**	**20.7**	**20.3**	**19.7**	**18.5**

As shown above, DEQ used natural thermal potential in the development of the Molalla River TMDL. The use of natural thermal potential in the development of TMDL waste load allocations has been subject to litigation for many years. In response to a recent court ruling, DEQ provided a memorandum for "Implementation of Water Quality Standards for Temperature in NPDES Permits" on March 19, 2018 (***Attachment B***). This memo provided guidance for permit writers for situations, like the Molalla River, where the TMDL was based on natural conditions criteria or on natural thermal potential. Per this guidance memorandum Molalla-Pudding River falls into Scenario D:

> Scenario D. The receiving stream is impaired for temperature and there is a TMDL based on natural conditions criteria (or natural thermal potential). For permit renewals, permit writers will determine the thermal loads that are consistent with TMDL waste load allocations and compare it

to the thermal loads based on BBNC with the human use allowance of 0.3°C (see OAR 340-041-0028(12)(b)(A)). The more stringent of the two loads must be addressed in the permit. The permit evaluation report should clearly describe how the temperature limits were developed. The additional mixing zone requirements in OAR 340-041-0053(2)(d) also will be applied to the permit.

For new sources, permit writers will need to consult with DEQ Headquarters staff.

Wasteload allocations under the Molalla TMDL use a human use allowance of 0.2°C, not the 0.3°C as stated in Scenario D above. This provides conservatism in the allocation and provides an allocation for non-point sources. The analysis below uses the Biologically Based Numeric Criteria (BBNC) of 13.0°C for Salmon and Steelhead Spawning. The TMDL presents the concept of calculating wasteload allocations as follows[9]:

> A wasteload allocation (WLA) is the portion of the loading capacity allocated to point sources. DEQ provides waste load allocations to all NPDES facilities with reasonable potential to warm the receiving stream above the applicable criteria. Equation 1 calculates the maximum allowable increase in stream temperature (ΔT) for a given thermal discharge.
>
> In most cases for this TMDL, a WLA is expressed as a flow-based formula (Equation 2). Using the formula as the wasteload allocation captures varying flow conditions, both effluent and in-stream, up to and including the design flow of the facility. This method allows facilities to increase discharge and still be within receiving water requirements. Waste load allocations for temperature are expressed as heat load limits (kcal/day or equivalent SI units MW-day/day) by multiplying the allowable stream temperature increase (not more than 0.2 ºC) by the combined flow of the point source and the receiving stream. This form of wasteload allocation is referred to as excess thermal load (ETL).
>
> $$\Delta T = \left(\frac{Q_e}{Q_e + Q_R}\right)(T_e - T_c) \quad \text{(Equation 1)}$$
>
> where:
>
> Q_R = river flow rate
>
> Q_e = effluent flow rate
>
> T_c = applicable river temperature criteria
>
> T_e = effluent temperature
>
> In terms of dilution factor, D_F
>
> $$\Delta T = \frac{T_e - T_c}{D_F}$$
>
> where:
>
> $$D_F = \frac{Q_e + Q_R}{Q_e}$$
>
> $$ETL = (\Delta T)(Q_R + Q_e)C_F \quad \text{(Eq. 2)}$$
>
> where:
>
> ETL = Excess thermal load, $kcal/day$
>
> ΔT = allowable temperature increase, $^\circ C$
>
> Q_R = river flow rate, upstream, m^3/s
>
> Q_e = effluent flow rate, m^3/s
>
> C_F = conversion factor
>
> $$C_F = 86.4 \times 10^6 \frac{kcal \cdot s}{^\circ C \cdot m^3 \cdot day}$$
>
> Alternatively, for flow as cfs:
>
> Q_R, Q_e units: ft^3/s
>
> $$C_F = 2{,}446{,}665 \frac{kcal \cdot s}{^\circ C \cdot ft^3 \cdot day}$$
>
> Where in-stream and effluent flow information are sufficient, DEQ assigns flow-based ETLs, such that the allowable heat load varies with the flow of the stream and the point source. If daily stream discharge information is not readily available or attainable, DEQ calculates a fixed ETL based on an estimated 7Q10 flow of the stream and the design flow of the facility.
>
> The current excess thermal load (ETL) from a point source can be quantified with Equation 3 by calculating the difference between the effluent temperature and applicable stream temperature criterion – either the biologically based numeric temperature criterion or the natural thermal potential temperature at the location of the discharge. Since applicable criteria are based on 7-day average daily maximum (7DADM) values, generally all calculations should be performed using trailing 7-day averages, with 7-day average daily maximum values used for effluent temperature (Te) and 7-day average values used for effluent flow (Qe). Effluent temperatures and effluent flows that correspond with a particular
>
> $$ETL = Q_e(T_e - T_c)C_F \quad \text{(Equation 3)}$$
>
> $$T_e = \frac{ETL}{Q_e C_F} + T_c \quad \text{(Eq. 3a)}$$
>
> $$Q_e = \frac{ETL}{(T_e - T_c)C_F} \quad \text{(Eq. 3b)}$$
>
> where:
>
> ETL = Excess thermal load, $kcal/day$

[99] ODEQ, 2008. Molalla-Pudding Subbasin TMDL & WQMP. December. Page 2-29

excess thermal load (ETL) can be calculated with Equations 3a and 3b. DEQ estimated the target criteria (natural thermal potential temperatures) at point source locations on both the Pudding and Molalla Rivers with methods described in the following section and Appendix E. Also, in the following section, the heat loading equivalent to 0.2ºC of the human use allowance is apportioned among the facilities, based in part on simulations of cumulative thermal effects from neighboring sources. Example tables of effluent temperatures and effluent flows within a point source's allocated ETL are included in Appendix D.

The current Molalla WWTP permit does not allow a discharge during the period May 1 – October 30 and limits the discharge to the river at a river flow of 350-cfs at the Canby station and a river temperature of 18°C. The requested permit modification eliminates the date restriction only limiting the discharge to periods when the river flow is greater than 350-cfs at Canby station and a using a human use allowance of 0.2°C above the BBNC of 13.0°C for Salmon and Steelhead Spawning.

The methodology used in the Molalla-Pudding TMDL shown above was used to calculate the temperature limit. Equation 1 above was used to determine the maximum allowable effluent temperature as follows:

$$\Delta T = \left(\frac{Q_e}{Q_e + Q_R}\right)(T_e - T_{c)}$$

Where: Q_e = Effluent Flow
Q_R = Minimum River Flow
T_c = River Temperature Criteria

Equation 1 requires data on the plant effluent temperature to determine the portion of the human use allowance used by a discharger. Effluent temperature data has been reported on a daily basis for the Molalla WWTP when it has discharged to the river and on some occasions when there has been no discharge. Available effluent temperature data for the period January 2010 through July 2017 was evaluated with the monthly statistics summarized in ***Table 6***.

Table 6
Molalla WWTP Effluent Temperature Statistics

Month	Monthly Statistics					
	Maximum	Minimum	Average	Median	90 Percentile	Count
Jan	9.3	0.0	4.2	5.3	8.6	376
Feb	10.7	4.1	8.5	8.6	10.1	222
Mar	15.3	5.9	10.7	10.7	12.8	222
Apr	18.5	10.1	14.1	14.0	16.4	235
May	20.4	15.1	17.2	17.0	18.8	57
Jun	20.4	16.2	18.0	17.9	18.7	30
Jul	-	-	-	-	-	0
Aug	-	-	-	-	-	0
Sep	17.6	15.7	16.7	16.9	17.6	5
Oct	15.1	8.4	13.7	13.8	14.7	41
Nov	14.8	5.5	10.6	10.6	13.2	172
Dec	10.2	4.0	7.2	7.7	9.3	207

The potential heating effects of the Molalla WWTP discharge was calculated for potential discharge months using Equation 1 from the TMDL. In this analysis, the historical 90-Percentile plant effluent temperature from ***Table 6*** for each month being evaluated was used as T_e. The current plant design flows for the respective months (Q_e) and the minimum stream flow (Q_R) of 224-cfs which is 64% of the minimum flow to discharge at the Canby station was used. The spawning temperature criteria of 13°C was used for T_c.

The results of this analysis are summarized in ***Table 7***. This analysis shows that the effect on river temperature of the Molalla WWTP discharge during the early summer season months of May and June and the late summer month of October using a 100% mix of the plant effluent. This calculation was not performed for the months of July, August and September due to lack of plant effluent data.

Table 7
Potential Heating Effects from Molalla WWTP Discharge to Molalla Rivera at River Mile 20

Month Evaluated	Point Source Discharge Flow (cfs)	90 Percentile Discharge Temperature (°C)	Minimum Stream Flow (cfs)	Spawning Temperature Criteria (°C)	Increase in River Temperature at 100% mix (°C) from Molalla WWTP
April	6.34 (4.10 mgd)	16.4 (57.2°F)	224	13 (55.4°F)	0.094
May	3.56 (2.30 mgd)	18.8 (64.4°F)	224	13 (55.4°F)	0.091
June	3.56 (2.30 mgd)	18.7 (64.4°F)	224	13 (55.4°F)	0.090
October	3.56 (2.30 mgd)	14.7 (59.0°F)	224	13 (55.4°F)	0.027
November	6.34 (4.10 mgd)	13.2 (53.6°F)	224	13 (55.4°F)	0.006

Table 5 provides a summary of the current waste load allocations in the Molalla subbasin. Table 5 shows no discharge or heat input from the Molalla WWTP. The information in ***Table 5*** was updated by adding the potential heating effects of the Molalla discharge. The results are summarized in ***Table 8***.

Table 8
Total Potential Heating Effects on Molalla River From Point Source Dischargers

Month Evaluated	Increase in River Temperature from Molalla WWTP	Molalla Drinking Water Plant	Sanders Wood Products	Sunstone Circuits, LLC.	Chevron Environmental Management	Updated Total HUA Allocation
May	0.094	0.000	0.000	0.040	0.020	0.154
June	0.091	0.010	0.000	0.040	0.020	0.161
July	-	0.016	0.000	0.040	0.020	0.076
August	-	0.017	0.020	0.040	0.020	0.097
September	-	0.022	0.160	0.040	0.020	0.242
October	0.027	0.022	0.040	0.040	0.020	0.149

The analysis summarized in ***Table 8*** shows that there is available temperature allocation within the TMDL for the Molalla WWTP to discharge during the months of May, June and October without exceeding the allowed combined human use allowance for the river of 0.2°C.

The next step in this analysis was to determine the maximum allowable Molalla WWTP effluent temperature that will limit the discharge during each of the summer season months without exceeding the human use allowance. The total current allocation summarized in ***Table 5*** was used as the Total Allocation Used. This was then subtracted from the available Human Use Allowance of 0.2°C to obtain the available allocation for each month. Equation 1 from the TMDL was again used to calculate the maximum effluent temperature with the results summarized in ***Table 9***. The analysis was done at the current summer season design flow of 2.30-mgd (3.56-cfs) and the minimum river flow of 224-cfs at the discharge point (350-cfs at the Canby station).

Table 9
Maximum Allowable Molalla WWTP Discharge Temperature

Month	Total HUA Allocation In TMDL (°C)	Allocation Available (°C)	Maximum Molalla WWTP Discharge Temperature (°C)
May	0.060	0.140	21.9
June	0.070	0.130	21.3
July	0.076	0.124	-
August	0.097	0.103	-
September	0.242	0.000	-
October	0.122	0.078	18.0

This results in a maximum effluent temperature of 21.9°C and 21.3°C for the months of May and June, respectively. The maximum temperature for October was 18°C. The analysis of plant effluent temperatures summarized in ***Table 6*** shows that the 90-Percentile temperatures for each of these months is less than the maximum temperature allowed within the Human Use Allowance. The 90-Percentile temperatures as shown in ***Table 6*** are 18.8, °C 18.7°C and 14.7°C for the months of May, June and October, respectively.

This analysis shows the existing TMDL provides thermal capacity within its limits. The analysis also shows the allowable effluent temperatures, from heat load capacity perspective, are higher than the current permit's temperature limits of 18°C and the 90% percentile discharge temperatures. This demonstrates that the excess thermal loads can be added to the Molalla NPDES permit and falls within the limits set forth in the TMDL.

5.4.3 Calculation of Molalla WWTP Excess Thermal Loads

Permit limits established in the TMDL are determined as Excess Thermal Loads (ETL). The basis for calculating the ETL is documented in the TMDL[10] as follows:

[10] ODEQ, 2008. Molalla-Pudding Subbasin TMDL & WQMP. December. Page 2-29

In most cases for this TMDL, a WLA is expressed as a flow-based formula (Equation 2). Using the formula as the wasteload allocation captures varying flow conditions, both effluent and in-stream, up to and including the design flow of the facility. This method allows facilities to increase discharge and still be within receiving water requirements. Waste load allocations for temperature are expressed as heat load limits (kcal/day or equivalent SI units MW-day/day) by multiplying the allowable stream temperature increase (not more than 0.2 ºC) by the combined flow of the point source and the receiving stream. This form of wasteload allocation is referred to as excess thermal load (ETL). Where in-stream and effluent flow information are sufficient, DEQ assigns flow-based ETLs, such that the allowable heat load varies with the flow of the stream and the point source. If daily stream discharge information is not readily available or attainable, DEQ calculates a fixed ETL based on an estimated 7Q10 flow of the stream and the design flow of the facility.

$ETL = (\Delta T)(Q_R + Q_e)C_F$ (Eq. 2)

where:

ETL = Excess thermal load, $kcal/day$

ΔT = allowable temperature increase, $^{\circ}C$

Q_R = river flow rate, upstream, m^3/s

Q_e = effluent flow rate, m^3/s

C_F = conversion factor

$C_F = 86.4 \times 10^6 \frac{kcal \cdot s}{^{\circ}C \cdot m^3 \cdot day}$

Alternatively, for flow as cfs:

Q_R, Q_e units: ft^3/s

$C_F = 2{,}446{,}665 \frac{kcal \cdot s}{^{\circ}C \cdot ft^3 \cdot day}$

There are three months where an ETL can be incorporated into the permit during the summer season: May, June and October. During this period of time, the temperature allocation (ΔT) that is available in the river for the Molalla WWTP discharge for each of the three months that allocation is available was calculated. The ETL for this period was calculated using Equation 3 as follows:

$$ETL = (\Delta T)(Q_R + Q_e)C_F$$

Where: ETL = Excess Thermal Load, kcal/day
ΔT = allowable temperature increase, °C
Q_R = river flow rate, upstream, ft^3/s
Q_e = effluent flow rate, ft^3/s
CF = conversion factor = 2,446,665 kcal-s/°C-ft^3-day

The ETL was determined using the available allocation that was determined in ***Table 9*** for each of the months. The ETLs were calculated for the three months with the following results:

- The ETL for the month of May is:

$$ETL = (0.140)(224+3.56)(2{,}446{,}665) = 77.95\text{-million kcal/day}$$

- The ETL for the month of June is:

$$ETL = (0.130)(224+3.56)(2{,}446{,}665) = 72.38\text{-million kcal/day}$$

- The ETL for the month of October is:

$$ETL = (0.078)(224+3.56)(2{,}446{,}665) = 43.43\text{-million kcal/day}$$

These values of ETL should be incorporated into the NPDES permit and the maximum temperature for discharge be removed.

5.5 Thermal Plumes

The administrative rule for temperature discharges discussed in Section 5.3 provides the bases for implementation of the temperature criteria and the human use allowance. Section OAR 340-041-0028 (12)(b)(C) states that point sources must be in compliance with the additional mixing zone requirements set out in OAR 340-041-0053(2)(d). This section provides the criteria that must be met within the thermal plume of the discharge. The temperature thermal plume requirements specified in OAR 340-041-0053(2)(d) are as follows:

> (d) Temperature Thermal Plume Limitations. Temperature mixing zones and effluent limits authorized under 340-041-0028(12)(b) will be established to prevent or minimize the following adverse effects to salmonids inside the mixing zone:
> (A) Impairment of an active salmonid spawning area where spawning redds are located or likely to be located. This adverse effect is prevented or minimized by limiting potential fish exposure to temperatures of 13 degrees Celsius (55.4 Fahrenheit) or less for salmon and steelhead, and 9 degrees Celsius (48 degrees Fahrenheit) for bull trout;
> (B) Acute impairment or instantaneous lethality is prevented or minimized by limiting potential fish exposure to temperatures of 32.0 degrees Celsius (89.6 degrees Fahrenheit) or more to less than 2 seconds);
> (C) Thermal shock caused by a sudden increase in water temperature is prevented or minimized by limiting potential fish exposure to temperatures of 25.0 degrees Celsius (77.0 degrees Fahrenheit) or more to less than 5 percent of the cross section of 100 percent of the 7Q10 low flow of the water body; the Department may develop additional exposure timing restrictions to prevent thermal shock; and
> (D) Unless the ambient temperature is 21.0 degrees of greater, migration blockage is prevented or minimized by limiting potential fish exposure to temperatures of 21.0 degrees Celsius (69.8 degrees Fahrenheit) or more to less than 25 percent of the cross section of 100 percent of the 7Q10 low flow of the water body.

Each of these requirements will be addressed in the following sections for the Molalla WWTP discharge.

5.5.1 Section (2)(d)A

The Molalla WWTP discharges into a segment of the river that is Core Cold Water Habitat and an active salmon spawning segment of the river. The portion of the river that the treatment plant discharges to has not been classified as an active redd.

5.5.2 Section (2)(d)(B)

This requirement is to limit fish exposure to temperatures of 32°C or more. The plant effluent is less that 32°C at all times, so this is not an issue.

5.5.3 Section (2)(d)(C)

This rule limits thermal shock caused by a sudden increase in water temperature by limiting potential fish exposure to temperatures of 25.0°C (77.0°F) or more to less than 5 percent of the cross section of 100 percent of the stream flow. The Molalla River flow at the plant outfall has been determined to be 224-cfs at the minimum flow of 350-cfs at the Canby gage. Using the Thermal Plume Model on the DEQ Temperature RPA spreadsheet[11], there is No Reasonable Potential at a temperature of 21.3°C. The RPA spreadsheet output is shown in ***Figure 8***.

[11] ODEQ, 2014. RPA Calculation Workbook for Temperature, Revision 2014. Retrieved from http:// *www.oregon.gov/deq/FilterPermitsDocs/RPATemperature.xlsx*

5.5.4 SECTION (2)(d)(D)

This requirement state that unless the ambient temperature is 21.0 degrees of greater, migration blockage is prevented or minimized by limiting potential fish exposure to temperatures of 21.0 degrees Celsius (69.8 degrees Fahrenheit) or more to less than 25 percent of the cross section of 100 percent of the low flow of the water body.

The plume model results shown above calculated the increase in stream temperature being 0.50° C to a temperature of 13.50° C which is less than the maximum allowed of 21° C. There is No Reasonable Potential at an effluent temperature of 21.3° C.

State of Oregon Department of Environmental Quality

l Plume Limitations within the Mixing Zone Rule (OAR 340-041-0053)

Shock - 25 deg C at 5% of the stream cross section

n Blockage - 21 deg C at 25% of the stream cross section

Section 5.6 of Temperature IMD

Facility Name Molalla WWTP - Interim Permit **Date:** 4/24/18

Enter data into white cells below:

7Q10 =	224	cfs
Ambient Temperature or Criterion =	13	ºC
Effluent Flow =	2.3	mgd
Max Effluent Temperature =	21.3	ºC
7 day Max Effluent Temperature =	21.3	ºC

5% of 7Q10 =	11.2	cfs
5% dilution =	4	
25% of 7Q10 =	56.0	cfs
25% dilution =	17	dilution = (Qe+Qr)/Qe

Temperature at 5% cross section =	**15.00**	**ºC**	**No Reasonable Potential**
Temperature at 25% cross section =	**13.50**	**ºC**	**No Reasonable Potential**
ΔT at 25% Stream Flow=	**0.50**	**ºC**	

Equation used to calculate ΔT at edge of MZ

Equation used to calculate thermal load limit

Where:

Qe = Effluent Flow in mgd
S = Dilution
ΔT_{all} = Allowable temperature increase at edge of MZ (ºC)
Cp = Specific Heat of Water (1 cal/gºC)
ρ = Density of Water (1 g/cm^3)
3785.41 = Flow conversion from mgd to m^3/day

Figure 8: Temperature RPA Worksheet for Thermal Plumes for Molalla Effluent

ATTACHMENT A

TECHNICAL ANALYSES IN SUPPORT OF
DRAFT NPDES PERMIT MODIFICATION
Geosyntec Consultants

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Date:	16 May 2018
To:	Tiffany Yelton Bram, Oregon Department of Environmental Quality
Cc:	Dan Huff, City of Molalla
	J.W. Ring, Mark Strandberg, and Christine Hein, Ring Bender LLP
	Dale Richwine, Richwine Environmental.
From:	Rob Annear and Jacob Krall, Geosyntec Consultants
Subject:	Technical Analyses in Support of NPDES Permit Modification Request

INTRODUCTION

This memorandum details analyses conducted to support the City of Molalla (City) in its draft National Pollutant Discharge Elimination System (NPDES) permit for its wastewater treatment plant (WWTP). The impacts of the proposed revised permit conditions on dissolved oxygen (DO) and total suspended solids (TSS) are evaluated.

The WWTP currently discharges to the Molalla River between November and April. The maximum WWTP effluent concentration is 10 mg/L for both Biochemical Oxygen Demand (BOD) and TSS. The WWTP is currently required to stop discharging when the 7-day average flow as measured at the USGS Gauge at Canby (Gauge #14200000) drops below 350 cfs.

This memorandum also evaluates the impacts of potentially increasing the maximum BOD and TSS concentration to 30 mg/L for November-April and allowing river discharge for the full year, provided the other conditions are met.

DISSOLVED OXYGEN

The Streeter-Phelps equation was used to evaluate the predicted maximum dissolved oxygen deficit due to the Biochemical Oxygen Demand (BOD) from the current WWTP with the proposed new permit conditions. The Oregon DEQ Streeter-Phelps equation spreadsheet, developed for reasonable potential analysis, was used[1]. Table 1 outlines the assumptions made in these calculations. The dissolved oxygen analysis was conducted for the current WWTP, based on 2025

[1] ODEQ, 2005. RPA Calculation Workbook Dissolved Oxygen, Revision 1.0. Retrieved from http://www.oregon.gov/deq/wq/wqpermits/Pages/NPDES-Individual-Permit-Templates.aspx

Dry Weather Design Flow conditions from the 2007 design documents. The assumptions made in this analysis are outlined in Table 1.

Table 1. Assumptions made in Dissolved Oxygen Analysis for Current WWTP Using the Streeter-Phelps Equation Spreadsheet (from DEQ).

Assumption/Parameter	Assumed Value	Notes/Reference
Ambient River Flow	350 cfs at Canby	Table 1
Ambient DO concentration	10.48 mg/L	Saturation value based on temperature at the point where the WWTP enters the river after mixing
WWTP Design Flow	2.3 MGD	2025 Dry Weather Design Flows For Current WWTP
WWTP DO Concentration	6 mg/L	Typical value for Cascade Aeration System
WWTP $CBOD_5$ concentration	10 mg/L	Draft NPDES Permit, May-October conditions
WWTP NH3-N concentration	16.7 mg/L	Current Permit Conditions
Total Kjeldahl Nitrogen	20.9 mg/L	Based on NH3-N being 80% of total Nitrogen
Deoxygenation rate constant at 20°C	Worst Case: 0.14/day	Maximum of range for Willamette River (McCutchen, 1983, DEQ spreadsheet)
River velocity	2.5 feet/second	Estimated based on USGS (2010)
River depth	1.7 feet	Estimated based on USGS (2010)
River width	67 feet	Estimated based on USGS (2010)
Sediment Oxygen Demand	0.45 $g/m^2/day$	Set so that the river without the WWTP maintains a constant DO.

The calculation conducted here is conservative for three reasons.

1) The calculation assumes that the WWTP is discharging at the Dry Weather Design Flow despite low river flow conditions, which is very unlikely.
2) The calculation assumes an effluent BOD of 30 mg/L—the November-April permit limit. It is much more likely that a river flow of 350 cfs at Canby would occur during the summer months, when the maximum BOD would be 10 mg/L.
3) The calculation assumes a WWTP effluent DO of 6 mg/L. Discharge monitoring report data shows that effluent DO is typically 10-12 mg/L.

Figure 1 shows the DO concentration sag curve for the assumptions indicated in Table 1, with an ambient river flow at Canby of 350 cfs. The figure demonstrates the current WWTP would have a small impact on the DO concentration in the Molalla River for 2025 Dry Weather Design Flow.

The figure shows the DO concentration sag curve for the river both with and without the current WWTP discharge. The DO in the river is reduced by 0.07 mg/L within the mixing zone due to the mixing with the current WWTP effluent.

Downstream of the WWTP, in the absence of other point sources and tributaries, the river DO concentration trends towards a value 0.09 mg/L below the river absent the WWTP. The analysis based on the current plant flows for 2025 show the DO concentration remains above 95% of saturation, meeting the standard in OAR 340-041-006 and the antidegradation condition in OAR 340-041-0028 (3) (c).

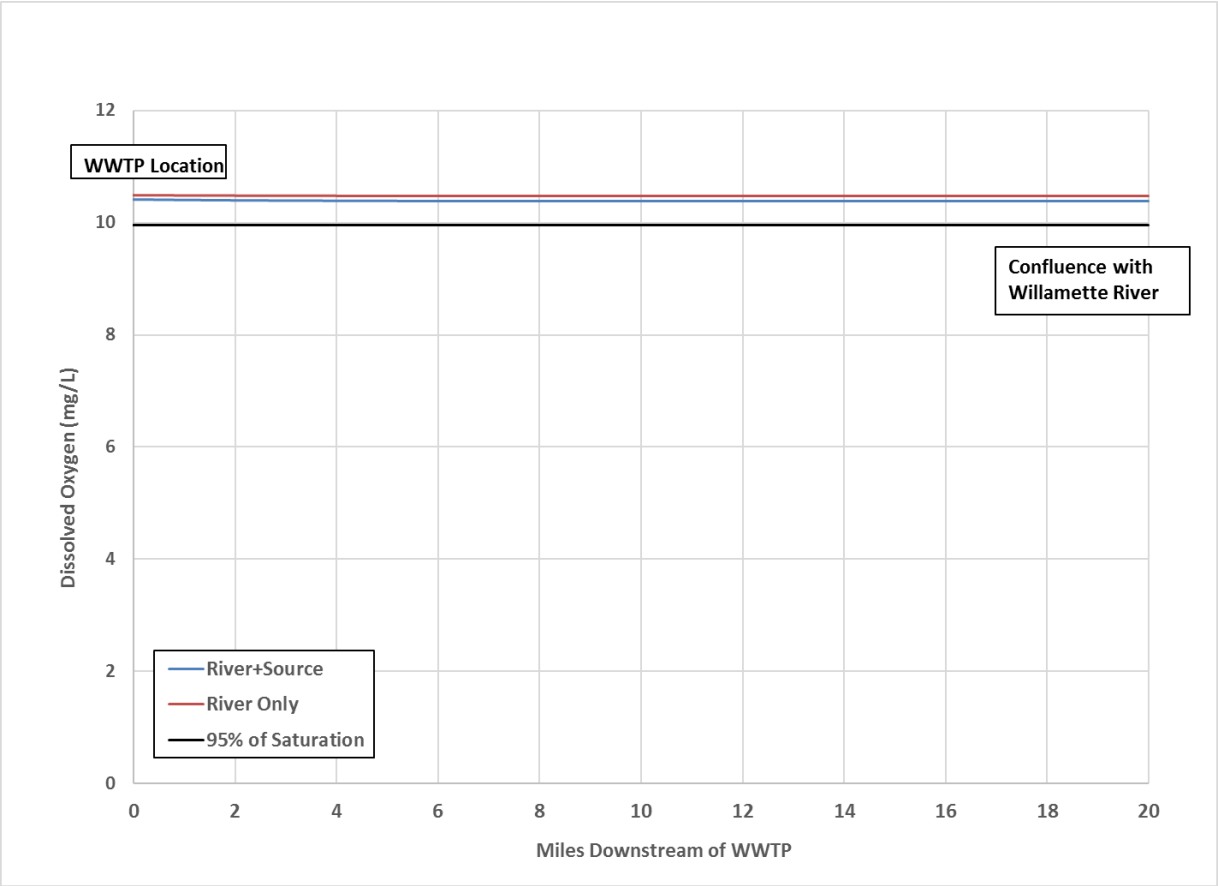

Figure 1. Dissolved Oxygen Sag Curve for the current WWTP 2025 Dry Weather Design Flow Conditions for Ambient River Flow of 350 cfs at Canby.

TOTAL SUSPENDED SOLIDS

Molalla River TSS concentration data were analyzed to understand the natural variability of TSS in the river and as the basis for determining the impacts to river TSS due to the WWTP.

Figure 2 is a box-and-whisker plot showing the natural variability of TSS in the Molalla River based on 25 samples collected by the ODEQ at Canby from February 2013 through April 2017. The average TSS concentration for these samples is 7.5 mg/L and the median is 3.0 mg/L. The 25^{th}-75^{th} percentile range is 1-6 mg/L.

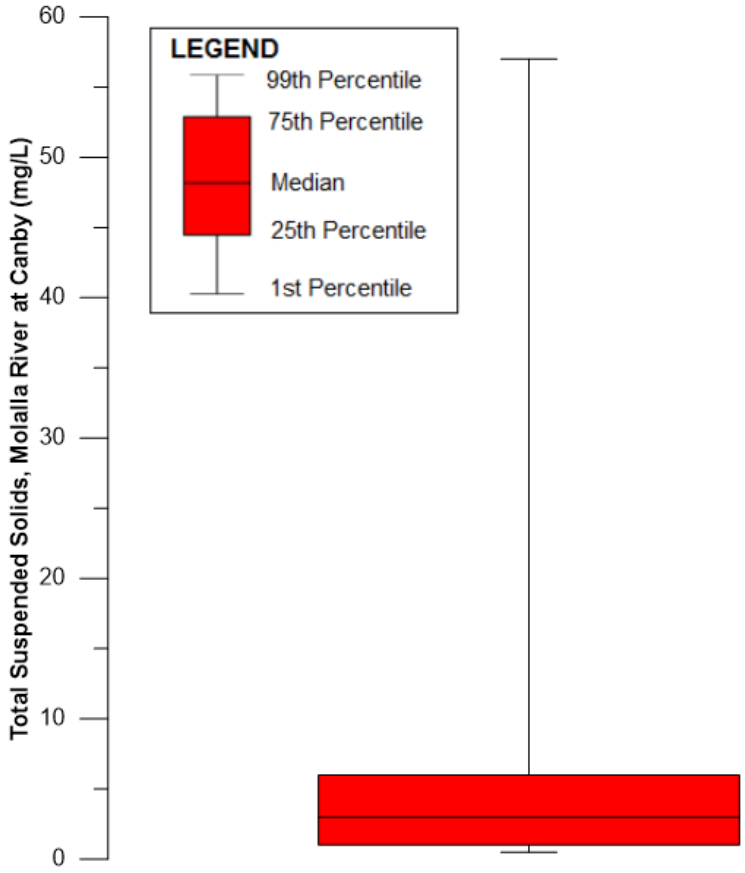

Figure 2. Box-and-whisker plot displaying variability of TSS in the Molalla River.

Table 2 shows how much the TSS concentration in the Molalla River would be expected to increase, as a function of ambient river flow. The table is based on a mass balance calculation assuming a plant discharge of 2.3 MGD, the median river TSS concentration of 3.0 mg/L and an effluent TSS of 30 mg/L. Table 2 demonstrates the increase in river TSS concentration due to the WWTP would be small—even at a low river flow of 150 cfs at Canby (well below the flow at which Molalla will be required to cease discharge) and median ambient TSS in the river (3.0 mg/L), the WWTP would only increase the TSS concentration in the river by 1.0 mg/L, well within the natural variability of river TSS concentration.

Table 2. Expected Increase in Molalla River TSS due to WWTP, as a Function of Ambient Molalla River Flow.

Molalla River Flow at USGS Gauge at Canby (#14200000), cfs	Expected TSS Concentration Downstream of WWTP (mg/L)	Increase in TSS Due to WWTP (mg/L), Relative to Median River TSS
350	3.2	0.4
300	3.2	0.5
250	3.3	0.6
200	3.3	0.7
150	3.3	1.0

SUMMARY

Overall, the analyses presented here support the requested permit criteria and demonstrate that the proposed new permit conditions will not degrade the river.

REFERENCES

ODEQ, 2008. Molalla-Pudding Subbasin TMDL & WQMP. December.

ODEQ, 2014. National Pollutant Discharge Elimination System Waste Discharge Permit #101514.

United States Geological Survey (2010). Geomorphic Setting, Aquatic Habitat and Water-Quality Conditions of the Molalla River, Oregon, 2009-2010.

ATTACHMENT B

Implementation of Water Quality Standards for Temperature in NPDES Permits
March 19, 2018
ODEQ

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WQ Permitting Policy

Implementation of Water Quality Standards for Temperature in NPDES Permits

Policy Number: WQP-007	Version: 1.1
Effective Date: March 19, 2018	Next Scheduled Revision Date: As needed
Approval: Ron Doughten	Title: WQ Manager
Section: WQ Permitting and Program Development	Division: Operations

State of Oregon Department of Environmental Quality

Intent/Purpose/ Statement of Need	DEQ's water quality standards for temperature and temperature total maximum daily loads (TMDLs) have been the subject of litigation for many years. The intent of this document is to provide guidance to permit writers on how to apply the temperature criterion in permitting given the status of that litigation. On Feb. 28, 2012, the U.S. District Court for the District of Oregon invalidated EPA's approval of DEQ's natural conditions criterion for water temperature. As a result of the court's decision, in August 2013, EPA disapproved Oregon's natural conditions criterion (NCC) at OAR 340-041-0028(8), leaving the remainder of the temperature standard effective. Also as a result of the court decision, the Environmental Quality Commission repealed portions of the narrative criteria in the temperature standard relating to agriculture and forestry. The NCC is not effective for purposes of National Pollutant Discharge Elimination System (NPDES) permitting. Following the decision on the NCC, a petition was filed challenging temperature TMDLs based on the NCC. On April 11, 2017, the U.S. District Court for the District or Oregon ordered that EPA's decision approving TMDLs based on the NCC on or after 9/27/2006 was "arbitrary and capricious." The order based this holding on the conclusion in the 2012 case that EPA's decision to approve the Natural Conditions Criteria under CWA 303(c) was arbitrary and capricious. To reach this decision the court concluded that the invalidation of the NCC in the temperature standard applied retroactively (i.e. the NCC was never valid). The decision concluded these TMDLs could not have been properly approved by EPA because they were not based on the proper criteria and reflected an invalid change in the standard. Litigation is ongoing as of the date of this document (March 19, 2018). The temperature TMDLs that are subject to the TMDL litigation are still in effect and should be implemented until the Court orders otherwise. NPDES permits need to meet the more stringent of either the TMDL waste load allocation (WLA) or the pre-TMDL condition based on the biologically based numeric criteria (BBNC). 401 certification of projects take a similar apporach as described in this document. Where applicable, 401 certifications would need to meet the more stringent of their NCC TMDL allocation or the temperature water quality standard based on BBNC.
Authority	ORS 468.020, 468B.030, 468B.035 & 468B.048 OAR 340-041-0028
Applicability	All NPDES permits
POLICY	Until such time as DEQ revises the water quality standard for temperature, permit writers will issue NPDES permits that ensure compliance with the currently effective temperature standard at OAR 340-041-0028 (see attached), which includes (4) biologically based numeric criteria (BBNC), (9) protection of cool water species, (11) the protecting cold water criteria and (12)(b) the human use allowance, and all other sections of 340-041-0028 except (8) the natural conditions criterion, as well as any waste load allocation that remains in effect.

This memo describes five scenarios listed below and discusses how the remaining criteria apply. Attached to this memo is a table showing all the currently effective TMDLs for temperature and which scenario most likely applies for each TMDL.

Scenario A. The receiving stream is not impaired by temperature.
Permit writers will continue to issue or reissue NPDES permits and effluent limits for temperature as appropriate to ensure compliance with the still effective portions of OAR 340-041-0028 described above, and the additional mixing zone requirements in OAR 340-041-0053(2)(d) (Temperature Thermal Plume Limitations).

Scenario B. The receiving stream is impaired, but there is no TMDL in place.
Permit writers will issue and reissue permits to ensure compliance with the applicable BBNC, and the human use allowance as described in OAR 340-041-0028(12)(b)(A), and the additional mixing zone requirements in OAR 340-041-0053(2)(d) (Temperature Thermal Plume Limitations).

Scenario C. The receiving stream is impaired for temperature and there is a TMDL based on the biologically based numeric criteria.
Permit writers will continue to issue and reissue permits developed to be consistent with waste load allocations in accordance with OAR 340-041-0028(12)(b)(B) and the additional mixing zone requirements in OAR 340-041-0053(2)(d).

Scenario D. The receiving stream is impaired for temperature and there is a TMDL based on natural conditions criteria (or natural thermal potential).
For permit renewals, permit writers will determine the thermal loads that are consistent with TMDL waste load allocations and compare it to the thermal loads based on BBNC with the human use allowance of 0.3°C (see OAR 340-041-0028(12)(b)(A)). The more stringent of the two loads must be addressed in the permit. The permit evaluation report should clearly describe how the temperature limits were developed. The additional mixing zone requirements in OAR 340-041-0053(2)(d) also will be applied to the permit.

For new sources, permit writers will need to consult with DEQ Headquarters staff.

Scenario E: The receiving stream is impaired for temperature and the TMDL was developed and approved with temperature criteria effective before December 2003.
Some of these TMDLs include waste load allocations based on site potential or system potential temperatures rather than BBNC. As permits are renewed, DEQ must demonstrate that permits are consistent with current water quality standards. Permits will be consistent with waste load allocations or include effluent limits based on BBNC and human use allowance, as in scenario C or D above.

Meeting WQBELs
Some NPDES sources will not be able to comply with WQBELs for temperature at the time of permit reissuance. Measures for reducing temperature impacts (i.e. heat loads) to the receiving water that may be available to point sources include, but are not limited to, the following: natural treatment systems, indirect discharge, riparian restoration via trading, cooling technology (i.e. cooling towers), effluent reuse or land application (non-discharge) and/or flow augmentation.

Permit holders who cannot meet permit limits for temperature in the short term, but are reasonably likely to meet the limits in a certain timeframe after taking identified steps, may qualify for a compliance schedule. OAR 340-041-0061(15) allows compliance schedules for WQBELS that are newly applicable to the permit.

If it is not reasonably certain when or if a permit holder can meet a permit limit even after implementing pollutant control programs, the permit holder may discuss with DEQ whether a variance is available under OAR 340-041-0059. That rule allows a variance from the requirement

	to meet a water quality standard when one or more circumstances described in the rule exists (e.g., pollutant control measures would cause more environmental damage than caused by the exceedance; natural conditions prevent attainment of the standard; or when controls to reduce the pollutant would cause substantial and widespread economic and social impact). Permit holders seeking variances must submit pollution reduction plans subject to DEQ approval and incorporation into the permit. Measures for reducing temperature that DEQ may consider include, but are not limited, to natural treatment systems, indirect discharge, riparian restoration via trading, and flow augmentation. All variances granted by DEQ must be approved by EPA, in consultation with the National Marine Fisheries Services and/or the U.S. Fish & Wildlife Service, similar to the process used when the EQC adopts a new water quality standard. **Currently Effective Temperature TMDLs** Below is a list of all the currently effective temperature TMDLs, and which of the scenarios described in the memo applies. Permit writers should verify the approach used to develop each WLA with the basin coordinator, as some TMDLs incorporate NCC as well as BBNC depending on data availability and modeling approaches.

Basin	TMDL	Date approved by EPA	Basis for WLA	Permitting Scenarios
Grande Ronde	Lower Grande Ronde	September 2010	NCC	D
	Upper Grande Ronde	March 2000	Pre-12/2003 criteria	E
John Day	John Day	December 2010	BBNC	C
Klamath	Upper Klamath Lake	August 2002	Pre-Dec. 2003 criteria	E
	Upper Klamath and Lost River	December 2010	NCC	See note 1.
Malheur	Malheur River Basin	September 2010	BBNC	N/A See note 2.
Middle Columbia – Hood	Miles Creek	December 2008	BBNC	C
	Western Hood	December 2001	Pre-12/2003 criteria	E
North Coast/Lower Columbia	North Coast	November 2006 Addendum	Addendum issued 11/2006 modifies TMDLs for North Coast Subbasins, Tillamook Bay and Nestucca Bay. The revised WLAs are all based on the applicable BBNC.	C
Oregon Closed Lake Basins	Alvord Lake		Pre-2003 criteria, but no point sources in basin.	N/A
Rogue	Rogue	December 2008	NCC	D
	Applegate	February 2004	NCC (site potential), but no point sources in basin.	N/A
	Bear Creek	October 2007	BBNC (Ashland POTW)	C
Sandy	Sandy	April 2005	NCC	See note 3.
Snake	Snake River/Hells Canyon	September 2004 Revised	BBNC	See note 4.
Umatilla	Umatilla	March 2001	Original TMDL based on criteria that were replaced Dec.2003. A document issued 9/07 states that the system potential temperature profile of the TMDL meets the definition of the NCC in the post-12/03 standard. It also lists WLAs based on a HUA of 0.3C.	D
	Walla Walla	September 2005	NCC however there are no point sources discharging during the critical period.	N/A
	Willow Creek	February 2008	NCC same as BBNC	C
Umpqua	Umpqua	April 2007	NCC	D
	Little River	January 2002	Pre-12/03 criteria	E

Willamette	Willamette – Mainstem Only	September 2006	BBNC and NCC	D
	Mollala-Pudding	December 2008	NCC	D
	Tualatin	August 2001	Original TMDL based on pre-12/03 criteria.	E

Notes:

1. WLAs for point sources in the Klamath River are defined in the OAR 340-041-0185.
2. Page 9-44 of the Malheur Basin TMDL report shows only 2 individual point sources in the basin and they are both for irrigation districts.
3. There are 3 point sources in the Sandy basin and the TMDL effectively provides permit limits for them in Table 3-10 on page 65 of the TMDL report.
4. The TMDL for Snake River/Hells Canyon does not include a table with explicit WLAs for temperature for individual point sources. Instead, the Executive Summary states on page r, that "Point sources discharging directly to the Snake River within the SR-HC TMDL reach have been allocated heat loads corresponding to discharge loads applied to design flows to ensure that no measurable increase requirements will not be exceeded." The following rationale is given on page 394:

> The point source discharges represent no-measurable-increase in the water temperature of the mainstem Snake River within the SR-HC TMDL reach. (No-measurable-increase is defined by the State of Oregon as 0.25 °F (0.14 °C), and by the State of Idaho as 0.3 °C.) The point source discharges are calculated to contribute less than 0.012 °F (0.0066 °C) increase in mainstem water temperature in the Upstream Snake River segment (RM 409 to 335).

Under the current temperature standard for Oregon, the HUA is 0.3C rather than 0.14C.

Definitions

History

Version	Author	Comments
1.0	Jane Hickman	New policy – never finalized
1.1	Rob Burkhart	Minor changes to 1.0

Attachments OAR 340-041-0028 Temperature (Water Quality Standards)

Attachment

OAR 340-041-0028

Temperature

(1) Background. Water temperatures affect the biological cycles of aquatic species and are a critical factor in maintaining and restoring healthy salmonid populations throughout the State. Water temperatures are influenced by solar radiation, stream shade, ambient air temperatures, channel morphology, groundwater inflows, and stream velocity, volume, and flow. Surface water temperatures may also be warmed by anthropogenic activities such as discharging heated water, changing stream width or depth, reducing stream shading, and water withdrawals.

(2) Policy. It is the policy of the Commission to protect aquatic ecosystems from adverse warming and cooling caused by anthropogenic activities. The Commission intends to minimize the risk to cold-water aquatic ecosystems from anthropogenic warming, to encourage the restoration and protection of critical aquatic habitat, and to control extremes in temperature fluctuations due to anthropogenic activities. The Commission recognizes that some of the State's waters will, in their natural condition, not provide optimal thermal conditions at all places and at all times that salmonid use occurs. Therefore, it is especially important to minimize additional warming due to anthropogenic sources. In addition, the Commission acknowledges that control technologies, best management practices and other measures to reduce anthropogenic warming are evolving and that the implementation to meet these criteria will be an iterative process. Finally, the Commission notes that it will reconsider beneficial use designations in the event that man-made obstructions or barriers to anadromous fish passage are removed and may justify a change to the beneficial use for that water body.

(3) Purpose. The purpose of the temperature criteria in this rule is to protect designated temperature-sensitive, beneficial uses, including specific salmonid life cycle stages in waters of the State.

(4) Biologically Based Numeric Criteria. Unless superseded by the natural conditions criteria described in section (8) of this rule, or by subsequently adopted site-specific criteria approved by EPA, the temperature criteria for State waters supporting salmonid fishes are as follows:

(a) The seven-day-average maximum temperature of a stream identified as having salmon and steelhead spawning use on subbasin maps and tables set out in OAR 340-041-0101 to 340-041-0340: Tables 101B, and 121B, and Figures 130B, 151B, 160B, 170B, 220B, 230B, 271B, 286B, 300B, 310B, 320B, and 340B, may not exceed 13.0 degrees Celsius (55.4 degrees Fahrenheit) at the times indicated on these maps and tables;

(b) The seven-day-average maximum temperature of a stream identified as having core cold water habitat use on subbasin maps set out in OAR 340-041-101 to 340-041-340: Figures 130A, 151A, 160A, 170A, 180A, 201A, 220A, 230A, 271A, 286A, 300A, 310A, 320A, and 340A, may not exceed 16.0 degrees Celsius (60.8 degrees Fahrenheit);

(c) The seven-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration use on subbasin maps set out at OAR 340-041-0101 to 340-041-0340: Figures 130A, 151A, 160A, 170A, 220A, 230A, 271A, 286A, 300A, 310A, 320A, and 340A, may not exceed 18.0 degrees Celsius (64.4 degrees Fahrenheit);

(d) The seven-day-average maximum temperature of a stream identified as having a migration corridor use on subbasin maps and tables OAR 340-041-0101 to 340-041-0340: Tables 101B, and 121B, and Figures 151A, 170A, 300A, and 340A, may not exceed 20.0 degrees Celsius (68.0 degrees Fahrenheit). In addition, these water bodies must have coldwater refugia that are sufficiently distributed so as to allow salmon and steelhead migration without significant adverse effects from higher water temperatures elsewhere in the water body. Finally, the seasonal thermal pattern in Columbia and Snake Rivers must reflect the natural seasonal thermal pattern;

(e) The seven-day-average maximum temperature of a stream identified as having Lahontan cutthroat trout or redband trout use on subbasin maps and tables set out in OAR 340-041-0101 to 340-041-0340: Tables 121B, 140B, 190B, and 250B, and Figures 180A, 201A, 260A and 310A may not exceed 20.0 degrees Celsius (68.0 degrees Fahrenheit);

(f) The seven-day-average maximum temperature of a stream identified as having bull trout spawning and juvenile rearing use on subbasin maps set out at OAR 340-041-0101 to 340-041-0340: Figures 130B, 151B, 160B, 170B, 180A, 201A, 260A, 310B, and 340B, may not exceed 12.0 degrees Celsius (53.6 degrees Fahrenheit). From August 15 through May 15, in bull trout spawning waters below Clear Creek and Mehlhorn reservoirs on Upper Clear Creek (Pine Subbasin), below Laurance Lake on the Middle Fork Hood River, and below Carmen reservoir on the Upper McKenzie River, there may be no more than a 0.3 degrees Celsius (0.5 Fahrenheit) increase between the water temperature immediately upstream of the reservoir and the water temperature immediately downstream of the spillway when the ambient seven-day-average maximum stream temperature is 9.0 degrees Celsius (48 degrees Fahrenheit) or greater, and no more than a 1.0 degree Celsius (1.8 degrees Fahrenheit) increase when the seven-day-average stream temperature is less than 9 degrees Celsius.

(5) Unidentified Tributaries. For waters that are not identified on the “Fish Use Designations” maps referenced in section (4) of this rule, the applicable criteria for these waters are the same criteria as is applicable to the nearest downstream water body depicted on the applicable map. This section (5) does not apply to the “Salmon and Steelhead Spawning Use Designations” maps.

(6) Natural Lakes. Natural lakes may not be warmed by more than 0.3 degrees Celsius (0.5 degrees Fahrenheit) above the natural condition unless a greater increase would not reasonably be expected to adversely affect fish or other aquatic life. Absent a discharge or human modification that would reasonably be expected to increase temperature, DEQ will presume that the ambient temperature of a natural lake is the same as its natural thermal condition.

(7) Oceans and Bays. Except for the Columbia River above river mile 7, ocean and bay waters may not be warmed by more than 0.3 degrees Celsius (0.5 degrees Fahrenheit) above the natural condition unless a greater increase would not reasonably be expected to adversely affect fish or other aquatic life. Absent a discharge or human modification that would reasonably be expected to increase temperature, DEQ will presume that the ambient temperature of the ocean or bay is the same as its natural thermal condition.

(8) Natural Conditions Criteria. Where the department determines that the natural thermal potential of all or a portion of a water body exceeds the biologically-based criteria in section (4) of this rule, the natural thermal potential temperatures supersede the biologically-based criteria, and are deemed to be the applicable temperature criteria for that water body.

NOTE: On August 8, 2013, the Environmental Protection Agency disapproved rule section OAR 340-041-0028(8). Consequently, section (8) is no longer effective as a water quality criterion for purposes of CWA Section 303(c) and it cannot be used for issuing certifications under CWA Section 401, permits under CWA Section 402, or total maximum daily loads under CWA section 303(d).

(9) Cool Water Species.

(a) No increase in temperature is allowed that would reasonably be expected to impair cool water species. Waters of the State that support cool water species are identified on subbasin tables and figures set out in OAR 340-041-0101 to 340-041-0340; Tables 140B, 190B and 250B, and Figures 180A, 201A and 340A.

(b) See OAR 340-041-0185 for a basin specific criterion for the Klamath River.

(10) Borax Lake Chub. State waters in the Malheur Lake Basin supporting the Borax Lake chub may not be cooled more than 0.3 degrees Celsius (0.5 degrees Fahrenheit) below the natural condition.

(11) Protecting Cold Water.

(a) Except as described in subsection (c) of this rule, waters of the State that have summer seven-day-average maximum ambient temperatures that are colder than the biologically based criteria in section (4) of this rule, may not be warmed by more than 0.3 degrees Celsius (0.5 degrees Fahrenheit) above the colder water ambient temperature. This provision applies to all sources taken together at the point of maximum impact where salmon, steelhead or bull trout are present.

(b) A point source that discharges into or above salmon & steelhead spawning waters that are colder than the spawning criterion, may not cause the water temperature in the spawning reach where the physical habitat for spawning exists during the time spawning through emergence use occurs, to increase more than the following amounts after complete mixing of the effluent with the river:

(A) If the rolling 60 day average maximum ambient water temperature, between the dates of spawning use as designated under subsection (4)(a) of this rule, is 10 to 12.8 degrees Celsius, the allowable increase is 0.5 Celsius above the 60 day average; or

(B) If the rolling 60 day average maximum ambient water temperature, between the dates of spawning use as designated under subsection (4)(a) of this rule, is less than 10 degrees Celsius, the allowable increase is 1.0 Celsius above the 60 day average, unless the source provides analysis showing that a greater increase will not significantly impact the survival of salmon or steelhead eggs or the timing of salmon or steelhead fry emergence from the gravels in downstream spawning reach.

(c) The cold water protection narrative criteria in subsection (a) do not apply if:

(A) There are no threatened or endangered salmonids currently inhabiting the water body;

(B) The water body has not been designated as critical habitat; and

(C) The colder water is not necessary to ensure that downstream temperatures achieve and maintain compliance with the applicable temperature criteria.

(12) Implementation of the Temperature Criteria.

(a) Minimum Duties. There is no duty for anthropogenic sources to reduce heating of the waters of the State below their natural condition. Similarly, each anthropogenic point and nonpoint source is responsible only for controlling the thermal effects of its own discharge or activity in accordance with its overall heat contribution. In no case may a source cause more warming than that allowed by the human use allowance provided in subsection (b) of this rule.

(b) Human Use Allowance. Insignificant additions of heat are authorized in waters that exceed the applicable temperature criteria as follows:

(A) Prior to the completion of a temperature TMDL or other cumulative effects analysis, no single NPDES point source that discharges into a temperature water quality limited water may cause the temperature of the water body to increase more than 0.3 degrees Celsius (0.5 Fahrenheit) above the applicable criteria after mixing with either twenty five (25) percent of the stream flow, or the temperature mixing zone, whichever is more restrictive; or

(B) Following a temperature TMDL or other cumulative effects analysis, waste load and load allocations will restrict all NPDES point sources and nonpoint sources to a cumulative increase of no greater than 0.3 degrees Celsius (0.5 Fahrenheit) above the applicable criteria after complete mixing in the water body, and at the point of maximum impact.

(C) Point sources must be in compliance with the additional mixing zone requirements set out in OAR 340-041-0053(2)(d).

(D) A point source in compliance with the temperature conditions of its NPDES permit is deemed in compliance with the applicable criteria.

(c) Air Temperature Exclusion. A water body that only exceeds the criteria set out in this rule when the exceedance is attributed to daily maximum air temperatures that exceed the 90th percentile value of annual maximum seven-day average maximum air temperatures calculated using at least 10 years of air temperature data, will not be listed on the section 303(d) list of impaired waters and sources will not be considered in violation of this rule.

(d) Low Flow Conditions. An exceedance of the biologically-based numeric criteria in section (4) of this rule, or an exceedance of the natural condition criteria in section (8) of this rule will not be considered a permit violation during stream flows that are less than the 7Q10 low flow condition for that water body.

(e) Other Nonpoint Sources. The department may, on a case-by-case basis, require nonpoint sources (other than forestry and agriculture), including private hydropower facilities regulated by a 401 water quality certification, that may contribute to warming of State waters beyond 0.3 degrees Celsius (0.5 degrees Fahrenheit), and are therefore designated as water-quality limited, to develop and implement a temperature management plan to achieve compliance with applicable temperature criteria or an applicable load allocation in a TMDL pursuant to OAR 340-042-0080.

(A) Each plan must ensure that the nonpoint source controls its heat load contribution to water temperatures such that the water body experiences no more than a 0.3 degrees Celsius (0.5 degree Fahrenheit) increase above the applicable criteria from all sources taken together at the maximum point of impact.

(B) Each plan must include a description of best management practices, measures, effluent trading, and control technologies (including eliminating the heat impact on the stream) that the nonpoint source intends to use to reduce its temperature effect, a monitoring plan, and a compliance schedule for undertaking each measure.

(C) The Department may periodically require a nonpoint source to revise its temperature management plan to ensure that all practical steps have been taken to mitigate or eliminate the temperature effect of the source on the water body.

(f) Compliance Methods. Anthropogenic sources may engage in thermal water quality trading in whole or in part to offset its temperature discharge, so long as the trade results in at least a net thermal loading decrease in anthropogenic warming of the water body, and does not adversely affect a threatened or endangered species. Sources may also achieve compliance, in whole or in part, by flow augmentation, hyporheic exchange flows, outfall relocation, or other measures that reduce the temperature increase caused by the discharge.

(g) Release of Stored Water. Stored cold water may be released from reservoirs to cool downstream waters in order to achieve compliance with the applicable numeric criteria. However, there can be no significant adverse impact to downstream designated beneficial uses as a result of the releases of this cold water, and the release may not contribute to violations of other water quality criteria. Where the Department determines that the release of cold water is resulting in a significant adverse impact, the Department may require the elimination or mitigation of the adverse impact.

(13) Site-Specific Criteria. The Department may establish, by separate rulemaking, alternative site-specific criteria for all or a portion of a water body that fully protects the designated use.

(a) These site-specific criteria may be set on a seasonal basis as appropriate.

(b) The Department may use, but is not limited by the following considerations when calculating site-specific criteria:

(A) Stream flow;

(B) Riparian vegetation potential;

(C) Channel morphology modifications;

(D) Cold water tributaries and groundwater;

(E) Natural physical features and geology influencing stream temperatures; and

(F) Other relevant technical data.

(c) DEQ may consider the thermal benefit of increased flow when calculating the site-specific criteria.

(d) Once established and approved by EPA, the site-specific criteria will be the applicable criteria for the water bodies affected.

[ED. NOTE: Tables referenced are available from the agency.]

Stat. Auth.: ORS 468.020, 468B.030, 468B.035 & 468B.048
Stats. Implemented: ORS 468B.030, 468B.035 & 468B.048
Hist.: DEQ 17-2003, f. & cert. ef. 12-9-03; DEQ 1-2007, f. & cert. ef. 3-14-07; DEQ 2-2007, f. & cert. ef. 3-15-07; DEQ 10-2011, f. & cert. ef. 7-13-11; DEQ 5-2013, f. & cert. ef. 6-21-13; DEQ 1-2015, f. & cert. ef. 1-7-15