9 Allocation approach

Figure 9-1 provides three separate conceptual representations of the total load to a temperature-impaired water. The left (completely orange) block shows the total load, with the bisecting lines representing the load that would meet the biologically-based numeric criteria plus the human use allowance (the temperature standard). The middle block represents the portions of the total load contributed by the different source categories (point, nonpoint, and background). The right block illustrates how the loading capacity element of the TMDL defines the various allocations.

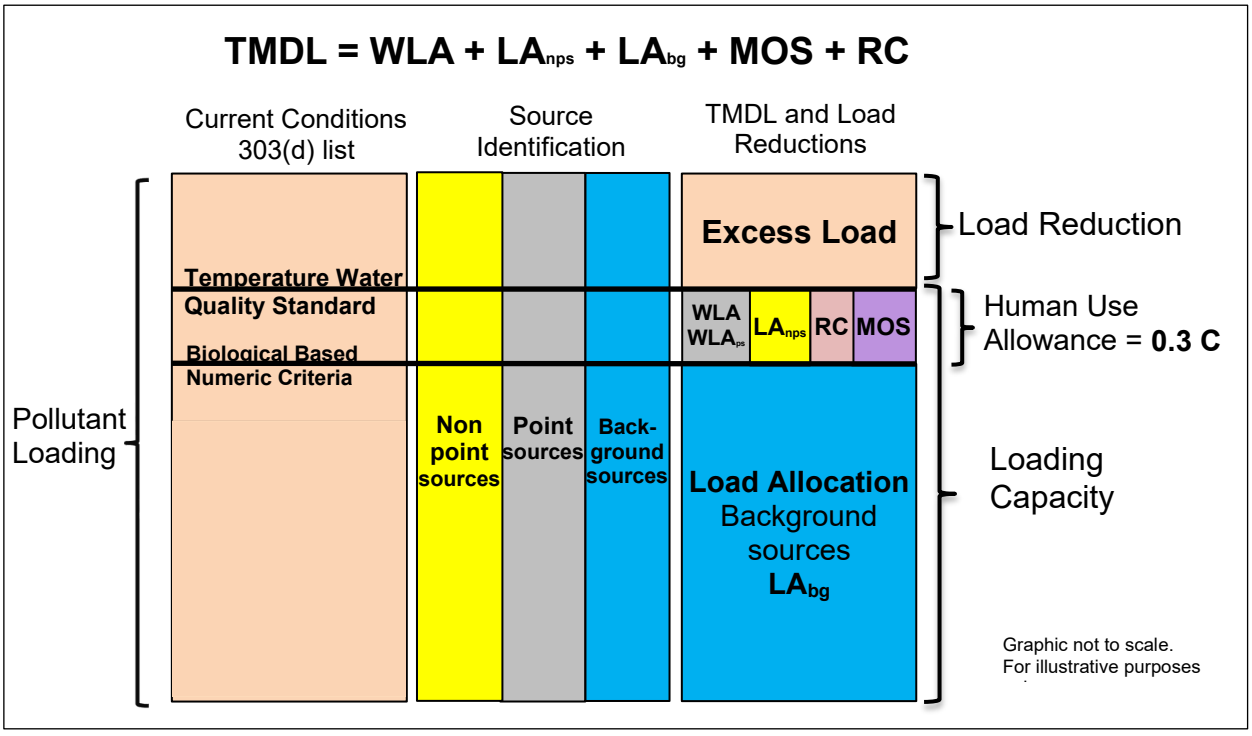

Figure 9-1: Conceptual representation and breakdown of total pollutant loading to a temperature-impaired waterbody.

Wasteload allocations (shown as WLA) are the portion of the TMDL loading capacity allocated to point sources and load allocations (shown as LAnps and LAbg) are the portion attributed to nonpoint sources, including background sources. OAR 340-042-0040(6) identifies the factors that DEQ or EQC may consider when distributing wasteload and load allocations.

The factors include:

a) Contributions from sources;
b) Costs of implementing measures;
c) Ease of implementation;
d) Timelines for attainment of water quality standards;
e) Environmental impacts of allocations;
f) Unintended consequences;
g) Reasonable assurances of implementation.
h) Any other relevant factor.

Oregon's temperature standard provides a framework for how the loading capacity is distributed between human sources of warming and background sources. The human use allowance at OAR 340-041-0028(12)(b)(B) identifies the portion of the loading capacity reserved for human uses. The rule requires that wasteload and load allocations restrict all NPDES point sources and nonpoint sources to a cumulative increase of no greater than 0.30°C (0.5°F) above the applicable criteria after complete mixing in the water body, and at the point of maximum impact (POMI). DEQ allocated a thermal load equivalent to a 0.30°C increase to human sources and the remainder of the loading capacity to background sources.
When distributing the thermal loads associated with a 0.30°C increase, DEQ considered the magnitude of the thermal load contributed from known sources, ease of implementing the allocations, the environmental impact of those contributions including where the impact occurs, and how the source contribution impacts cumulative warming.

9.1 Point source wasteload allocations (WLAs)

9.1.2 Approach for developing WLAs for Willamette Mainstem

Modeling performed for the critical low flow model year of 2015 showed that point source ΔT impacts for 2015 did not exceed 0.20°C. This suggests that WLAs can be set to current thermal loads. DEQ's approach to individual point source allocations for the Willamette River and major tributaries downstream from USACE/PGE reservoirs (Willamette Mainstem) was to generate an initial set of thermal wasteload allocations that equal or slightly exceed current excess thermal loads, based on point source effluent data submitted by permittees. These were then modeled using the set of CE-QUAL-W2 models that comprise the Willamette Mainstem Model to determine maximum cumulative impacts on river temperature and ensure that point source impacts, plus the impacts from other sectors that have been allocated portions of the HUA, do not exceed 0.3°C.

Measured 7-day average effluent flow rates and 7DADM effluent temperatures were used to calculate ΔT values using Equation 9-3 below for each day that data was available. Effluent data used for this analysis was collected and provided to DEQ by point sources (via discharge monitoring reports and other submittals). The pair of effluent flow and temperatures and corresponding ΔT values for each point source for the spring spawning period, summer non-spawning period, and fall spawning period are show in Table 9-1. From Newberg Pool downstream through Portland Harbor to the confluence with the Columbia River, spawning is not a designated use, so ΔT values are only provided for the summer in these reaches. The ΔT values shown are used to derive allocated human use allowances. These are rounded up to two or three decimal places. Three decimal places are required in areas where cumulative impacts approach 0.2°C. Rounding up to two decimal places is likely acceptable elsewhere. In some cases, where the ΔT is small and effluent flow and temperature data sparse, an adjustment

factor, generally ranging from 10-30%, is applied, as shown in Table 9-1. This is to avoid adverse, unexpected impacts on small dischargers who contribute only a small part of the cumulative thermal load. In one case a negative adjustment factor is applied to limit the ΔT of a large discharge. The overall goal of this effort was to generate a preliminary set of wasteload allocations at least as large as current thermal loads and then test it by modeling.

For the City of Scappoose STP discharge to Multnomah Channel, Equation 9-2 (in the TMDL report) is used to calculate the current thermal load and wasteload allocation for the facility. This is because the facility discharges to Multnomah Channel, which is tidally influenced and which receives flow both the Willamette and Columbia Rivers. For this facility, a static (not flow dependent) wasteload allocation is provided that is set 30% higher than current thermal loads, based on limited effluent data available. Modeling showed that maximum impacts of point sources on the temperature in Multnomah Channel is less than 0.10°C.

The following describes other factors DEQ considered when assigning the point of discharge human use allowance to point sources:

- If a point source is not authorized to discharge in the current NPDES permit (maximum effluent flow = 0), a human use allowance of 0.00 degrees Celsius was assigned during the no discharge period. A human use allocation of zero means there may be no warming above the applicable temperature criteria.
- On modeled streams, a characterization of point source discharge and cumulative effects analysis was completed. The results of the characterization and modeling informed the portion of the human use allowance assigned.

Table 9-19-1: Derivation of Effluent flow, temperature, and ΔT used to derive thermal WLAs for Mainstem Willamette River and Major Tributary individual point sources (Spring Spawning, Summer, Fall Spawning).

NPDES Permittee - WQ File No. - EPA No. - Receiving water and location	Effluent Flow to use for WLA (cfs)	Effluent T to use for WLA (oC)	ΔT based on Effluent Flow and T (oC)	Allocation Rationale
ODFW - CLACKAMAS RIVER HATCHERY - 64442 - 102663 - Clackamas River RM 22.6	42.122.86	15.115.5	0.07500.047	Adj Factor = 0%; Round up WLA based on obs T and Q 2016-2023Adj Factor = 0%; WLA derived from obs T and Q
	4117.80	20.219.7	0.2800.107	Adj Factor = 0%; Round up WLA based on obs T and Q 2016-2023Adj Factor = 0%; Round up WLA based on obs T and Q
	4222.00	17.616.6	0.3000.122	Adj Factor = 0%; Round up WLA based on obs T and Q 2016-2023Adj Factor = 0%; Round up WLA derived from obs T and Q
COTTAGE GROVE STP - 20306 - 101300 - Coast Fork Willamette River RM 20.6	2.09	17.6	0.154	Adj Factor = 0%; Round up WLA derived from obs T and Q
	1.21	24.4	0.207	Adj Factor = 0%; Round up WLA derived from obs T and Q
	NA	NA	NA	Adj Factor = NA; Trout spawning only so no WLA needed for fall

NPDES Permittee - WQ File No. - EPA No. - Receiving water and location	Effluent Flow to use for WLA (cfs)	Effluent T to use for WLA (oC)	ΔT based on Effluent Flow and T (oC)	Allocation Rationale
MONROE STP - 57951 - 101692 - Long Tom River RM 6.9	1.14	20.8	0.057	Adj Factor = 20%; Round up WLA derived from obs T and Q
	NA	NA	NA	Adj Factor = NA; No WLA or WLA = 0% May-Oct
	NA	NA	NA	Adj Factor = NA; No WLA needed for fall since criterion not exceeded
IP SPRINGFIELD PAPER MILL 001+002 - 96244 - 101081 - McKenzie River RM 14.7	26.64	22.2	0.098	Adj Factor = 10%; Round up WLA derived from obs T and Q
	28.85	26.7	0.196	Adj Factor = 0%; Round up WLA derived from obs T and Q
	28.75	25.0	0.209	Adj Factor = 0%; Round up WLA derived from obs T and Q
ODFW Dexter Ponds - 64450 - ? - Middle Fork Willamette River RM 15.7	48.0047~~.97~~	13.8	0.037	Adj Factor = 0%; Round up WLA derived from obs T and Q
	48.0047~~.97~~	20.1	0.200	Adj Factor = 0%; Round up WLA based on obs T and Q
	48.0047~~.97~~	20.1	0.268	Adj Factor = 0%; Round up WLA derived from obs T and Q
LOWELL STP - 51447 - 101384 - Middle Fork Willamette River RM 15.7	3.04	21.3	0.025	Adj Factor = 0%; Round up WLA derived from obs T and Q
	1.22	23.2	0.009	Adj Factor = 20%; Round up WLA based on obs T and Q
	3.04	21.3	0.020	Adj Factor = 0%; Round up WLA derived from obs T and Q
ODFW - Minto Fish Facility (MARION FORKS HATCHERY) - 64495 - 101917 - North Santiam River RM 41.13	30.00	13.4	0.013	Adj Factor = 0%; Round up WLA derived from obs T and Q
	36.00	16.4	0.017	Adj Factor = 0%; Round up WLA based on obs T and Q
	41.00	12.7	0.013	Adj Factor = NA; Effluent T never exceeds criterion and is less than u/s river T. Small allocation provided set equal to min of spring and summer values
FRANK LUMBER CO. INC. - 30904 - 101583 - North Santiam River RM 32.5	2.97	22.5	0.029	Adj Factor = 0%; Round up WLA derived from obs T and Q
	2.97	24.5	0.031	Adj Factor = 0%; Round up WLA based on obs T and Q
	4.35	19.7	0.030	Adj Factor = 0%; Round up WLA derived from obs T and Q
STAYTON STP - 84781 - 101601 -	1.78	22.2	0.011	Adj Factor = 0%; Round up WLA derived from obs T and Q

NPDES Permittee - WQ File No. - EPA No. - Receiving water and location	Effluent Flow to use for WLA (cfs)	Effluent T to use for WLA (oC)	ΔT based on Effluent Flow and T (oC)	Allocation Rationale
North Santiam River RM 14.9	1.88	22.5	0.014	Adj Factor = 20%; Round up WLA based on obs T and Q
	1.78	22.2	0.016	Adj Factor = 0%; Round up WLA derived from obs T and Q
JEFFERSON STP - 43129 - 101780 - Santiam River (enters WR at RM 109) RM 9.2	0.55	18.0	0.001	Adj Factor = 20%; Round up WLA derived from obs T and Q
	0.45	25.5	0.003	Adj Factor = 20%; Round up WLA based on obs T and Q
	0.51	19.0	0.002	Adj Factor = 20%; Round up WLA derived from obs T and Q
ODFW South Santiam Hatchery - 64560 - GEN03: Industrial Wastewater; NPDES fish hatcheries - South Santiam River RM 37.8	10.60	11.6	-0.018	Adj Factor = NA; Effluent T never exceeds criterion and is less than u/s river T. Small allocation provided.
	25.90	11.3	-0.206	Adj Factor = NA; Effluent T never exceeds criterion and is less than u/s river T. Small allocation provided.
	28.50	11.6	-0.058	Adj Factor = NA; Effluent T never exceeds criterion and is less than u/s river T. Small allocation provided.
SWEET HOME STP - 86840 - 101657 - South Santiam River RM 31.5	2.56	16.4	0.010	Adj Factor = 0%; Round up WLA derived from obs T and Q
	2.07	22.6	0.023	Adj Factor = 0%; Round up WLA based on obs T and Q
	3.49	20.6	0.040	Adj Factor = 0%; Round up WLA derived from obs T and Q
LEBANON WWTP - 49764 - 101771 - South Santiam River RM 17.4	4.05	18.2	0.015	Adj Factor = 0%; Round up WLA derived from obs T and Q
	4.84	21.7	0.030	Adj Factor = 20%; Round up WLA based on obs T and Q
	12.20	17.8	0.071	Adj Factor = 0%; Round up WLA derived from obs T and Q
MWMC - EUGENE/SPRINGFIELD STP - 55999 - 102486 - Willamette River RM 178	42.56	18.4	0.117	Adj Factor = 0%; Round up WLA derived from obs T and Q
	55.00	20.6	0.095	Adj Factor = 0%; Set to uncorrected 2006 WLA
	86.28	18.8	0.250	Adj Factor = -0.24; Reduce WLA derived from obs T and Q so that ΔT ≤ 0.19oC
HARRISBURG LAGOON TREATMENT PLANT - 105415 - 101626 -	1.85	17.1	0.001	Adj Factor = 20%; Round up WLA derived from obs T and Q NEED APR 15-APR 30
	0.00	NA	NA	Adj Factor = NA; No WLA or WLA = 0 May-Oct; Need WLA Apr 15-30 and Nov 1-15

NPDES Permittee - WQ File No. - EPA No. - Receiving water and location	Effluent Flow to use for WLA (cfs)	Effluent T to use for WLA (oC)	ΔT based on Effluent Flow and T (oC)	Allocation Rationale
Willamette River RM 158.4	1.85	17.1	0.002	Adj Factor = 20%; Round up WLA derived from obs T and Q NEED NOV 1-15
CASCADE PACIFIC PULP, LLC - 36335 - 101114 - Willamette River RM 147.7	16.46	20.5	0.023	Adj Factor = 0%; Round up WLA derived from obs T and Q
	17.29	28.1	0.050	Adj Factor = 0%; Round up WLA based on obs T and Q
	14.48	23.9	0.022	Adj Factor = 0%; Round up WLA derived from obs T and Q
HOLLINGSWORTH & VOSE FIBER CO - CORVALLIS - 28476 - 101331 - Willamette River RM 132.5	0.07	23.4	0.00014	Adj Factor = 100%; Round up WLA derived from obs T and Q
	0.14	23.4	0.00022	Adj Factor = 100%; Round up WLA based on obs T and Q - use adj factor to account for 2006 Round up WLA and uncertianty
	0.10	14.0	0.00002	Adj Factor = 100%; Round up WLA derived from obs T and Q
CORVALLIS STP - 20151 - 101714 - Willamette River RM 130.8	15.24	18.5	0.016	Adj Factor = 0%; Round up WLA derived from obs 2018-2022 T and Q
	~~9.78~~11.62	~~22.7~~22.6	~~0.013~~0.016	Adj Factor = 0%; Round up WLA derived from obs 2018-2022 T and Q~~Adj Factor = 0%; Set to uncorrected 2006 WLA~~
	~~33.24~~15.43	~~18.4~~19.6	~~0.042~~0.024	Adj Factor = 0%; Round up WLA derived from obs 2018-2022 T and Q
OSU JOHN L. FRYER AQUATIC ANIMAL HEALTH LAB - 103919 - 102512 - Willamette River RM 130	0.86	17.7	0.0007	Adj Factor = 20%; Round up WLA derived from obs T and Q
	1.18	18.7	0.0002	Adj Factor = 20%; Round up WLA based on obs T and Q
	0.84	14.6	0.0003	Adj Factor = 20%; Round up WLA derived from obs T and Q
ADAIR VILLAGE STP - 500 - 101701 - Willamette River RM 122	1.29	16.0	0.0006	Adj Factor = 20%; Round up WLA derived from obs T and Q - NEED APR 1-APR 30
	0.00	0.0	0.0000	Adj Factor = NA; No discharge May 1 - Oct 31, Need WLA Apr 1-30 and Nov 1-15
	1.29	16.0	0.0009	Adj Factor = 20%; Round up WLA derived from obs T and Q - NEED NOV 1-15
AM WRF - ALBANY-MILLERSBURG WATER RECLAMATION FACILITY - 1098 - 102024 - Willamette River RM 118	14.3	17.3	0.010	Adj Factor = 0%; Round up WLA derived from obs T and Q
	13.7	22.5	0.016	Adj Factor = 0%; Round up WLA based on obs T and Q
	25.1	19.4	0.036	Adj Factor = 0%; Round up WLA derived from obs T and Q

NPDES Permittee - WQ File No. - EPA No. - Receiving water and location	Effluent Flow to use for WLA (cfs)	Effluent T to use for WLA (oC)	ΔT based on Effluent Flow and T (oC)	Allocation Rationale
~~Teledyne Wah Chang Albany~~ ATI Millersburg - 87645 - ~~100532~~ 100522 - Willamette River RM ~~115.5~~118	~~0.005~~5.1	~~27.7~~24.14	~~0.000020~~.009	~~Adj Factor = 100%; Round up WLA derived from obs T and Q~~Additional information submitted April 2024 by permittee
	~~0.006~~5.1	~~31.7~~26.33	~~0.000020~~.011	~~Adj Factor = 100%; Round up WLA based on obs T and Q~~Additional information submitted April 2024 by permittee
	~~0.008~~5.3	~~20.3~~22.23	~~0.000040~~.011	~~Adj Factor = 100%; Round up WLA derived from obs T and Q~~Additional information submitted April 2024 by permittee
INDEPENDENCE STP - 41513 - 101217 - Willamette River RM 95.5	3.82	23.8	0.004	Adj Factor = 20%; Round up WLA derived from obs T and Q - NEED APR 1-May 15
	3.75	23.9	0.006	Adj Factor = 20%; No WLA or WLA = 0 Jun-Oct, Need WLA Apr 1 - May 30 and Nov 1-15, Non-spawning WLA applies May 15-30
	6.20	16.1	0.003	Adj Factor = 20%; Round up WLA derived from obs T and Q - NEED NOV 1-15
MONMOUTH STP - 57871 - 101919 - Willamette River RM 95.5	5.71	19.4	0.004	Adj Factor = 20%; Round up WLA derived from obs T and Q - NEED APR 1-May 15
	4.28	24.0	0.007	Adj Factor = 20%; No WLA or WLA = 0 Jun-Oct, Need WLA Apr 1 - May 30 and Nov 1-15, Non-spawning WLA applies May 15-30
	5.72	16.0	0.002	Adj Factor = 20%; Round up WLA derived from obs T and Q - NEED NOV 1-15
SALEM WILLOW LAKE STP - 78140 - 101145 - Willamette River RM 78.4	46.4	18.0	0.022	Adj Factor = 0%; Round up WLA derived from obs T and Q
	39.8	~~22.9~~25.3	~~0.034~~0.05	Adj Factor = 0%; Set to uncorrected 2006 WLA based on data through 2023
	112.3	18.5	0.085	Adj Factor = 0%; Round up WLA derived from obs T and Q
COVANTA Marion County Solid Waste-to-Energy Facility - 89638 - 101240 - Willamette River RM 72	0.15	36.0	0.0004	Adj Factor = 20%; Round up WLA derived from obs T and Q
	0.27	42.0	0.0011	Adj Factor = 20%; Round up WLA based on obs T and Q - NOTE High T
	0.15	36.0	0.0005	Adj Factor = 20%; Round up WLA derived from obs T and Q
BROOKS SEWAGE TREATMENT PLANT - 100077 - 101397 - Willamette River RM 71.7	1.51	18.6	0.0007	Adj Factor = 20%; Round up WLA derived from obs T and Q - NEED APR 1-30
	0.00	NA	NA	Adj Factor = NA; No WLA or WLA = 0 May-Oct; Need WLA Apr 1-30 and Nov 1-15
	1.51	18.6	0.0012	Adj Factor = 20%; Round up WLA derived from obs T and Q - NEED NOV 1-15
DUNDEE STP - 25567 - 101722 - Willamette River RM 51.7	0.44	22.5	0.0003	Adj Factor = 20%; WLA using PER Actual ADWF effluent flow rate and current T - round up

NPDES Permittee - WQ File No. - EPA No. - Receiving water and location	Effluent Flow to use for WLA (cfs)	Effluent T to use for WLA (oC)	ΔT based on Effluent Flow and T (oC)	Allocation Rationale
NEWBERG - WYNOOSKI ROAD STP - 102894 - 100988 - Willamette River RM 49.7	3.00	24.3	0.0023	Adj Factor = 20%; WLA using ADWF effluent flow rate and current T - round up
CENTURY MEADOWS SANITARY SYSTEM (CMSS) - 96010 - 101721 - Willamette River RM 42.8	0.57	23.3	0.0003	Adj Factor = 20%; WLA using current effluent flow rate and T pair - round up
WILSONVILLE STP - 97952 - 101888 - Willamette River RM 38.5	3.46	25.1	0.0031	Adj Factor = 10%; WLA using ADWF effluent flow rate and current T - round up
CANBY STP - 13691 - 101063 - Willamette River RM 33	1.54	26.4	0.0017	Adj Factor = 10%; Round up WLA based on obs T and Q
CANBY REGENCY MOBILE HOME PARK - 97612 - 101644 - Willamette River RM 31.6	0.05	21.7	0.00001	Adj Factor = 30%; Round up WLA based on obs T and Q
FOREST PARK MOBILE VILLAGE - 30554 - 102323 - Willamette River RM 28.2	0.01	28.0	0.0000	Adj Factor = 30%; Round up WLA based on obs T and Q
WEST LINN PAPER COMPANY - 21489 - 100976 - Willamette River RM 27.5	4.94	25.5	0.0044	Adj Factor = 0%; Set to uncorrected 2006 WLA
WES Tri-city WPCP - 89700 - 101168 - Willamette River RM 25.5	9.95	24.7	0.0075	Adj Factor = 0%; WLA using ADWF effluent flow rate and current T - round up
TRYON CREEK WWTP - 70735 - 101614 - Willamette River RM 20.3	6.07	22.0	0.0019	Adj Factor = 10%; WLA using ADWF effluent flow rate and current T - round up
OAK LODGE WATER SERVICES WATER RECLAMATION FACILITY - 62795 - 100986 - Willamette River RM 20.1	3.73	23.6	0.0021	Adj Factor = 0%; Set to uncorrected 2006 WLA
WES Kellogg Creek WWTP - 16590 - 100983 - Willamette River RM 18.5	9.79	22.6	0.0041	Adj Factor = 0%; Set to uncorrected 2006 WLA
OHSU CENTER FOR HEALTH AND HEALING - 113611 -	0.05	18.0	0.0000	Adj Factor = 0%; WLA may not be needed since T does not exceed 18. WLA using current effluent flow rate and max acute T - round up

NPDES Permittee - WQ File No. - EPA No. - Receiving water and location	Effluent Flow to use for WLA (cfs)	Effluent T to use for WLA (oC)	ΔT based on Effluent Flow and T (oC)	Allocation Rationale
102833 - Willamette River RM 14.462				
UNIVAR USA INC - 100517 - 101613 - Willamette River RM 9	0.03		0.0000	Adj Factor = 30%; WLA using current effluent flow rate and T=32 - round up
VIGOR INDUSTRIAL - 70596 - 101393 - Willamette River RM 8.2	2.40	32.0	0.0046	Adj Factor = 0%; WLA using current effluent flow rate and T=32 - round up
ARKEMA - 68471 - 103075 - Willamette River RM 7.2	0.13	32.1	0.0003	Adj Factor = 30%; Round up WLA based on obs T and Q
SLLI - 74995 - 101180 - Willamette River RM 7	0.04	32.0	0.0001	Adj Factor = 25%; Round up WLA based on obs T and Q
SILTRONIC CORPORATION - 93450 - 101128 - Willamette River RM 6.6	2.55	30.4	0.0043	Adj Factor = 0%; WLA using design ADWF effluent flow rate and current T - round up
NW NATURAL GAS SITE REMEDIATION - 120589 - 103061 - Willamette River RM 6.4	0.64	19.4	-0.0001	Adj Factor = 0%; Observed T < 20C criterion. WLA using current effluent flow rate and T=22 - round up
EVRAZ OREGON STEEL - 64905 - 101007 - Willamette River RM 2.4	1.22	25.9	0.0012	Adj Factor = 10%; Round up WLA based on obs T and Q
SCAPPOOSE STP - 78980 - 100677 - Multnomah Channel RM 10.5796	NA	NA	NA	No spawning period WLA required. No exceedance of spawning criteria that applies from Jan 1 to May 15 - Non-spawning 18C criterion exceeded Jun 1 - Sep 30 (summer only)
	0.92	25.0	NA	Adj Factor = 30%; WLA using PER current ADWF effluent flow rate and PER max current T. Since 7Q10 unknown and model shows 2015 impacts of all pt sources in Mult Channel <0.1C, use ETL equation

9.1.3 Wasteload allocations

Wasteload allocations for NPDES permitted point sources listed in were calculated using **Equation 9-1**.

Wasteload allocations may be implemented in NPDES permits in any of the following ways: 1) incorporating the 7Q10 wasteload allocation in Table 9-2 as a static numeric limit. Permit writers may recalculate the static limit using different values for 7Q10 (Q_R), and effluent flow (Q_E), if better estimates are available. 2) incorporating **Equation 9-1** directly into the permit with effluent

flow (Q_E), river flow (Q_R), and the wasteload allocation (WLA) being dynamic and calculated on a daily basis. The allocated portion of the human use allowance (ΔT) is based on the value in Table 9-2.

Table 9-2~~9-11~~: Thermal wasteload allocations (WLA) for point sources to Willamette River and major tributaries

NPDES Permittee - WQ File Number – Permit Number – Outfall location	Assigned Human Use Allowance ΔT (°C)	WLA period start	WLA period end	Annual 7Q10 River flow (cfs)	Effluent discharge (cfs)	7Q10 WLA (x 10^6 kcals/day)
[1] ADAIR VILLAGE STP - 500 - 101701 - Willamette River RM 122	0.001	1-Apr	15-May	6,308	1.3	15.437
	0.002	15-Oct	15-Nov	4,443	1.3	21.747
[3] AM WRF - ALBANY-MILLERSBURG WATER RECLAMATION FACILITY - 1098 - 102024 - Willamette River RM 118	0.01	1-Apr	15-May	6,308	14.3	154.686
	0.017	16-May	14-Oct	3,857	13.7	160.995
	0.037	15-Oct	15-Nov	4,443	25.1	404.482
ARKEMA - 68471 - 103075 - Willamette River RM 7.2	0.001	1-Jun	30-Sep	6,235	0.2	15.255
[1] BROOKS SEWAGE TREATMENT PLANT - 100077 - 101397 - Willamette River RM 71.7	0.001	1-Apr	15-May	11,955	1.6	29.254
	0.002	15-Oct	15-Nov	7,134	1.6	34.917
CANBY REGENCY MOBILE HOME PARK - 97612 - 101644 - Willamette River RM 31.6	0.001	1-Jun	30-Sep	5,717	0.1	13.988
CANBY STP - 13691 - 101063 - Willamette River RM 33	0.004	1-Jun	30-Sep	5,634	3.1	55.168
CASCADE PACIFIC PULP, LLC - 36335 - 101114 - Willamette River RM 147.7	0.023	1-Apr	15-May	5,330	16.5	300.865
	0.05	16-May	14-Oct	3,442	17.3	423.187
	0.022	15-Oct	15-Nov	7,281	14.5	392.692
CENTURY MEADOWS SANITARY SYSTEM (CMSS) - 96010 - 101721 - Willamette River RM 42.8	0.001	1-Jun	30-Sep	5,717	0.6	13.989
CORVALLIS STP - 20151 - 101714 - Willamette River RM 130.8	0.016	1-Apr	15-May	5,330	15.3	209.251
	~~0.015~~0.016	16-May	14-Oct	3,442	~~9.8~~11.7	~~126.681~~135.201
	~~0.042~~0.024	15-Oct	15-Nov	4,281	~~33.3~~15.5	~~443.337~~252.290
COTTAGE GROVE STP - 20306 - 101300 - Coast Fork Willamette River RM 20.6	0.16	1-Apr	15-May	61	2.1	24.702
	~~0.22~~0.23	16-May	15-Nov	36	1.3	~~20.077~~21.159
COVANTA Marion County Solid Waste-to-Energy Facility - 89638 - 101240 - Willamette River RM 72	0.001	1-Apr	15-May	8,747	0.2	21.401
	0.002	16-May	14-Oct	5,634	0.3	27.57
	0.001	15-Oct	15-Nov	7,134	0.2	17.455
DUNDEE STP - 25567 - 101722 - Willamette River RM 51.7	~~0.001~~0.002	1-Jun	30-Sep	5,717	1.1	~~13.99~~27.981
EVRAZ OREGON STEEL - 64905 - 101007 - Willamette River RM 2.4	0.002	1-Jun	30-Sep	6,235	1.3	30.516
FOREST PARK MOBILE VILLAGE - 30554 - 102323 - Willamette River RM 28.2	0.001	1-Jun	30-Sep	5,717	0.1	13.988
	0.03	1-Apr	15-Jun	987	3	72.666

FRANK LUMBER CO. INC. - 30904 - 101583 - North Santiam River RM 32.5	0.04	16-Jun	31-Aug	799	3	78.489
	0.04	1-Sep	15-Nov	957	4.4	94.089
[1] HARRISBURG LAGOON TREATMENT PLANT - 105415 - 101626 - Willamette River RM 158.4	0.002	1-Apr	30-Apr	5,204	1.9	25.474
	0.003	1-Nov	15-Nov	3,853	1.9	28.295
HOLLINGSWORTH & VOSE FIBER CO - CORVALLIS - 28476 - 101331 - Willamette River RM 132.5	0.001	15-Apr	15-May	5,330	0.1	13.041
	0.001	16-May	14-Oct	3,442	0.2	8.422
	0.001	15-Oct	15-Nov	4,281	0.1	10.474
INDEPENDENCE STP - 41513 - 101217 - Willamette River RM 95.5	0.005	1-Apr	15-May	10,688	3.9	130.797
	0.007	16-May	14-Oct	3,857	3.8	66.123
	0.004	15-Oct	15-Nov	7,134	6.2	69.879
JEFFERSON STP - 43129 - 101780 - Santiam River (enters WR at RM 109) RM 9.2	0.01	1-Apr	15-May	3,821	0.6	93.502
	0.01	16-May	14-Oct	1,065	0.8	26.077
	0.01	15-Oct	15-Nov	1,927	0.6	47.162
LEBANON WWTP - 49764 - 101771 - South Santiam River RM 17.4	0.02	1-Apr	15-May	1,433	4.1	70.322
	0.04	16-May	14-Oct	595	4.9	58.71
	0.08	15-Oct	15-Nov	817	12.3	162.322
MONMOUTH STP - 57871 - 101919 - Willamette River RM 95.5	0.005	1-Apr	15-May	9,945	5.8	121.731
	0.008	16-May	14-Oct	3,857	4.3	75.578
	0.003	15-Oct	15-Nov	7,103	5.8	52.179
MONROE STP - 57951 - 101692 - Long Tom River RM 6.9	0.07	1-Apr	1-May	55	1.2	9.625
MWMC - EUGENE/SPRINGFIELD STP - 55999 - 102486 - Willamette River RM 178	0.12	1-Apr	15-May	1,906	42.6	572.109
	0.107	16-May	14-Oct	1,466	55.1	398.214
	0.19	15-Oct	15-Nov	1,925	86.3	934.986
NEWBERG - WYNOOSKI ROAD STP - 102894 - 100988 - Willamette River RM 49.7	0.006	1-Jun	30-Sep	5,634	6.2	82.798
NW NATURAL GAS SITE REMEDIATION - 120589 - 103061 - Willamette River RM 6.4	0.001	1-Jun	30-Sep	6,235	0.7	15.257
OAK LODGE WATER SERVICES WATER RECLAMATION FACILITY - 62795 - 100986 - Willamette River RM 20.1	0.003	1-Jun	30-Sep	6,235	4.1	45.795
ODFW - CLACKAMAS RIVER HATCHERY - 64442 - 102663 - Clackamas River RM 22.6	0.075~~0.05~~	1-Apr	15-Jun	1,186	42.1~~22.9~~	225.356~~14 7.889~~
	0.28~~0.11~~	16-Jun	31-Aug	620	41.0~~17.8~~	452.829~~17 1.653~~
	0.30~~0.07~~	1-Sep	15-Nov	~~646~~645	42.0~~22~~	504.258~~11 4.406~~
ODFW - Minto Fish Facility (MARION FORKS HATCHERY) - 64495 - 101917 - North Santiam River RM 41.13	0.03	1-Apr	15-Jun	987	30	74.648
	0.03	16-Jun	31-Aug	799	36	61.289
	0.03	1-Sep	15-Nov	957	41	73.253
ODFW Dexter Ponds - 64450 - NA - Middle Fork Willamette River RM 15.7	0.04	1-Apr	15-Jun	986	48	101.194~~10 1.191~~
	0.21	16-Jun	14-Sep	989	48	532.810~~53 2.795~~

	0.27	15-Sep	15-Nov	1,280	48	877.276~~87 7.256~~
ODFW South Santiam Hatchery - 64560 - GEN03: Industrial Wastewater; NPDES fish hatcheries - South Santiam River RM 37.8	0.02	1-Apr	15-Jun	841	10.6	41.672
	0.02	16-Jun	31-Aug	595	25.9	30.383
	0.02	1-Sep	15-Nov	678	28.5	34.571
OHSU CENTER FOR HEALTH AND HEALING - 113611 - 102833 - Willamette River RM 14.462	0.001	1-Jun	30-Sep	6,235	0.1	15.255
OSU JOHN L. FRYER AQUATIC ANIMAL HEALTH LAB - 103919 - 102512 - Willamette River RM 130	0.001	1-Apr	15-May	5,800	0.9	14.193
	0.001	16-May	14-Oct	3,710	1.2	9.08
	0.001	15-Oct	15-Nov	4,149	0.9	10.153
SALEM WILLOW LAKE STP - 78140 - 101145 - Willamette River RM 78.4	0.022	1-Apr	15-May	10,688	46.4	577.797
	~~0.052~~0.05	16-May	14-Oct	5,634	39.8	~~721.858~~71 4.000
	0.085	15-Oct	15-Nov	7,134	112.3	1,506.99
[2] SCAPPOOSE STP - 78980 - 100677 - Multnomah Channel RM 10.5796	NA	1-Jun	30-Sep	~~10~~NA	0.92	20.391 [2]
SILTRONIC CORPORATION - 93450 - 101128 - Willamette River RM 6.6	0.007	1-Jun	30-Sep	6,235	4.2	106.857
SLLI - 74995 - 101180 - Willamette River RM 7	0.001	1-Jun	30-Sep	6,235	0.1	15.255
STAYTON STP - 84781 - 101601 - North Santiam River RM 14.9	0.02	1-Apr	15-Jun	1,482	1.8	72.607
	0.02	16-Jun	31-Aug	860	1.9	42.176
	0.02	1-Sep	15-Nov	1,019	1.8	49.951
SWEET HOME STP - 86840 - 101657 - South Santiam River RM 31.5	0.02	1-Apr	15-Jun	876	2.6	42.993
	0.03	16-Jun	31-Aug	595	2.1	43.827
	0.04	1-Sep	15-Nov	667	3.5	65.62
[3] ~~Teledyne Wah Chang Albany~~ ATI Millersburg- 87645 - ~~100532~~ 100522- Willamette River RM ~~115.5~~118	0.009	1-Apr	15-May	6,308	5.2~~0.1~~	139.017~~15. 434~~
	0.011~~0.001~~	16-May	14-Oct	3,857	5.2~~0.1~~	103.945~~9.4 37~~
	0.011~~0.001~~	15-Oct	15-Nov	4,443	5.4~~0.1~~	119.721~~10. 871~~
TRYON CREEK WWTP - 70735 - 101614 - Willamette River RM 20.3	0.005	1-Jun	30-Sep	6,235	12.9	76.433
UNIVAR USA INC - 100517 - 101613 - Willamette River RM 9	0.001	1-Jun	30-Sep	6,235	0.1	15.255
VIGOR INDUSTRIAL - 70596 - 101393 - Willamette River RM 8.2	0.005	1-Jun	30-Sep	6,235	2.4	76.304
WES Kellogg Creek WWTP - 16590 - 100983 - Willamette River RM 18.5	0.007	1-Jun	30-Sep	6,235	15.5	107.05
WES Tri-city WPCP - 89700 - 101168 - Willamette River RM 25.5	0.014	1-Jun	30-Sep	6,235	18.5	214.203
WEST LINN PAPER COMPANY - 21489 - 100976 - Willamette River RM 27.5	0.013	1-Jun	30-Sep	6,235	6.5	198.521
WILSONVILLE STP - 97952 - 101888 - Willamette River RM 38.5	0.005	1-Jun	30-Sep	5,634	4.2	68.974
[1] NPDES specifies no discharge during summer period. Therefore, no WLA is required during the summer.						

[2] Because Multnomah Channel is tidally influenced and includes water from both Willamette and Columbia Rivers, river flow rate is not applicable, and Equation 9-1 does not apply for Scappoose STP. 20.391 x 10^6 kcal/day is the WLA for this facility (i.e, only WLA Option 1 above is available for this facility).

[3] ATI Millersburg and Albany-Millersburg Water Reclamation Facility discharge to the same outfall, but each holds an individual NPDES permit and is assigned its own WLA.

9.1.4 Wasteload allocation equation

Equation 9-1 was used to calculate the thermal wasteload allocations in Table 9-2.

$$WLA = (\Delta T) \cdot (Q_E + Q_R) \cdot C_F$$ **Equation 9-11**

where,

$WLA =$ Wasteload allocation (kilocalories/day), expressed as a 7-day rolling average.

$\Delta T =$ The allocated portion of the human use allowance and the maximum temperature increase (°C) above the applicable temperature criterion using 100% of river flow not to be exceeded by each individual source from all outfalls combined. When the minimum duties provision at OAR 340-041-0028(12)(a) applies, ΔT = 0.0. **Equation 9-6** was used to determine if the minimum duties provision applies.

$Q_E =$ The daily mean effluent flow (cfs).
When effluent flow is in million gallons per day (MGD) convert to cfs:

$$\frac{1{,}000{,}000\ gallons}{1\ day} \cdot \frac{0.13368 ft^3}{1\ \text{gallon}} \cdot \frac{1\ day}{86{,}400\ sec} = 1.5472\ ft^3/sec$$

$Q_R =$ The daily mean river flow rate, upstream (cfs).
When flow is <= 7Q10, Q_R = 7Q10. When flow is > 7Q10, Q_R equals the daily mean river flow, upstream.

$C_F =$ Conversion factor using flow in cubic feet per second (cfs): 2,446,899

$$\left(\frac{1\ m}{3.2808\ ft}\right)^3 \cdot \frac{1000\ kg}{1\ m^3} \cdot \frac{86400\ sec}{1\ day} \cdot \frac{1\ kcal}{1\ kg\ \cdot 1℃} = 2{,}446{,}899$$

9.1.5 WLA attainment equation

When evaluating current discharge, DEQ used **Equation 9-2** to calculate the excess thermal loading (ETL). The ETL was compared against the wasteload allocation (WLA) to assess attainment.

$$ETL = (T_E - T_C) \cdot Q_E \cdot C_F$$ **Equation 9-22**

where,

$ETL =$ The ~~daily~~ excess thermal load (kilocalories/day), expressed as a 7-day rolling average.

$T_{C,i} =$ The point of discharge applicable river temperature criterion (°C) (T_c); or when the minimum duties provision at OAR 340-041-0028(12)(a) applies $T_{C,i}$ = the ~~7DADM~~ daily maximum temperature measured at the facility intake (T_i). **Equation 9-6** was used to determine if the minimum duties provision applies.

$T_E =$ The daily maximum effluent temperature (°C)

$Q_E =$ The daily mean effluent flow (cfs or MGD)

$C_F =$ Conversion factor for flow in cubic feet per second (cfs): 2,446,665

$$\left(\frac{1\ \text{m}}{3.2808\ \text{ft}}\right)^3 \cdot \frac{1000\ kg}{1\ m^3} \cdot \frac{86400\ sec}{1\ day} \cdot \frac{1\ kcal}{1\ kg\ \cdot 1℃} = 2{,}446{,}665$$

Conversion factor for flow in millions of gallons per day (MGD): 3,785,411

$$\frac{1\ m^3}{264.17\ gal} \cdot \frac{1000\ kg}{1\ m^3} \cdot \frac{1000000\ gal}{1\ million\ gal} \cdot \frac{1\ kcal}{1\ kg\ \cdot 1℃} = 3{,}785{,}441$$

9.1.6 Calculating current change in temperature

Equation 9-3 was used to assess the change in temperature based on point source effluent discharge, river flow, and the applicable temperature criteria.

$$\Delta T_{Current} = \left(\frac{Q_E}{Q_E + Q_R}\right) \cdot (T_E - T_C) \qquad \textbf{Equation 9-33}$$

where,

$\Delta T_{Current} =$ The current river temperature increase (°C) above the applicable river temperature criterion using 100% of river flow.

$Q_E =$ The daily mean effluent flow (cfs).
When effluent flow is in million gallons per day (MGD) convert to cfs:
$$\frac{1 \text{ million } gallons}{1\ day} \cdot \frac{1.5472\ ft^3}{1 \text{ million gallons}} = 1.5472$$

$Q_R =$ The daily mean river flow rate, upstream (cfs).
When river flow is <= 7Q10, Q_R = 7Q10. When river flow > 7Q10, Q_R is equal to the daily mean river flow, upstream.

$T_E =$ The daily maximum effluent temperature (°C)

$T_C =$ The point of discharge applicable river temperature criterion (°C). When the minimum duties provision at OAR 340-041-0028(12)(a) applies T_C = the 7DADM measured at the facility intake.

9.1.7 Calculating acceptable effluent temperatures

Equation 9-4 was used to calculate the daily maximum effluent temperatures (°C) acceptable under the allocated portion of the human use allowance (∆T) and the wasteload allocation (WLA).

$$T_{E\_WLA} = \frac{(Q_E + Q_R) \cdot (T_C + \Delta T) - (Q_R \cdot T_C)}{Q_E} \qquad \textbf{Equation 9-4a} \text{ (using } \Delta T)$$

$$T_{E\_WLA} = \frac{(WLA)}{Q_E \cdot C_F} + T_C \qquad \textbf{Equation 9-4b} \text{ (using WLA)}$$

where,

$T_{E\_WLA} =$ Daily maximum effluent temperature (°C) allowed under the wasteload allocation.
When T_{E_WLA} is > 32 deg-C, T_{E_WLA} = 32 deg-C as required by the thermal plume limitations in OAR 340-041-0053(2)(d)(B).

$WLA =$ Wasteload allocation (kilocalories/day) from **Equation 9-1**.

$\Delta T =$ The allocated portion of the human use allowance and the maximum temperature increase (°C) above the applicable river temperature criterion using 100% of river flow not to be exceeded by each individual source from all outfalls combined. When the minimum duties provision at OAR 340-041-0028(12)(a) applies, ΔT = 0.0.

$Q_E =$ The daily mean effluent flow (cfs).
When effluent flow is in million gallons per day (MGD) convert to cfs:
$$\frac{1 \text{ million } gallons}{1\ day} \cdot \frac{1.5472\ ft^3}{1 \text{ million gallons}} = 1.5472$$

$Q_R =$ The daily mean river flow rate, upstream (cfs).
When river flow is <= 7Q10, Q_R = 7Q10. When river flow > 7Q10, Q_R is equal to the daily mean river flow, upstream.

$T_{C,i}$ = The point of discharge applicable river temperature criterion (°C) (T_c); or when the minimum duties provision at OAR 340-041-0028(12)(a) applies $T_{C,i}$ = the 7DADM measured at the facility intake (T_i).

C_F = Conversion factor for flow in cubic feet per second (cfs): 2,446,665

$$\left(\frac{1\ m}{3.2808\ ft}\right)^3 \cdot \frac{1000\ kg}{1\ m^3} \cdot \frac{86400\ sec}{1\ day} \cdot \frac{1\ kcal}{1\ kg\ \cdot 1℃} = 2{,}446{,}665$$

9.1.8 Calculating acceptable effluent flows

Equation 9-5 was used to calculate the daily mean effluent flow (cfs) acceptable under the allocated portion of the human use allowance (ΔT) and the wasteload allocation (WLA).

$$Q_{E\_WLA} = \frac{(Q_R \cdot T_C) - ((T_C + \Delta T) * Q_R)}{T_C + \Delta T - T_E}$$ **Equation 9-5a** (using ΔT)

$$Q_{E\_WLA} = \frac{(WLA)}{(T_E - T_C) * C_F}$$ **Equation 9-5b** (using WLA)

where,

Q_{E_WLA} = Daily mean effluent flow (cfs) allowed under the wasteload allocation.

WLA = Wasteload allocation (kilocalories/day) from **Equation 9-1**.

ΔT = The allocated portion of the human use allowance and the maximum temperature increase (°C) above the applicable river temperature criterion using 100% of river flow not to be exceeded by each individual source from all outfalls combined. When the minimum duties provision at OAR 340-041-0028(12)(a) applies, ΔT = 0.0.

T_E = The daily maximum effluent temperature (°C).

Q_R = The daily mean river flow rate, upstream (cfs).
When river flow is <= 7Q10, Q_R = 7Q10. When river flow > 7Q10, Q_R is equal to the daily mean river flow, upstream.

$T_{C,i}$ = The point of discharge applicable river temperature criterion (°C) (T_c); or when the minimum duties provision at OAR 340-041-0028(12)(a) applies $T_{C,i}$ = the 7DADM measured at the facility intake (T_i).

C_F = Conversion factor for flow in cubic feet per second (cfs): 2,446,665

$$\left(\frac{1\ m}{3.2808\ ft}\right)^3 \cdot \frac{1000\ kg}{1\ m^3} \cdot \frac{86400\ sec}{1\ day} \cdot \frac{1\ kcal}{1\ kg\ \cdot 1℃} = 2{,}446{,}665$$

9.1.9 Determination of when minimum duties provision applies

The minimum duties provision at OAR 340-041-0028(12)(a) states that anthropogenic sources are only responsible for controlling the thermal effects of their own discharge or activity in accordance with its overall heat contribution.

For point sources, DEQ is implementing the minimum duties provision if a facility operation meets acceptable operation and design requirements. Generally, the facility must be operated as a “flow through” facility where intake water moves through the facility and is not processed as part of an industrial or wastewater treatment operation. If a facility mixes the intake water with other wastewater or as a method to cool equipment DEQ considers the thermal effects of this operation to be part of the facility’s own activity and the minimum duties provision does not apply. The intake water must also be returned to the same stream where the intake is located. If

the water is not returned to the same stream the facility is not considered to be flowing water through the facility.

When the minimum duties provision applies, the facility cannot add any additional thermal loading to the intake temperatures when the intake temperatures are warmer than the maximum effluent discharge temperatures allowed by the wasteload allocation. The purpose is to ensure the facility controls for thermal effects resulting from passing the water through and not from upstream sources.

In the Mainstem Willamette and major tributaries TMDL project area, DEQ determined that ODFW Clackamas Fish Hatchery, ODFW Dexter Ponds, ODFW South Santiam Hatchery, and ODFW Minto Fish Facility operate as a flow through facility. DEQ permit writers may determine other existing or newly permitted facilities not identified in this TMDL operate as a flow through facility. For such facilities, the assigned human use allowance will be zero during the period when minimum duties apply and measured as an increase above the daily maximum influent temperature as summarized in ***Equation 9-6***.

When assessing the wasteload allocation for attainment, DEQ used the approach described in ***Equation 9-6*** to implement the minimum duties provision.

The minimum duties provision applies on days when $T_{E\_WLA} < T_i$.

When the minimum duties provision at OAR 340-041-0028(12)(a) applies, $\Delta T = 0.0$. ***Equation 9-66***

where,

T_{E_WLA} = Daily maximum effluent temperature (°C) allowed under the wasteload allocation as calculated using **Equation 9-4**.

T_i = The daily maximum influent temperature (°C) measured at the facility intake.

For fish hatcheries, some or all of the effluent may be river water diverted through the hatchery. This pass-through water may warm as it flows through a facility. However, a review of data for Willamette Mainstem hatcheries indicates that only a small amount of excess thermal load is generally due to heating of pass-through water. Most of the excess thermal load of hatcheries is due to the river being warmer than the applicable criteria.

The potential increase in River T due to heating of pass-through water are show in FIG . Fish Hatchery Potential increase River T is calculated by dividing maximum differences between influent (river) and effluent temperature, based on upper 95th percentile differences in 7-day average daily maximum values, by the dilution ratio (River flow rate divided by Effluent flow rate). Of the four hatcheries presented, only Minto appears likely to heat pass-through water sufficient to contribute a significant percentage of the Excess Thermal Load contributed by the facility.

Table 9-3 Fish Hatchery heating of pass-through water relative to wasteload allocation ΔT

NPDES Permittee - WQ File Number - EPA Number – Outfall location	Assigned Human Use Allowance (ΔT) (°C)	Fish Hatchery 95th Percentile Teff-Tinf (°C)	Fish Hatchery Dilution Ratio	Fish Hatchery Potential increase in River T due to heating of pass-through water (°C)

ODFW - CLACKAMAS RIVER HATCHERY - 64442 - 102663 - Clackamas River RM 22.6	0.075	0.20	28.2	0.007
	0.28	0.37	14.9	0.025
	0.30	0.23	15.4	0.015
ODFW - Minto Fish Facility - 64495 - 101917 - North Santiam River RM 41.13	0.03	1.35	34.3	0.040
	0.03	1.63	22.6	0.072
	0.03	0.92	27.9	0.033
ODFW Dexter Ponds - 64450 - ? - Middle Fork Willamette River RM 15.7	0.04	NA	20.6	NA
	0.21	0.00	20.6	0.000
	0.27	0.11	26.7	0.004
ODFW South Santiam Hatchery - 64560 - GEN03: Ind. ; NPDES fish hatcheries - S. Santiam River RM 37.8	0.02	0.00	79.3	0.000
	0.02	0.00	23.0	0.000
	0.02	0.00	23.8	0.000