Snake River Temperature Total Maximum Daily Load

DRAFT
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State of Oregon
DEQ Department of Environmental Quality

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Acknowledgments

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Acronyms

7DADM	7-Day Average Daily Maximum
7Q10	7-Day, 10-Year Low Flow
ADWDF	Average Dry Weather Design Flow
AU	Assessment Unit
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
DEQ	Oregon Department of Environmental Quality
DMA	Designated Management Agency
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
EQC	Oregon Environmental Quality Commission
EWEB	Eugene Water and Electric Board
GNIS	USGS Geographic Names Information System
HUA	Human Use Allowance
HUC	Hydrologic Unit Code
IMD	Internal Management Directive
LA	Load Allocation
LC	Loading Capacity
MGD	Millions of Gallons per Day
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
OAR	Oregon Administrative Rules
ODC	Oregon Department of Corrections
ODFW	Oregon Department of Fish & Wildlife
ORS	Oregon Revised Statutes
POMI	Point of Maximum Impact
SIC	Standard Industrial Classification
STP	Sewage Treatment Plant
TMDL	Total Maximum Daily Load
TSD	Technical Support Document
USGS	United States Geological Survey
WLA	Wasteload Allocation
WQMP	Water Quality Management Plan
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

1 Introduction

This Total Maximum Daily Load (TMDL) project addresses temperature impairments on the Snake River, Brownlee Reservoir, Oxbow Reservoir, and Hells Canyon Reservoir within Oregon.

OAR 340-42-0040(3) requires the Oregon Department of Environmental Quality (DEQ) or the Oregon Environmental Quality Commission (EQC) to prioritize and schedule TMDLs for completion considering various factors outlined in the rule. The Snake River Temperature TMDL were identified as a medium priority on Oregon's TMDL priority ranking submitted with Oregon's 2022 Integrated Report and due to court order to Oregon and the Environmental Protection Agency (EPA) to establish TMDLs to replace the temperature TMDLs developed as part of the 2003 Snake River – Hells Canyon TMDLs (Table 1-1).

1.1 Previous TMDLs

In 2003 and again in 2004 Oregon DEQ and Idaho DEQ issued joint TMDL actions addressing a number of Snake River impairments, including temperature (Table 1-1). EPA approved these TMDL actions in March of 2003 and September 2004 respectively. Once approved by EPA, the updated Snake River Temperature TMDL will replace Oregon's temperature TMDLs listed in Table 1-1. TMDLs for other water quality impaired parameters are still effective.

Table 1-1: Summary of previous TMDLs developed for the Snake River and Hells Canyon Complex.

TMDL Action ID	TMDL Name	EPA Approval Date	Water Quality Impairments Addressed
10007	Snake River - Hells Canyon TMDL	3/1/2003	DDD 4,4', DDE 4,4', DDT 4,4', Dieldrin, Temperature, Total Dissolved Gas
10791	Snake River - Hells Canyon TMDL Revised	9/9/2004	Chlorophyll-a, Dissolved Oxygen, Algae, Sedimentation

2 TMDL name and location

Per OAR 340-042-0040(4)(a), this element describes the geographic area for which the TMDL was developed.

The Snake River Temperature TMDL apples to the entirety of the Snake River, Brownlee Reservoir, Oxbow Reservoir, and Hells Canyon Reservoir within Oregon (Figure 2-1) from approximately river mile 176 at the tri-state border of Oregon, Washington, and Idaho upstream to approximately river mile 409 at the Oregon and Idaho border. This extent sums to a total of 12 assessment units (AUs), all of which are Category 5 listed as impaired for temperature on Oregon's 2022 Section 303(d) list (Table 2-1).

MAP HERE

Figure 2-1: Snake River Temperature TMDL project area overview.

2.1 Impaired waters

Table 2-1 presents AUs that were listed as impaired for temperature on DEQ's 2022 Clean Water Act Section 303(d) List (as part of Oregon's Integrated Report), which was approved by the EPA on September 1, 2022. AUs listed in Category 5 (i.e., designated use is not supported, or a water quality standard is not attained) require development of a TMDL. Locations of these listed segments are depicted in Figure 2-2**.**

Some of the assessment units downstream of Hells Canyon Dam have both year-round and spawning use designations impaired. If both use designations are impaired, it is counted as two Category 5 303(d) listings. Therefore, the TMDL addresses a total of 15 Category 5 temperature listings identified on the 2022 Integrated Report. This TMDL also addresses any future 303(d) listing for the spawning use period on the Snake River assessment unit OR_SR_1706010301_02_103306 (Salmon River to Stateline). Currently this AU is impaired for temperature for the year-round use designation. It is unassessed for temperature for the spawning use period. Model results indicate there are exceedances to the spawning criteria and would likely be 303(d) listed.

Table 2-1: Snake River and Hells Canyon Complex category 5 temperature impairments on the 2022 Integrated Report.

AU ID	AU Name	AU Description	Use Period
OR_SR_1705010311_02_102702	Snake River	Idaho to Boise River	Year round
OR_SR_1705011501_02_103231	Snake River	Boise River to Malheur River	Year round
OR_SR_1705011502_02_103230	Snake River	Malheur River to Mann Creek	Year round
OR_SR_1705020101_02_103229	Snake River	Mann Creek to Hog Creek	Year round
OR_LK_1705020103_05_100578	Brownlee Reservoir	Lake/Reservoir Unit	Year round
OR_LK_1705020311_05_100605	Brownlee Reservoir	Lake/Reservoir Unit - Powder River Arm	Year round
OR_LK_1705020107_05_100583	Oxbow Reservoir	Lake/Reservoir Unit	Year round
OR_LK_1705020107_05_100582	Hells Canyon Reservoir	Lake/Reservoir Unit	Year round
OR_SR_1706010101_02_103274	Snake River	Hells Canyon Reservoir to Sheep Creek	Spawning
OR_SR_1706010101_02_103274	Snake River	Hells Canyon Reservoir to Sheep Creek	Year round
OR_SR_1706010102_02_103280	Snake River	Sheep Creek to Getta Creek	Spawning
OR_SR_1706010102_02_103280	Snake River	Sheep Creek to Getta Creek	Year round
OR_SR_1706010103_02_103282	Snake River	Getta Creek to Salmon River	Spawning
OR_SR_1706010103_02_103282	Snake River	Getta Creek to Salmon River	Year round
OR_SR_1706010301_02_103306	Snake River	Salmon River to Stateline	Year round

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Figure 2-2: Snake River and Hells Canyon Complex Category 5 temperature impairments on the 2022 Integrated Report.

3 Pollutant identification

OAR 340-042-0040(4)(b) requires identification of the pollutants causing impairment of water quality that are addressed by these TMDLs. The associated water quality standards and beneficial uses are identified in Section 4.

Temperature is the water quality parameter of concern, but heat or thermal loading is the pollutant of concern causing impairment. Heat caused by human activities are of particular concern.

EPA regulations (40 CFR 130.2(i)) and OAR 340-042-0040(O)(5)(b) allow for TMDLs to utilize other appropriate measures (or surrogate measures). Surrogate measures are defined in OAR 340-042-0030(14) as “substitute methods or parameters used in a TMDL to represent pollutants.” In accordance with OAR 340-042-0040(5)(b), DEQ used a temperature target for thermal loading caused by dam and reservoir operations. Monitoring stream temperature, rather than a thermal load, is easier and a more meaningful approach for reservoir management. Temperature is mathematically related to excess thermal loading and used directly to evaluate attainment of temperature water quality standards. For these reasons, DEQ is using a surrogate measure to implement the load allocation for dam and reservoir operations.

4 Water quality standards and beneficial uses

OAR 340-042-0040(4)(c), requires TMDLs identify the beneficial uses in the basin, specifying the most sensitive beneficial use, and the relevant water quality standards established in OAR 340-041-0202 through 340-041-0975.

Table 4-1 specifies the beneficial uses designated in the Snake River. Fish and aquatic life use is the most temperature sensitive beneficial use. Oregon’s water quality standards for temperature are designed to protect fish and aquatic life uses.

Table 4-1: Designated beneficial uses in the Snake River as identified in OAR 340-041-021 Table 121A. An “X” indicates the use is applicable.

Beneficial Uses	Snake River RM 176 to 409	Most Sensitive to Temperature
Public Domestic Water Supply	X	
Private Domestic Water Supply	X	
Industrial Water Supply	X	
Irrigation	X	
Livestock Watering	X	
Fish & Aquatic Life	X	X
Wildlife & Hunting	X	
Fishing	X	
Boating	X	
Water Contact Recreation	X	

Beneficial Uses	Snake River RM 176 to 409	Most Sensitive to Temperature
Aesthetic Quality	X	
Hydro Power	X	
Commercial Navigation & Transportation	X	

The Snake River and Hells Canyon Complex of reservoirs serve as the shared border between Oregon and Idaho from river miles 176 to 409.The Snake River flows into the states of Washington and Idaho downstream of Oregon at river mile 176. Table 4-3 and the sections that follow summarize each state's applicable temperature criteria on the Snake River and reservoirs along the shared border with Oregon. The most stringent temperature criteria, which formed the basis for the TMDL allocations, is Oregon's criteria. When Oregon's criteria are attained, it is expected to result in attainment of Idaho and Washington's criteria. The evaluation of each state's criteria is discussed in Section 4 of the TSD. The final instream numeric temperature targets are summarized in Section 4.4.

Table 4-2: Summary of Oregon, Idaho, and Washington temperature criteria.

Location	Oregon Criteria	Idaho Criteria	Washington Criteria
Snake River Oregon-Idaho Stateline to Hells Canyon Dam,	Redband or Lahontan Cutthroat Trout Use 7DADM 20.0 + 0.3 HUA	Cold water aquatic life DM 22.0°C DA 19.0°C	NA
Brownlee Reservoir (Powder River Arm)	Redband or Lahontan Cutthroat Trout Use 7DADM 20.0 + 0.3 HUA	NA	NA
Snake River Hells Canyon Dam to Salmon River	Salmon and steelhead migration corridor 7DADM 20.0 + 0.3 HUA Coldwater refugia narrative Natural seasonal thermal pattern narrative Salmon and steelhead spawning Oct 23 – Apr 15 7DADM 13.0 + 0.3 HUA	Cold water aquatic life DM 22.0°C DA 19.0°C Salmonid spawning Oct [23]* 29 – Nov 6 7DADM 14.5°C Nov 7 – Apr 15 7DADM 13.0°C	NA
Snake River Salmon River to the Tri-State border	Salmon and steelhead migration corridor 7DADM 20.0 + 0.3 HUA Coldwater refugia narrative Natural seasonal thermal pattern narrative Salmon and steelhead spawning Oct 23 – Apr 15 7DADM 13.0 + 0.3 HUA	Cold water aquatic life DM 22.0°C DA 19.0°C	NA
Snake River Tri-State border to Clearwater River	NA	Cold water aquatic life DM 22.0°C DA 19.0°C	DM 20.0°C + 0.3°C due to any single source or + 1.1 °C all source activities combined

4.1 Oregon temperature criteria

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Figure 4-1: Oregon aquatic life fish use designations in the Snake River.

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Figure 4-2: Oregon aquatic life salmon and steelhead spawning use designations in the Snake River.

4.1.1 Salmon and steelhead migration corridor use

The Snake River from the tri-state border to Hells Canyon Dam (approximately river mile 169 to 247.5) is designated for salmon and steelhead migration corridor use and cool water refugia.

OAR 340-041-0028(4)(d). Waters that have been designated as having a migration corridor use are identified in OAR 340-041-0121 Table 121B and shown in Figure 4-1. These waters may not exceed 20.0°C (68.0°F) expressed as a 7DADM. Waters designated for salmon and steelhead migration corridor use also have two narrative temperature criteria provisions that apply. The provisions include protection of cold water refugia (Section 4.1.1.1) and the natural seasonal thermal pattern (Section 4.1.1.2).

4.1.1.1 Cold water refugia narrative

Waters designated for salmon and steelhead migration corridor (see section 4.1.1) must have cold water 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. The narrative provision supplements the numeric criterion of 20°C to protect migrating populations of salmon and steelhead.

The narrative criteria directs that sufficient cold-water refuge be available within the warmer waters of migration corridors. As the temperature of corridors approach 20°C, the role of cold ware refugia is expected to enable fish to migrate to upstream and downstream destinations beyond the Snake River without impairment. Fish may move into cold water refugia if the temperature of the mainstem Snake River corridor becomes too warm.

Cold water refugia is defined in OAR 340-041-0002(10) to mean those portions of a water body where or times during the diel temperature cycle when the water temperature is at least 2°C colder than the daily maximum temperature of the adjacent well-mixed flow of the water body.

The cold water refugia narrative is applicable to the Snake River from approximately river mile 176 at the tri-state border of Oregon, Washington, and Idaho upstream to approximately river mile 247.5 at Hells Canyon Dam.

There are several types of cold water refuges. The different types are discussed in TSD Section 4.1. DEQ evaluated the potential for tributaries of the Snake River to serve as cool water refugia as well as diurnal cool water refugia, which is when cooler waters are available at night in the mainstem Snake River due to the daily diel temperature patterns.

A tributary was determined to be a cold water refuge if the daily maximum temperature of the tributary inflow is at least 2°C cooler than the daily maximum of the Snake River when the Snake River daily maximum temperature is 20°C or warmer. The 25th through 75th percentile of the temperature differences was used as thresholds to indicate frequency of refuge availability. This means that if a tributary is 2°C cooler than the mainstem Snake at the 25th percentile, cold water refugia is available 75% of the days when the Snake River is 20°C or warmer. Tributaries that never exceed 18°C are noted with an asterisk (*).

Applying the evaluation approach to tributaries with available temperature data, the following Snake River tributaries provide cold water refugia at their mouths at the 25th percentile (75% of the days)

- *Brush Creek (RM 244. Idaho)
- Battle Creek (RM 242, Oregon)
- *Granite Creek (RM 239, Idaho)
- *Three Creeks (RM 238, Idaho)
- Saddle Creek (RM 236, Oregon)
- *Hat Creek (RM 235, Oregon)
- *Bernard Creek (RM 235, Idaho)
- Sluice Creek (RM 231, Oregon)
- Rush Creek (RM 231, Oregon)
- *Sheep Creek (RM 229, Idaho)

The following tributaries have at least 2°C cooler temperatures at their mouths at the 50th percentile (or about half the days).

- Salt Creek (RM 220, Oregon)
- Big Canyon Creek (RM 210, Idaho)
- Knight Creek (RM 190, Oregon)

The following tributaries have at least 2°C cooler temperatures at their mouths at the 75th percentile (or about 25% the days).

- Temperance Creek (RM 223, Oregon)
- Somers Creek (RM 210, Oregon)
- Getta Creek (RM 205, Idaho)
- Wolf Creek (RM 203, Idaho)
- Divide Creek (193, Idaho)
- Imnaha River (RM 191, Oregon)
- Salmon River (RM 188, Idaho)

The ten tributaries in the 75th percentile group not only provided the highest frequency of cold water refugia, the majority of them (six out of ten) were always cold with temperatures never exceeding 18°C with the remaining four exceeding 18°C less than 10% of the days. The largest tributaries by flow, which may provide a larger cold water plume and greater capacity for fish use, are the Salmon and Imnaha Rivers. These rivers have at least 2°C cooler temperatures at the 75th percentile (or about 25% of the days).

The approach used to evaluate Snake River diurnal cool water refugia is similar to the tributary analysis. The Snake River daily maximum and daily minimums were compared for each day when the Snake River daily maximum temperature is 20°C or warmer. The model calibration temperatures were used for this analysis as it provides a complete temporal and spatial characterization of temperatures in the Snake River downstream of Hells Canyon Dam. The differences between Snake River daily maximums and daily minimums is less than 2°C except for a few rare outlier days in the reaches between river miles 220 and 230 with differences at 2.1°C . The maximum differences occurred between river miles 210 and 230 with the 25th percentile differences at about 1.0 °C, the 50th percentile at 1.2 °C, and the 75th percentile at 1.4 °C. Based on these results night time temperatures in the Snake River are not a diurnal cool water refuge.

Additional information on the evaluation of cold water refuges is discussed in Section4.1 of the TSD.

4.1.1.2 Natural seasonal thermal pattern narrative

The seasonal thermal pattern in waters designated as a salmon and steelhead migration corridor (see section 4.1.1) must reflect the natural seasonal thermal pattern. This narrative is applicable to the Snake River from approximately river mile 176 at the tri-state border of Oregon, Washington, and Idaho upstream to approximately river mile 247.5 at Hells Canyon Dam. The focus of this narrative is on the seasonal shift of the temperature profile rather the magnitude of temperatures. It is attained when the seasonal temperature profile is similar to the natural profile. Key traits are that the summer maximum occurs at the same time it would naturally without modification. The timing of the spring warming and fall cooling gradients are also similar.

A significant temperature shift may impact the fish uses even if the 20°C summer maximum criterion is not exceeded. Oregon Department of Fish and Wildlife advises that In the fall, a modification to a thermal pattern causes warmer water temperatures to remain longer in the fall, which can adversely affect the survival of fish until spawning and the viability of eggs after spawning. Fall cooling is important to protect the migration of adult salmon upstream and spawning. Many northwest rivers cool quite rapidly in the fall. In the spring, impoundments delay warm water from passing downstream in a manner that slows the growth of newly emerged fry, which can adversely affect survival during rearing and outmigration.

The dam and reservoir surrogate measure temperature target described in Section 9.3.1 is the numeric temperature target implementing the natural seasonal thermal pattern narrative. Attainment of the surrogate measure temperature target ensures attainment of the natural seasonal thermal pattern downstream of Hells Canyon Dam.

4.1.2 Redband or Lahontan Cutthroat Trout

The Snake River from Hells Canyon Dam to the Oregon/Idaho Stateline (approximately river mile 247.5 to 409) is designated for Lahontan cutthroat trout or redband trout use. Waters that have been designated as having Lahontan cutthroat trout or redband trout use are identified in rule at OAR 340-041-0121 Table 121B and shown in Figure 4-1.

OAR 340-041-0028(4)(e) The seven-day-average maximum temperature of a stream identified as having Lahontan cutthroat trout or redband trout use may not exceed 20.0 degrees Celsius (68.0 degrees Fahrenheit).

4.1.3 Salmon and steelhead spawning use

The Snake River from the Oregon/Washington/Idaho border to Hells Canyon Dam (River Mile 169 to 247.5) is designated for salmon and steelhead spawning use from October 23 – April 15.

OAR 340-041-0028(4)(a). Waters that have been designated as having salmon and steelhead spawning use are identified in rule at OAR 340-041-0121 Table 121B and shown in Figure 4-2. During the spawning period, these waters may not exceed 13.0°C (55.4°F) expressed as a 7DADM.

4.1.4 Human use allowance

Oregon water quality standards have provisions for human use (OAR 340-041-0028(12)(b)). The human use allowance (HUA) is an insignificant addition of heat (0.3°C) authorized in waters that exceed the applicable temperature criteria. Following a temperature TMDL, or other cumulative effects analysis, wasteload and load allocations will restrict all NPDES point sources and nonpoint sources to a cumulative increase of no greater than 0.3°C (0.5°F) above the applicable biological criterion after complete mixing in the waterbody, and at the point of maximum impact (POMI). The rationale behind selection of 0.3°C for the HUA and how DEQ implements this portion of the standard can be found in DEQ (2003) and the Temperature IMD (DEQ, 2008a).

4.1.5 Protecting cold water

The “protecting cold water” criterion in OAR 340-041-0028(11) applies to waters of the state that have summer ambient 7DADM temperatures that are colder than the biologically based criteria. With some exceptions (summarized in Figure 4-1), these waters may not be warmed cumulatively by anthropogenic point and nonpoint sources by more than 0.3°C (0.5°F) above the colder water ambient temperature. This applies to all anthropogenic sources taken together at the point of maximum impact where salmon, steelhead or bull trout are present. A summary of how DEQ implements this portion of the standard can be found in the PCW IMD (DEQ, 2011) and the Temperature IMD (DEQ, 2008a). DEQ found that the protecting colder water criteria does not apply to the Snake River and Hells Canyon Complex reservoirs as the 7DADM temperatures regular exceed the applicable biologically based criteria. However, when temperatures consistently attain the year round and spawning criteria in the future, the protecting cold water criteria will apply.

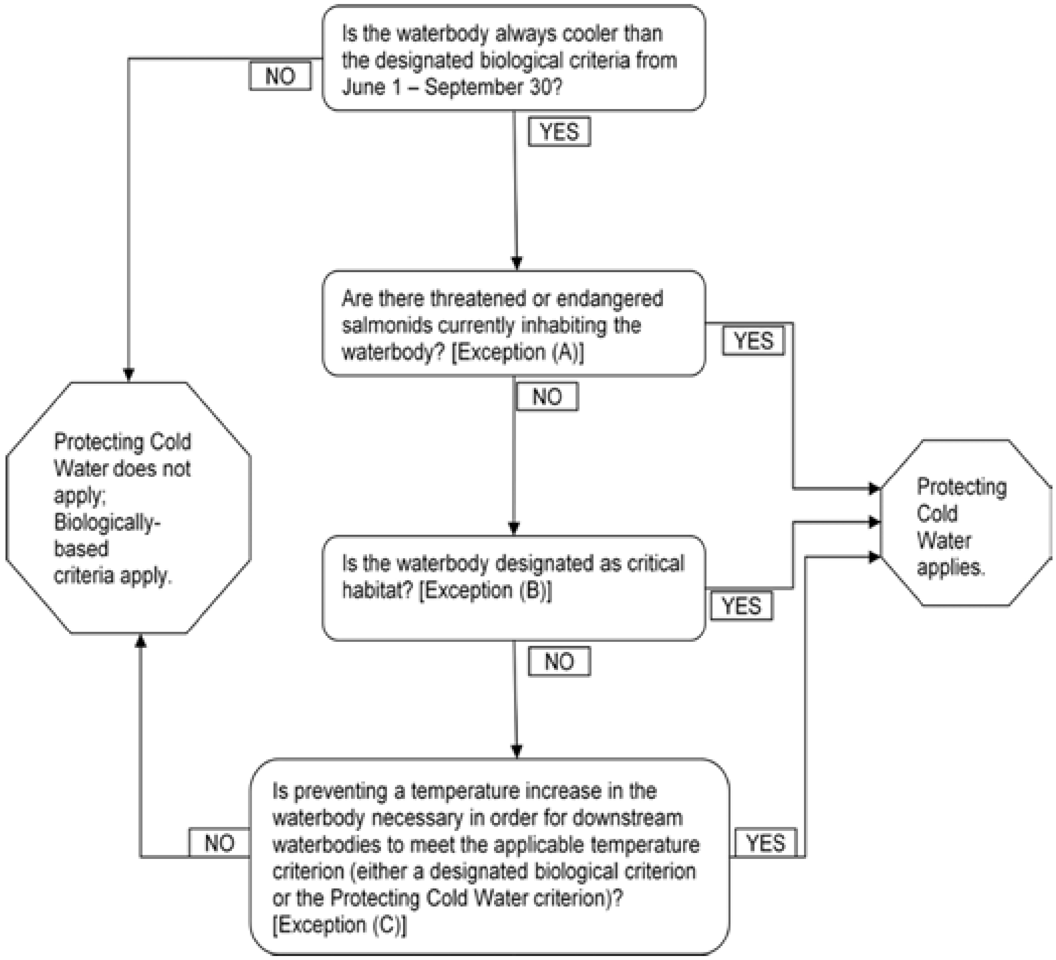

Figure 4-3: Flowchart to determine applicability of the PCW criterion. Extracted from DEQ, 2011.

4.1.6 Minimum duties

The minimum duties provision at OAR 340-041-0028(12)(a) states 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 their 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.

The TMDL allocations implement this provision by assigning allocations for anthropogenic sources separate from background sources, which includes the warming contributed from natural background conditions. Anthropogenic sources assigned a wasteload allocation or nonpoint source load allocation are only responsible for attaining their respective allocations and controlling for the warming they contribute.

For dam and reservoir operations, DEQ developed a surrogate measure temperature target (Section 9.3.1) that implements the TMDL load allocation and the minimum duties provision. On days when incoming temperatures upstream of the reservoirs cause exceedances to applicable criteria plus the assigned human use allowance in the reservoirs or downstream, the dam and reservoir operations must not contribute any additional heat to the waterbody above those incoming temperatures. This ensures dam operators are only responsible for temperature increases caused by the dam and reservoir operations.

For point sources, DEQ implements the minimum duties provision if a facility operation meets certain operation and design requirements. 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 is not applicable. 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 thermal effects are not from the receiving stream and therefore attributed to the facility’s own discharge.

For facilities that operate as a flow through facility, the minimum duties provision applies when the intake temperatures are warmer than the maximum effluent discharge temperatures allowed by the assigned wasteload allocation. On days when this occurs, the facility cannot add any additional thermal loading above what is contributed by the intake temperatures (i.e. no increase in temperature, HUA = 0.0^{o}C above the intake temperature) The purpose is to ensure the facility controls for thermal effects resulting from passing the water through and not from upstream sources. DEQ found the minimum duties provision does not apply to any of the existing NPDES permitted facilities discharging to the Snake River or Hells Canyon Complex reservoirs.

4.1.7 Statewide narrative criteria

The Oregon statewide narrative criteria at OAR 340-041-0007(1) apply to all waters of the state. The highest and best practicable treatment and/or control of wastes, activities, and flows must in every case be provided so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor and other deleterious factors at the lowest possible levels.

4.1.8 Antidegradation policy

The purpose of Oregon’s Antidegradation Policy (OAR 340-041-0004) is to guide decisions that impact water quality and prevent further unnecessary degradation from new or increased pollution. Likewise, the policy’s goal is to protect, maintain, and enhance water quality to fully protect all existing beneficial uses. The Antidegradation Policy identifies some circumstances when an antidegradation review is not warranted. An insignificant increase in temperature, authorized by the human use allowance provisions (OAR 340-041-0028(12)), is deemed not a reduction in water quality and therefore an antidegradation review is not required. Additionally, riparian restoration activities (OAR 340-041-0004(5)(a)) that result in a net ecological benefit are not subject to antidegradation review. This TMDL will not degrade water quality. It will improve water quality as it is designed to achieve compliance with existing temperature criteria in order to ensure that beneficial uses of the Snake River are fully supported.

4.2 Idaho temperature criteria

4.2.1 Cold water aquatic life

IDAPA 58.01.02.250.02.b. Idaho has designated the entire extent of the Snake River and Hells Canyon Complex (river mile 176 to 409) for cold water aquatic life use. Waters designated for cold water aquatic life are not to vary from the following due to human activities:

Water temperatures of 22°C or less with a maximum daily average of no greater than 19°C.

4.2.2 Salmonid spawning site specific criteria

IDAPA 58.01.02.286. Weekly maximum temperatures (WMT) are regulated to protect fall chinook spawning and incubation in the Snake River from Hell's Canyon Dam to the confluence with the Salmon River from October 23 through April 15. Because the WMT is a lagged seven (7) day average, the first WMT is not applicable until the seventh day of this time period, or October 29. A WMT is calculated for each day after October 29 based upon the daily maximum temperature for that day and the prior six (6) days. From October 29 through November 6, the WMT must not exceed 14.5°C. From November 7 through April 15, the WMT must not exceed 13°C.

IDAPA 58.01.02.0.10.59 defines the WMT as the mean of daily maximum temperatures measured over a consecutive seven (7) day period ending on the day of calculation. When used seasonally, e.g., spawning periods, the first applicable WM temperature occurs on the seventh day into the time period. The MWMT is the single highest WMT that occurs during a given year or other period of interest, e.g., a spawning period. Idaho's WMT is the same summary statistic as Oregon's 7DADM.

4.2.3 Natural background conditions

IDAPA 58.01.02.200.09. When natural background conditions exceed any applicable water quality criteria set forth in [IDAPA 58.01.02] Sections 210, 250, 251, 252, or 253, the applicable water quality criteria shall not apply; instead, there shall be no lowering of water quality from natural background conditions. Provided, however, that temperature may be increased above natural background conditions when allowed under Section 401.

4.2.4 Point source wastewater treatment requirements

IDAPA 58.01.02.401.01.c. If temperature criteria for the designated aquatic life use are exceeded in the receiving waters upstream of the discharge due to natural background conditions, then wastewater must not raise the receiving water temperatures by more than 0.3°C.

4.3 Washington temperature criteria

WAC 173-201A-602 Table 602: WRIA 35, Note 2b. Temperature on the Snake River above Clearwater River shall not exceed a 1-day maximum of 20.0°C due to human activities. When natural conditions exceed a 1-day maximum of 20.0°C, no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed 0.3°C due to any single source or 1.1°C due to all such activities combined.

4.4 Numeric water quality targets

TMDLs must contain numeric water quality targets. The targets summarized in Table 4-3 represent the instream endpoint that ensures all applicable temperature water quality standards are attained and beneficial uses are protected, including relevant temperature criteria for the States of Idaho and Washington. The most stringent temperature criteria, which formed the basis for the targets and TMDL allocations, is Oregon's temperature criteria. The evaluation of each state's criteria is discussed in Section 4 of the TSD.

Temperature targets summarized in Table 4-2 include Oregon's temperature criteria and application of the water quality standard implementation provisions, relevant narrative provisions, and the antidegradation policy.

Table 4-3: Summary of applicable numeric temperature targets in the Snake River and Hells Canyon Complex.

Applicable Criteria	Applicable Waters	Temperature Target (°C)	Period When Criteria Applies
Salmon and steelhead spawning	Snake River RM 247.5 to169 Hells Canyon Dam to OR/WA/ID border	13.0 + 0.3 HUA 7DADM	Oct 23 – Apr 15
Salmon and steelhead migration corridor	Snake River RM 247.5 to169 Hells Canyon Dam to OR/WA/ID border	20.0 + 0.3 HUA 7DADM	Year Round
Redband or Lahontan Cutthroat Trout	Snake River RM 409 to 247.5 OR/ID border to Hells Canyon Dam	20.0 + 0.3 HUA 7DADM	Year Round
Coldwater refugia narrative OAR 340-041-0028(4)(d)	Snake River RM 247.5 to169 Hells Canyon Dam to OR/WA/ID border	2 degrees Celsius colder than the daily maximum temperature of the adjacent well-mixed water body	Year Round
Natural seasonal thermal pattern narrative	Snake River RM 247.5 to169 Hells Canyon Dam to OR/WA/ID border	HCC Surrogate Measure Temperature Target	Year Round

5 Seasonal variation and critical period for temperature

Per OAR 340-042-0040(4)(j) and 40 Code of Federal Regulation 130.7(c)(1), TMDLs must identify any seasonal variation and the critical condition or period of each pollutant, if applicable.

Stream temperatures have an annual pattern with the warmest 7DADM stream temperatures occurring in July or August and the coldest occurring in late December and January. July and

August are months when stream flows typically are low, solar radiation fluxes are high, and ambient air temperature conditions are warmest. Conversely, the coldest seasonal temperatures occur in late December and January.

The critical period is based on the frequency and period when 7DADM stream temperatures exceed the applicable temperature criteria. In setting this period, DEQ relied upon monitoring sites with the longest period of exceedance and frequency of exceedance.

The Snake River critical periods are presented in Table 5-1. Allocations presented in the TMDL apply during these critical periods. Section 5 of the TSD summarizes the critical period approach and presents plots of 7DADM temperature data used to determine seasonal variation and the critical periods.

Table 5-1: Critical periods for the Snake River and Hells Canyon Complex.

Location	AU IDs	Critical Period
Snake River from ID/OR Stateline to Brownlee Reservoir (approximately RM 409 - 340)	OR_SR_1705010311_02_102702 OR_SR_1705011501_02_103231 OR_SR_1705011502_02_103230 OR_SR_1705020101_02_103229	May 1 - October 31
Brownlee Reservoir, Oxbow Reservoir, Hells Canyon Reservoir and Snake River from Hells Canyon Dam to the tri-state border (approximately RM 340 - 176)	OR_LK_1705020103_05_100578 OR_LK_1705020311_05_100605 OR_LK_1705020107_05_100583 OR_LK_1705020107_05_100582 OR_SR_1706010101_02_103274 OR_SR_1706010102_02_103280 OR_SR_1706010103_02_103282 OR_SR_1706010301_02_103306	May 15 – November 15

6 Temperature water quality data evaluation overview

6.1 Model overview

7 Pollutant sources or source categories

This element identifies the pollutant sources and estimates, to the extent existing data allow, the amount of actual pollutant loading from these sources (OAR 340-042-0040(4)(f)). The rule requires that a TMDL will establish wasteload allocations and load allocations for these sources.

OAR 340-042-0030(12) defines a source as is any process, practice, activity or resulting condition that causes or may cause pollution or the introduction of pollutants to a waterbody.

This section identifies the pollutant sources and estimates, to the extent existing data allow, the amount of pollutant loading from existing sources.

Both point and nonpoint sources are sources of thermal pollution to the Snake River and Hells Canyon complex of reservoirs. Within the nonpoint source category, both background and anthropogenic nonpoint sources contribute to thermal pollution. Each source's thermal loading varies in frequency and magnitude based on the flow rate and temperature of discharge, prevalence of the activities, size of the land area on which the activities occur, locations of activities in relation to surface water, and transport mechanisms.

7.1 Point sources

OAR 340-045-0010(17) and ORS 468B.005(4) defines a point source as "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged."

Individual NPDES permittees in Table 7-1 were identified as sources of thermal loading. These sources discharge or have potential to discharge thermal loads that increase 7DADM stream temperatures above the applicable criteria. Only Oregon permittees were assigned thermal waste load allocations in this TMDL. Individual NPDES permittees located in Idaho were assigned wasteload allocation in the 2004 TMDL (ODEQ and IDEQ, 2004). The thermal loading from the individual facilities evaluated have a relatively small temperature increase. The 95th percentile 7DADM cumulative temperature increases above the applicable criteria based on current discharges is 0.08^{o}C.

Table 7-1: Individual NPDES permittees discharging to the Snake River.

NPDES Permittee WQ File Number: EPA Number	Oregon WQ File Number	EPA Number	Applicable Temperature Criteria (°C)	Receiving Stream (Oregon AU ID)
Idaho Power – Hells Canyon Power Plant	41297	OR0027278	20.0 13.0	Snake River RM 247 (OR_SR_1706010101_02_103274)
Idaho Power - Oxbow Power Plant	41299	OR0027286	20.0	Hells Canyon Reservoir RM 272.5 (OR_LK_1705020107_05_100582)
Idaho Power - Brownlee Power Plant	-	ID0020907	20.0	Oxbow Reservoir RM 284 (OR_LK_1705020107_05_100583)
Ontario STP	63631	OR0020621	20.0	Snake River RM 369 (OR_SR_1705011501_02_103231)
Simplot - Ontario	63810	OR0002402	20.0	Snake River RM 370 (OR_SR_1705011501_02_103231)
Weiser WWTP	-	ID0020290	20.0	Snake River RM 351 (OR_SR_1705011502_02_103230)

NPDES permitted point source discharges covered by ODOT's Phase I individual MS4 stormwater permit and registrants under the general stormwater permits (MS4 phase II, 1200-A, 1200-C, and 1200-Z) and other Oregon general NPDES permits with discharges to the Snake

River (200-J, CAFO NPDES) do not contribute to exceedances of applicable temperature criteria and impact beneficial uses based on DEQ evaluation of the permit requirements, available dilution, or frequency and magnitude of discharges.

7.2 Nonpoint sources

OAR 340-041-0002(42) defines nonpoint sources as “diffuse or unconfined sources of pollution where wastes can either enter, or be conveyed by the movement of water, into waters of the state.” ORS 468B.005(3) defines a nonpoint sources as any source of pollution other than a point source.

Nonpoint source categories or activities identified as sources of thermal loading and increase 7DADM stream temperatures above the applicable criteria include:

- Dam and reservoir operation;
- Elevated temperatures from inflowing tributaries to the Snake River.
- Increases in solar radiation loading from the disturbance or removal of near-stream vegetation.
- Background sources, including natural sources and anthropogenic sources defined as backgrounds sources (See Section 7.3)

Table 7-2:Summary of nonpoint source 95th percentile cumulative 7DADM temperatures increases above the applicable criteria.

Nonpoint Source Category	95th percentile 7DADM cumulative warming (°C)	Spawning Use Period RM 176 - 247 95th percentile 7DADM cumulative warming (°C)
Dam and reservoir operations	4.6	6.36
Oregon tributaries	0.37	0.01
Disturbance or removal of near-stream vegetation	0.15	0.04

7.3 Background sources

OAR 340-042-0030(1) states background sources include all sources of pollution or pollutants not originating from human activities. Background sources may also include anthropogenic sources of a pollutant that DEQ or another Oregon state agency does not have the authority to regulate, such as pollutants emanating from another state, tribal lands, or sources otherwise beyond the jurisdiction of the state.

Natural background thermal loading is influenced by a number of landscape and meteorological characteristics, such as substrate and channel morphology conditions; streambank and channel elevations; near-stream vegetation; groundwater; hyporheic flow; tributary inflows; precipitation; cloudiness; air temperature; relative humidity; and others natural factors. Some of these factors, may be influenced by anthropogenic impacts. As such, it was not possible to develop a model in which all human influences were controlled or accounted for. The difference between natural background sources and anthropogenic background sources were quantified using the best available information.

Table 7-3:Summary of background nonpoint source 95th percentile cumulative 7DADM temperatures increases above the applicable criteria.

Background Nonpoint Source Category	95th percentile 7DADM cumulative warming (°C)	Spawning Use Period RM 176 - 247 95th percentile 7DADM cumulative warming (°C)
Idaho tributaries and Snake River at upstream boundary	6.9	0.09
All background sources (natural and anthropogenic)	7.77	1.61

8 Loading capacity and excess loads

OAR 340-042-0040(4)(d) defines the loading capacity as the amount of a pollutant or pollutants that a waterbody can receive and still meet water quality standards. The excess load is the difference between the actual pollutant load in a waterbody and the loading capacity of that waterbody. In accordance with OAR 340-042-0040(4)(e), Oregon TMDLs must include the excess load to the extent existing data allow.

The loading capacity represents the thermal load equivalent to the applicable river temperature criteria plus the 0.30°C human use allowance. The excess load represents the thermal load equivalent of the difference between the maximum 7DADM ambient river temperature and the applicable temperature criteria plus 0.3°C human use allowance.

For temperature, thermal loading capacity (LC) was calculated using **Equation 8-1**. The excess load was calculated using **Equation 8-2**.

Table 8-1 and Table 8-2 present the loading capacity and excess load on each AU with available data during the 20 °C year round use period and 13 °C spawning use period, respectively. The loads in these tables represent the loading capacity and excess loads on the same day that the maximum 7DADM river temperature was recorded. The estimated river flow (Q_R) is also from the same day the maximum 7DADM river temperature was recorded. The loading capacity was also calculated using 7Q10 low flows (see Section 9.6) for consistency with the source category allocations, which were also calculated using 7Q10 flows.

Because loading capacity is dynamic and scales with flow, **Equation 8-1** may be used to calculate the loading capacity when river flow is greater than 7Q10. **Equation 8-1** may also be used to calculate the loading capacity if in the future the applicable temperature criteria are updated and approved by EPA.

Wasteload allocations to point sources and load allocations to nonpoint sources are based on loads equivalent to the allowed 0.30°C human use allowance increase above the applicable temperature criterion. For some NPDES permitted point sources and nonpoint sources, the maximum cumulative temperature impact in an AU is less than the sum of the individual HUA assignments at their respective points of discharge or locations of activity due to heat dissipation within the AU. For this reason, the temperature criterion and the maximum allowed cumulative temperature increase for each source category is used in **Equation 8-1**, rather than the sum of the HUAs for each unique individual source. The river flow (Q_R) used in **Equation 8-1** is assumed to include the combined sum of effluent flow from all upstream point sources; inflows from upstream tributaries, groundwater, and nonpoint sources; and any outflows.

$$LC = (T_C + \text{HUA}) \cdot Q_R \cdot C_F$$ **Equation 8-1**

where,

$LC =$ Loading Capacity (kilocalories/day).

$T_C =$ The applicable river temperature criterion (°C).

$\text{HUA} =$ The 0.3°C human use allowance assigned to point sources, nonpoint sources, and reserve capacity.

$Q_R =$ The daily mean river flow rate in cubic feet per second (cfs).

$C_F =$ Conversion factor using flow in cfs: 2,446,665

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

$$EL = (T_R \cdot Q_R \cdot C_F) - LC$$ **Equation 8-2**

where,

$EL =$ The excess load (kilocalories/day)

$LC =$ The loading capacity (kilocalories/day) calculated using **Equation 8-1**.

$T_R =$ The maximum 7DADM ambient river temperature (°C).

$Q_R =$ The daily mean river flow rate (cfs).

$C_F =$ Conversion factor using flow in cfs: 2,446,665

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

The percent reduction, calculated using **Equation 3-2,** is the percent reduction needed attain criteria and is applicable to both temperature and thermal loading. This is because the river flow rate used to calculate a thermal load is the same number in the numerator and denominator and is cancelled out when calculating the percent reduction.

$$\text{PR} = \frac{(T_R - T_C - \text{HUA})}{T_R} \cdot 100$$ **Equation 8-3**

where,

$\text{PR} =$ Percent load reduction (%). If PR < 0, PR = 0

$T_R =$ The maximum 7DADM ambient river temperature (°C).

$T_C =$ The applicable river temperature criterion (°C).

$\text{HUA} =$ The 0.3°C human use allowance assigned to point sources, nonpoint sources, margin of safety, or reserve capacity.

Table 8-1: Maximum observed 7DADM water temperature on AUs during the 20 °C year round use period with the corresponding river flow rate, loading capacity, excess load, excess temperature, and percent load reduction on that day.

Assessment Unit	Maximum 7DADM Temperature (°C)	Excess 7DADM Temperature (°C)	Date of Maximum 7DADM Temperature	Flow (cfs)	Loading Capacity (kcal/day)	Excess Load (kcal/day)	Percent Load Reduction
Snake River Stateline to Boise River OR_SR_1705010311_02_102702	26.2	5.9	2010-08-05	5420	2.692E+11	7.881E+10	22.6
Snake River Boise River to Malheur River OR_SR_1705011501_02_103231	28.5	8.2	2015-07-05	5910	2.935E+11	1.189E+11	28.8
Snake River Malheur River to Weiser River OR_SR_1705011502_02_103230	28.3	8.0	2013-07-05	6616	3.286E+11	1.290E+11	28.2
Snake River Weiser River to Hog Creek/Brownlee Reservoir OR_SR_1705020101_02_103229	29.5	9.2	2006-07-28	10900	5.414E+11	2.461E+11	31.3
Oxbow Reservoir OR_LK_1705020107_05_100583	24.3	4.0	2018-08-12	11760	5.841E+11	1.145E+11	16.4
Hells Canyon Reservoir OR_LK_1705020107_05_100582	23.6	3.3	2018-08-18	9166	4.552E+11	7.490E+10	14.1
Snake River Hells Canyon Reservoir to Sheep Creek OR_SR_1706010101_02_103274	24.0	3.7	2018-08-20	10800	5.364E+11	9.830E+10	15.5
Snake River Sheep Creek to Getta Creek OR_SR_1706010102_02_103280	24.0	3.7	2018-08-20	10800	5.364E+11	9.671E+10	15.3
Snake River Getta Creek to Salmon River	24.0	3.7	2018-08-21	11710	5.816E+11	1.063E+11	15.5
Snake River Salmon River to Stateline	24.0	3.7	2006-07-29	20500	1.018E+12	1.870E+11	15.5

Table 8-2: Maximum observed 7DADM water temperature on AUs during the 13 °C spawning use period with the corresponding river flow rate, loading capacity, excess load, excess temperature, and percent load reduction on that day.

Assessment Unit	Maximum 7DADM Temperature (°C)	Excess 7DADM Temperature (°C)	Date of Maximum 7DADM Temperature	Flow (cfs)	Loading Capacity (kcal/day)	Excess Load (kcal/day)	Percent Load Reduction
Snake River Hells Canyon Reservoir to Sheep Creek OR_SR_1706010101_02_103274	18.7	5.4	2015-10-23	8750	2.847E+11	1.145E+11	28.7
Snake River Sheep Creek to Getta Creek OR_SR_1706010102_02_103280	18.6	5.3	2015-10-23	8750	2.847E+11	1.124E+11	28.3
Snake River Getta Creek to Salmon River OR_SR_1706010103_02_103282	18.4	5.1	2015-10-23	9038	2.941E+11	1.137E+11	27.9
Snake River Salmon River to Stateline OR_SR_1706010301_02_103306	16.7	3.4	2015-10-23	13100	4.263E+11	1.090E+11	20.4

9 Allocations, reserve capacity, and margin of safety

9.1 Human use allowance assignments

The HUA rule at OAR 340-041-0028(12)(b)(B) identifies the allowed temperature increase 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 0.3°C (0.5°F) above the applicable criteria after complete mixing in the waterbody, and at the POMI.

Table 9-1 present the portions of the HUA assigned to anthropogenic source categories for each AUs in the TMDL project area. See TSD Section 9 for approach to HUA assignments.

The assigned HUA for NPDES point sources is the maximum cumulative warming allowed anywhere in the AU from all NPDES individual permittees. The HUA assigned to any single NPDES point source is summarized in Table 9-1. Similarly, the assigned portion of the HUA for nonpoint sources represents the maximum cumulative warming allowed anywhere in the AU and at the POMI from all nonpoint source activities within each source category. DEQ expects the amount of warming for each unique point or nonpoint source activity to be less than the values shown in Table 9-1. DEQ will implement the TMDL in a manner consistent with the HUA rule by requiring all nonpoint sources to implement management strategies and reduce their warming impact such that the assigned HUA is attained. Point sources will be required to implement their wasteload allocations through their NPDES permits such that the assigned HUA is attained.

The dam and reservoir operations source category accounts for nonpoint source temperature impacts associated with dam impoundment and release of the impounded water back into the natural channel. Dam and reservoir discharges associated with an NPDES permit are included in the NPDES assigned HUAs. The HUA for dam and reservoir operations are achieved through the implementation of the load allocations described in Section 9.3 and the temperature target surrogate measure described in Section 9.3.1.

Anthropogenic warming from tributaries accounts for temperature increases in the Snake River caused by point or nonpoint source anthropogenic warming in tributaries to the Snake River. Inflow from canals or drains are also included in this category. The HUA assignments in Table 9-1 are based on all tributaries in Oregon and the Payette River in Idaho having no more than a 0.3°C. increase at the tributary mouth. Other Idaho tributaries are assumed to have no more than a 0.14°C increase at the mouth consistent with Idaho's Snake River Temperature TMDL (IDEQ, 2004). Snake River anthropogenic warming entering Oregon at river mile 409 was not assigned a HUA and is considered a background source under OAR 340-042-0030(1). Warming from background sources is addressed under the background load allocation.

Other nonpoint source sectors include temperature warming associated with climate change sources in Oregon, solar loading from lack of streamside vegetation, and the withdrawal of water from the Snake River that is intended for consumptive uses.

Table 9-1: HUA assignments for source or source categories on Snake River or Hells Canyon Complex Reservoir assessment units.

Assessment Unit	Assessment Unit ID	NPDES point sources	Dam and reservoir operations	Anthropogenic warming from tributaries	Other nonpoint sectors	Reserve capacity	Total HUA
Snake River Idaho to Boise River	OR_SR_1705010311_02_102702	0.01	0.00	0.05	0.00	0.24	0.30
Snake River Boise River to Malheur River	OR_SR_1705011501_02_103231	0.01	0.00	0.05	0.00	0.24	0.30
Snake River Malheur River to Weiser River	OR_SR_1705011502_02_103230	0.01	0.00	0.15	0.00	0.14	0.30
Snake River Weiser River to Hog Creek/Brownlee Reservoir	OR_SR_1705020101_02_103229	0.01	0.00	0.15	0.00	0.14	0.30
Brownlee Reservoir	OR_LK_1705020103_05_100578	0.01	0.00	0.12	0.00	0.17	0.30
Brownlee Reservoir Powder River Arm	OR_LK_1705020311_05_100605	0.01	0.00	0.10	0.00	0.19	0.30
Oxbow Reservoir	OR_LK_1705020107_05_100583	0.02	0.00	0.10	0.00	0.18	0.30
Hells Canyon Reservoir	OR_LK_1705020107_05_100582	0.04	0.00	0.10	0.00	0.16	0.30
Snake River Hells Canyon Reservoir to Sheep Creek	OR_SR_1706010101_02_103274	0.11	0.00	0.11	0.00	0.08	0.30
Snake River Sheep Creek to Getta Creek	OR_SR_1706010102_02_103280	0.09	0.00	0.11	0.00	0.10	0.30
Snake River Getta Creek to Salmon River	OR_SR_1706010103_02_103282	0.09	0.00	0.12	0.00	0.09	0.30
Snake River Salmon River to Stateline	OR_SR_1706010301_02_103306	0.09	0.00	0.12	0.00	0.09	0.30

9.2 Wasteload allocations for point sources

Wasteload allocations (WLAs) are assigned to the NPDES permitted point sources listed in Table 9-2. NPDES permitted point source discharges covered by ODOT's Phase I individual MS4 stormwater permit and registrants under the general stormwater permits (MS4 phase II, 1200-A, 1200-C, and 1200-Z) and other general NPDES permits with discharges to the Snake River (200-J, CAFO NPDES) do not contribute to exceedances of applicable temperature criteria and impact beneficial uses based on DEQ evaluation of the permit requirements, available dilution, or frequency and magnitude of discharge. Therefore, no additional TMDL requirements are needed for these permitted points sources to control temperature, other than those included in their respective NPDES permits.

Table 9-2: Thermal wasteload allocations (WLA) assigned to point sources.

NPDES Permittee WQ File Number: EPA Number	WLA period	Applicable Temperature Criteria (°C)	Assigned HUA ΔT (°C)	Annual 7Q10 River flow (cfs)	Effluent discharge (MGD/cfs)	7Q10 WLA (kcals/day)
Idaho Power – Hells Canyon Power Plant 41297 : OR0027278	5/15 – 11/15	20.0 13.0	0.019 0.035	6884	10.5/16.25	320.769E+6 590.891E+6
Idaho Power - Oxbow Power Plant 41299 : OR0027286	5/1 – 10/31	20.0	0.021	6854	12.15/18.8	353.124E+6
Ontario STP 63631 : OR0020621	5/1 – 10/31	20.0	0.001	4755	3.06/4.7	11.645E+6
Simplot - Ontario 63810 : OR0002402	5/1 – 10/31	20.0	0.017	4755	4.3/6.7	198.055E+6

Wasteload allocations were calculated using Equation 9-1.

The effluent discharge used to calculate the wasteload allocations presented in Table 9-2 are based on the average dry weather facility design, a maximum discharge authorized by an NPDES permit, or an effluent discharge characterized from discharge data. More information on the specific source of the effluent discharge flow, effluent temperature, and the rationale behind the assigned HUA is described in the TSD Section 9.2.

Wasteload allocations may be implemented in NPDES permits in any of the following ways:

(1) Incorporate 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 discharge (Q_E) using seasonal values or annual values, as appropriate, if more recent data or better estimates are available. The assigned portion of the HUA (ΔT) is static and based on the value in Table 9-2.

(2) Incorporate **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 assigned portion of the HUA (ΔT) is static and based on the value in Table 9-2. Permit

writers may recalculate the 7Q10 using seasonal or annual values, as appropriate, if more recent data or better estimates are available.

$WLA = \Delta T \cdot (Q_E + Q_R) \cdot C_F$ Equation 9-1a

$WLA = \Delta T \cdot Q_E \cdot D_F \cdot C_F$ Equation 9-1b

where,

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

$\Delta T =$ The assigned portion of the HUA at the point of discharge from Table 9-2. It is 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.

$Q_E =$ 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 river flow is <= 7Q10, Q_R = 7Q10. When river flow > 7Q10, Q_R is equal to the daily mean river flow, upstream.

$D_F =$ Dilution factor. $(Q_E + Q_R)/Q_E$ For lakes, the dilution factor is 1 unless determined using another method.

$C_F =$ Conversion factor using flow in cfs: 2,446,665

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

9.3 Load allocations for nonpoint sources

OAR 340-042-0040(4)(h) defines load allocations as the portions of the receiving water's loading capacity that are allocated to existing nonpoint sources, including runoff, deposition, soil contamination and groundwater discharges, or to background sources. Load allocations are best estimates of loading, and may range from reasonably accurate estimates to gross allotments depending on the availability of data and appropriate techniques for predicting loading. Whenever reasonably feasible, natural background, long-range transport and anthropogenic nonpoint source loads will be distinguished from each other.

Load allocations assigned to background sources on each AU are calculated using **Equation 9-2**.

$$LA_{BG} = (T_C) \cdot (Q_R) \cdot C_F$$

Equation 9-2

where,

$LA_{BG} =$ Load allocation to background sources (kilocalories/day).

$T_C =$ The applicable temperature criteria, not including the HUA. When there are two year-round applicable temperature criteria that apply to the same AU, the more stringent criteria shall be used.

$Q_R =$ The daily average river flow rate (cfs). For a lake, a dilution factor of 1 may be used for Q_R unless determined using another method.

$C_F =$ Conversion factor using flow in cfs: 2,446,665

$$\left(\frac{1\text{ m}}{3.2808\text{ ft}}\right)^3 \cdot \frac{1\,m^3}{35.31\,ft^3} \cdot \frac{1000\,kg}{1\,m^3} \cdot \frac{86400\,sec}{1\,day} \cdot \frac{1\,kcal}{1\,kg\ \cdot 1℃} = 2{,}446{,}665$$

Load allocations assigned to anthropogenic nonpoint sources on each AU are calculated using **Equation 9-3.**

$$LA_{NPS} = (\Delta T) \cdot (Q_R) \cdot C_F$$

Equation 9-3

where,

$LA_{NPS} =$ Load allocation to anthropogenic nonpoint sources (kilocalories/day).

$\Delta T =$ The portion of the HUA assigned to each nonpoint source or source category representing the maximum cumulative temperature increase (°C) from the nonpoint source or source category. When the minimum duties provision at OAR 340-041-0028(12)(a) applies, ΔT = 0.0.

$Q_R =$ The daily average river flow rate (cfs).

$C_F =$ Conversion factor using flow in cfs: 2,446,665

$$\left(\frac{1\text{ m}}{3.2808\text{ ft}}\right)^3 \cdot \frac{1\,m^3}{35.31\,ft^3} \cdot \frac{1000\,kg}{1\,m^3} \cdot \frac{86400\,sec}{1\,day} \cdot \frac{1\,kcal}{1\,kg\ \cdot 1℃} = 2{,}446{,}665$$

Table 9-3: Thermal load allocations (LA) assigned to background sources.

AU Name	AU ID	Year Round Use Temperature Criteria	Spawning Use Temperature Criteria	7Q10 Background LA Year Round Use Period (kcals/day)	7Q10 Background LA Spawning Use Period (kcals/day)
Snake River Idaho to Boise River	OR_SR_1705010311_02_102702	20	NA	2.083E+11	NA
Snake River Boise River to Malheur River	OR_SR_1705011501_02_103231	20	NA	2.327E+11	NA
Snake River Malheur River to Weiser River	OR_SR_1705011502_02_103230	20	NA	2.853E+11	NA
Snake River Weiser River to Hog Creek/Brownlee Reservoir	OR_SR_1705020101_02_103229	20	NA	2.981E+11	NA
Brownlee Reservoir	OR_LK_1705020103_05_100578	20	NA	3.548E+11	NA
Brownlee Reservoir Powder River Arm	OR_LK_1705020311_05_100605	20	NA	3.915E+08	NA
Oxbow Reservoir	OR_LK_1705020107_05_100583	20	NA	3.354E+11	NA
Hells Canyon Reservoir	OR_LK_1705020107_05_100582	20	NA	3.369E+11	NA
Snake River Hells Canyon Reservoir to Sheep Creek	OR_SR_1706010101_02_103274	20	13	3.369E+11	2.190E+11
Snake River Sheep Creek to Getta Creek	OR_SR_1706010102_02_103280	20	13	3.745E+11	2.434E+11
Snake River Getta Creek to Salmon River	OR_SR_1706010103_02_103282	20	13	3.745E+11	2.434E+11
Snake River Salmon River to Stateline	OR_SR_1706010301_02_103306	20	13	5.563E+11	3.616E+11

Table 9-4: Thermal load allocations (LA) assigned to anthropogenic nonpoint sources.

AU Name	AU ID	7Q10 LA Dam and reservoir operations (kcals/day)	7Q10 LA Anthropogenic warming from tributaries (kcals/day)	7Q10 LA Other nonpoint sectors (kcals/day)
Snake River Idaho to Boise River	OR_SR_1705010311_02_102702	0	5.207E+08	0
Snake River Boise River to Malheur River	OR_SR_1705011501_02_103231	0	5.817E+08	0
Snake River Malheur River to Weiser River	OR_SR_1705011502_02_103230	0	2.140E+09	0
Snake River Weiser River to Hog Creek/Brownlee Reservoir	OR_SR_1705020101_02_103229	0	2.236E+09	0
Brownlee Reservoir	OR_LK_1705020103_05_100578	0	2.129E+09	0
Brownlee Reservoir Powder River Arm	OR_LK_1705020311_05_100605	0	1.957E+06	0
Oxbow Reservoir	OR_LK_1705020107_05_100583	0	1.677E+09	0
Hells Canyon Reservoir	OR_LK_1705020107_05_100582	0	1.684E+09	0
Snake River Hells Canyon Reservoir to Sheep Creek	OR_SR_1706010101_02_103274	0	1.853E+09	0
Snake River Sheep Creek to Getta Creek	OR_SR_1706010102_02_103280	0	2.060E+09	0
Snake River Getta Creek to Salmon River	OR_SR_1706010103_02_103282	0	2.247E+09	0
Snake River Salmon River to Stateline	OR_SR_1706010301_02_103306	0	3.338E+09	0

9.4 Surrogate measures

EPA regulations (40 CFR 130.2(i)) and OAR 340-042-0040(O)(5)(b) allow for TMDLs to utilize other appropriate measures (or surrogate measures). This section presents the surrogate measure that implement the dam and reservoir load allocations, the natural seasonal thermal pattern narrative criteria, and the minimum duties provision.

The HCC project thermal load allocations (Table 9-4) and assigned HUA (Table 9-1) are zero. This means that on days when inflowing water temperatures upstream of the reservoirs exceed the applicable criteria plus assigned human use allowance, the HCC project must not increase 7DADM temperatures above those incoming temperatures accounting for any warming or cooling that would occur through the reservoir reaches absent the dam and reservoir operation. This ensures dam operators are only responsible for temperature increases caused by the dam and reservoir operations.

Monitoring stream temperature, rather than a thermal load, is easier and a more meaningful approach for reservoir management and effectiveness monitoring. Temperature is mathematically related to excess thermal loading and directly linked to the temperature water quality standard. For these reasons, DEQ is using a surrogate measure to implement the load allocation for dam and reservoir operations. The surrogate measure is as follows:

The 7DADM temperatures released from Hells Canyon Dam shall be less than or equal to:

a) The flow weighted 7DADM no dam temperature[1] + 0.14 °C, or
b) The applicable seasonal 7DADM temperatures in I or II:
   I. 12.0 °C from May 1 to Apr 15 and Oct 21 to Nov 15 when the value from a) is less than 12.0 °C;
   II. 19.0 °C from Apr 16 – Oct 20 when the value from a) is less than 19.0 °C;

Note 1: No dam temperatures are temperatures flowing into the reservoirs accounting for any warming or cooling that would occur through the reservoir reaches absent the dam and reservoir operations. No dam temperatures may be calculated using a regression (**Equation 9-4**).

For implementation of the low flow conditions provision at OAR 340-041-0028(12)(d), the 7Q10 shall be calculated at a monitoring gage upstream of the reservoirs or at nearby gage that isn't influenced by the dam's operations.

$$tmax_{RM247} = -5.4298 + (0.5860 * tmean_{RM345}) + (0.4822 * tmax_{RM345}) + (0.4285 * log\_qmean_{RM345}) \quad \text{Equation 9-4}$$

where,

$tmax_{RM247} =$ The estimated no dam daily maximum temperature (°C) at Hells Canyon Dam, Snake River mile 247.

$tmean_{RM345}=$ The daily mean temperature (°C) at Snake River mile 345. e.g. IPC monitoring station *Snake_River_345.2_LB.*

$tmax_{RM345}=$ The daily maximum temperature (°C) at Snake River mile 345. e.g. IPC monitoring station *Snake_River_345.2_LB.*

$log\_qmean_{RM345} =$ The log of the daily mean flow (cfs) at USGS gage 13269000, Snake River at Weiser ID.

9.5 Reserve capacity

DEQ set aside explicit portions of the HUA as reserve capacity that may be available to provide either point or nonpoint source allocation(s) to new or increased thermal loads, or to assign additional allocation to any existing source(s) that were assigned an erroneous allocation or may not have been identified during the development of this TMDL. The portion of the HUA associated with the reserve capacity is in Table 9-5 and Section 9.1.1.

Table 9-5:Thermal load set aside as reserve capacity (RC).

AU Name	AU ID	RC HUA ∆T (°C)	7Q10 RC (kcals/day)
Snake River Idaho to Boise River	OR_SR_1705010311_02_102702	0.24	2.499E+09
Snake River Boise River to Malheur River	OR_SR_1705011501_02_103231	0.24	2.792E+09
Snake River Malheur River to Weiser River	OR_SR_1705011502_02_103230	0.14	1.997E+09
Snake River Weiser River to Hog Creek/Brownlee Reservoir	OR_SR_1705020101_02_103229	0.14	2.087E+09
Brownlee Reservoir	OR_LK_1705020103_05_100578	0.17	3.016E+09
Brownlee Reservoir Powder River Arm	OR_LK_1705020311_05_100605	0.19	3.719E+06
Oxbow Reservoir	OR_LK_1705020107_05_100583	0.18	3.018E+09
Hells Canyon Reservoir	OR_LK_1705020107_05_100582	0.16	2.695E+09
Snake River Hells Canyon Reservoir to Sheep Creek	OR_SR_1706010101_02_103274	0.08	1.347E+09
Snake River Sheep Creek to Getta Creek	OR_SR_1706010102_02_103280	0.10	1.873E+09

AU Name	AU ID	RC HUA ∆T (°C)	7Q10 RC (kcals/day)
Snake River Getta Creek to Salmon River	OR_SR_1706010103_02_103282	0.09	1.685E+09
Snake River Salmon River to Stateline	OR_SR_1706010301_02_103306	0.09	2.503E+09

Modeling analyses were performed to evaluate the cumulative temperature impacts of wasteload and load allocations (WLAs and LAs) assigned to sources on the Snake River. The model analysis results show WLAs and LA do not exceed the 0.3°C HUA and that for most AUs sufficient assimilative capacity is available to accommodate the reserve capacity summarized in Table 9-5.

[Summary of model results evaluating hypothetical assignment of reserve capacity at the ID/OR Stateline – See TSD Appendix C]

DEQ will consider requests for allocation of reserve capacity submitted in writing on a case-by-case basis. Except when DEQ is correcting an error or omission, DEQ may require requesters to demonstrate that there are no reasonable alternatives to an increased load and to prepare modeling or similar analysis to ensure that loading capacity is available at the discharge location(s) or in downstream waters. The HUA assigned to reserve capacity may not be available for allocation due to cumulative warming and points of maximum impact downstream. DEQ will use its discretion in making determinations on requests, based on the information available and priorities appropriate at the time of the request. DEQ will track allocation of reserve capacity over time and will not approve requests once reserve capacity is depleted. Allocations of reserve capacity must be approved by DEQ's Director or designee.

9.6 Margin of safety

CFR 130.7(c)(1) and OAR 340-042-0040(4)(i) require a TMDL to include a margin of safety. The margin of safety accounts for lack of knowledge or uncertainty. This may result from limited data; an incomplete understanding of the exact magnitude or quantity of thermal loading from various sources; or the actual effect controls will have on loading reductions and receiving water. The margin of safety is intended to account for such uncertainties in a manner that is conservative and will result in environmental protection. A margin of safety can be achieved through two approaches: (1) implicitly using conservative analytical assumptions to develop allocations, or (2) explicitly specifying a portion of the TMDL loading capacity as a margin of safety.

The Snake River temperature TMDL used an implicit margin of safety in derivation of the allocations. The primary conservative assumptions include:

- Calculating wasteload allocations based on the paired average dry weather design flow (ADWDF) or a maximum flow allowed by the NPDES permit, maximum effluent temperature, and the critical 7Q10 low river flow. It is rare that actual discharges from point sources will reach design flows at the same time that maximum effluent temperature and low 7Q10 river flows occur.

- Setting point source effluent temperatures as high as 32°C for the model scenario assessing the wasteload allocations. On days when the current thermal load was less than the wasteload allocation, the maximum effluent temperatures were increased above the actual temperatures up to either 32°C or the effluent temperature that would fully utilize the wasteload allocation. Actual maximum effluent temperatures are unlikely to get this warm or be sustained over multiple days or weeks.
- The modeling shows the maximum temperature increases from various source categories is seasonal in nature with the maximum increase limited to a short period of time. In addition, the maximum warming for each source category assessed does not always occur at the same time. However, the HUA and subsequent allocations are assigned based on the assumption that the maximum warming occurs all at the same time. This means that a portion of the loading capacity reserved for human use will go unutilized most of the time.

9.7 Allocation summary

Table 9-7 through Table 9-18 present TMDL allocations for source or source categories on each AU in the project area. The allocations to background sources were calculated using Equation 9-2 and were based on the applicable year-round use criterion and the spawning use criterion in the respective AU. The allocations to NPDES point sources were calculated using Equation 9-1. The allocations to nonpoint sources were calculated using Equation 9-3. All allocations presented in Table 9-7 through Table 9-18 were calculated using the annual 7Q10 river flow rate (Table 9-6). These calculations assume the 7Q10 flows at these gages include effluent flow from all upstream point sources; plus inflows from upstream tributaries, groundwater, or nonpoint sources; and any outflows. As summarized in the TMDL, allocations may be dynamic and calculated using the relevant equations when river flow rates are greater than 7Q10.

The HUA assignments to all anthropogenic sources or source categories are equal to 0.30°C. Wasteload allocations to point sources and load allocations to nonpoint sources are based on loads equivalent to the allowed 0.30°C increase. For some NPDES permitted point sources and nonpoint sources, the maximum cumulative impact at the POMI in an AU is less than the sum of the individual HUA assignments at their respective points of discharge or activity due to heat dissipation within the AU.

Table 9-6: Summary of 7Q10 flow and temperature targets used to calculate allocations for each assessment unit.

AU Description	AU ID	Annual 7Q10 (cfs)	Year Round Use Period Temperature Target (°C)	Spawning Use Period Temperature Target (°C)
Snake River Idaho to Boise River	OR_SR_1705010311_02_102702	4256	20 7DADM + 0.3 HUA	NA
Snake River Boise River to Malheur River	OR_SR_1705011501_02_103231	4755	20 7DADM + 0.3 HUA	NA
Snake River Malheur River to Weiser River	OR_SR_1705011502_02_103230	5831	20 7DADM + 0.3 HUA	NA
Snake River Weiser River to Hog Creek/Brownlee Reservoir	OR_SR_1705020101_02_103229	6092	20 7DADM + 0.3 HUA	NA
Brownlee Reservoir	OR_LK_1705020103_05_100578	7251	20 7DADM + 0.3 HUA	NA
Brownlee Reservoir Powder River Arm	OR_LK_1705020311_05_100605	8	20 7DADM + 0.3 HUA	NA
Oxbow Reservoir	OR_LK_1705020107_05_100583	6854	20 7DADM + 0.3 HUA	NA
Hells Canyon Reservoir	OR_LK_1705020107_05_100582	6884	20 7DADM + 0.3 HUA	NA
Snake River - Hells Canyon Reservoir to Sheep Creek	OR_SR_1706010101_02_103274	6884	20 7DADM + 0.3 HUA	13 7DADM + 0.3 HUA
Snake River Sheep Creek to Getta Creek	OR_SR_1706010102_02_103280	7654	20 7DADM + 0.3 HUA	13 7DADM + 0.3 HUA
Snake River Getta Creek to Salmon River	OR_SR_1706010103_02_103282	7654	20 7DADM + 0.3 HUA	13 7DADM + 0.3 HUA
Snake River Salmon River to Stateline	OR_SR_1706010301_02_103306	11369	20 7DADM + 0.3 HUA	13 7DADM + 0.3 HUA

Table 9-7: Allocation summary for the Snake River from Idaho to the Boise River (OR_SR_1705010311_02_102702).

Source or Source Category	Assigned HUA (°C)	7Q10 Year Round Use Allocations (kcal/day)
Background	0.00	2.083E+11
NPDES point sources	0.01	1.041E+08
Dam and reservoir operations	0.00	0.000E+00
Anthropogenic warming from tributaries	0.05	5.207E+08
Other nonpoint sectors	0.00	0.000E+00
Reserve capacity	0.24	2.499E+09
-	Total Allocated Load	2.114E+11
-	Loading Capacity	2.114E+11

Table 9-8: Allocation summary for the Snake River from Boise River to Malheur River (OR_SR_1705011501_02_103231).

Source or Source Category	Assigned HUA (°C)	7Q10 Year Round Use Allocations (kcal/day)
Background	0.00	2.327E+11
NPDES point sources	0.01	1.163E+08
Dam and reservoir operations	0.00	0.000E+00
Anthropogenic warming from tributaries	0.05	5.817E+08
Other nonpoint sectors	0.00	0.000E+00
Reserve capacity	0.24	2.792E+09
-	Total Allocated Load	2.362E+11
-	Loading Capacity	2.362E+11

Table 9-9: Allocation summary for the Snake River from Malheur River to Weiser River (OR_SR_1705011502_02_103230).

Source or Source Category	Assigned HUA (°C)	7Q10 Year Round Use Allocations (kcal/day)
Background	0.00	2.853E+11
NPDES point sources	0.01	1.427E+08
Dam and reservoir operations	0.00	0.000E+00
Anthropogenic warming from tributaries	0.15	2.140E+09
Other nonpoint sectors	0.00	0.000E+00
Reserve capacity	0.14	1.997E+09
-	Total Allocated Load	2.896E+11
-	Loading Capacity	2.896E+11

Table 9-10: Allocation summary for the Snake River from Weiser River to Hog Creek/Brownlee Reservoir (OR_SR_1705020101_02_103229).

Source or Source Category	Assigned HUA (°C)	7Q10 Year Round Use Allocations (kcal/day)
Background	0.00	2.981E+11
NPDES point sources	0.01	1.491E+08
Dam and reservoir operations	0.00	0.000E+00
Anthropogenic warming from tributaries	0.15	2.236E+09
Other nonpoint sectors	0.00	0.000E+00
Reserve capacity	0.14	2.087E+09
-	Total Allocated Load	3.026E+11
-	Loading Capacity	3.026E+11

Table 9-11: Allocation summary for Brownlee Reservoir (OR_LK_1705020103_05_100578).

Source or Source Category	Assigned HUA (°C)	7Q10 Year Round Use Allocations (kcal/day)
Background	0.00	3.548E+11
NPDES point sources	0.01	1.774E+08
Dam and reservoir operations	0.00	0.000E+00
Anthropogenic warming from tributaries	0.12	2.129E+09
Other nonpoint sectors	0.00	0.000E+00
Reserve capacity	0.17	3.016E+09
-	Total Allocated Load	3.601E+11
-	Loading Capacity	3.601E+11

Table 9-12: Allocation summary for Brownlee Reservoir, Powder River Arm (OR_LK_1705020311_05_100605).

Source or Source Category	Assigned HUA (°C)	7Q10 Year Round Use Allocations (kcal/day)
Background	0.00	3.915E+08
NPDES point sources	0.01	1.957E+05
Dam and reservoir operations	0.00	0.000E+00
Anthropogenic warming from tributaries	0.10	1.957E+06
Other nonpoint sectors	0.00	0.000E+00
Reserve capacity	0.19	3.719E+06
-	Total Allocated Load	3.973E+08
-	Loading Capacity	3.973E+08

Table 9-13: Allocation summary for Oxbow Reservoir (OR_LK_1705020107_05_100583).

Source or Source Category	Assigned HUA (°C)	7Q10 Year Round Use Allocations (kcal/day)
Background	0.00	3.354E+11
NPDES point sources	0.02	3.354E+08
Dam and reservoir operations	0.00	0.000E+00
Anthropogenic warming from tributaries	0.10	1.677E+09
Other nonpoint sectors	0.00	0.000E+00
Reserve capacity	0.18	3.018E+09
-	Total Allocated Load	3.404E+11
-	Loading Capacity	3.404E+11

Table 9-14: Allocation summary for Hells Canyon (OR_LK_1705020107_05_100582).

Source or Source Category	Assigned HUA (°C)	7Q10 Year Round Use Allocations (kcal/day)
Background	0.00	3.369E+11
NPDES point sources	0.04	6.737E+08
Dam and reservoir operations	0.00	0.000E+00
Anthropogenic warming from tributaries	0.10	1.684E+09
Other nonpoint sectors	0.00	0.000E+00
Reserve capacity	0.16	2.695E+09
-	Total Allocated Load	3.419E+11
-	Loading Capacity	3.419E+11

Table 9-15: Allocation summary for the Snake River from Hells Canyon Reservoir to Sheep Creek (OR_SR_1706010101_02_103274).

Source or Source Category	Assigned HUA (°C)	7Q10 Year Round Use Allocations (kcal/day)	7Q10 Year Spawning Use Allocations (kcal/day)
Background	0.00	3.369E+11	2.190E+11
NPDES point sources	0.11	1.853E+09	1.853E+09
Dam and reservoir operations	0.00	0.000E+00	0.000E+00
Anthropogenic warming from tributaries	0.11	1.853E+09	1.853E+09
Other nonpoint sectors	0.00	0.000E+00	0.000E+00
Reserve capacity	0.08	1.347E+09	1.347E+09
-	Total Allocated Load	3.419E+11	2.240E+11
-	Loading Capacity	3.419E+11	5.053E+09

Table 9-16: Allocation summary for Snake River from Sheep Creek to Getta Creek (OR_SR_1706010102_02_103280).

Source or Source Category	Assigned HUA (°C)	7Q10 Year Round Use Allocations (kcal/day)	7Q10 Year Spawning Use Allocations (kcal/day)
Background	0.00	3.745E+11	2.434E+11
NPDES point sources	0.09	1.685E+09	1.685E+09
Dam and reservoir operations	0.00	0.000E+00	0.000E+00
Anthropogenic warming from tributaries	0.11	2.060E+09	2.060E+09
Other nonpoint sectors	0.00	0.000E+00	0.000E+00
Reserve capacity	0.10	1.873E+09	1.873E+09
-	Total Allocated Load	3.802E+11	2.491E+11
-	Loading Capacity	3.802E+11	5.618E+09

Table 9-17: Allocation summary for Snake River from Sheep Creek to Getta Creek (OR_SR_1706010103_02_103282).

Source or Source Category	Assigned HUA (°C)	7Q10 Year Round Use Allocations (kcal/day)	7Q10 Year Spawning Use Allocations (kcal/day)
Background	0.00	3.745E+11	2.434E+11
NPDES point sources	0.09	1.685E+09	1.685E+09
Dam and reservoir operations	0.00	0.000E+00	0.000E+00
Anthropogenic warming from tributaries	0.12	2.247E+09	2.247E+09
Other nonpoint sectors	0.00	0.000E+00	0.000E+00
Reserve capacity	0.09	1.685E+09	1.685E+09
-	Total Allocated Load	3.802E+11	2.491E+11

Source or Source Category	Assigned HUA (°C)	7Q10 Year Round Use Allocations (kcal/day)	7Q10 Year Spawning Use Allocations (kcal/day)
-	Loading Capacity	3.802E+11	5.618E+09

Table 9-18: Allocation summary for Snake River from Salmon River to Stateline (OR_SR_1706010301_02_103306).

Source or Source Category	Assigned HUA (°C)	7Q10 Year Round Use Allocations (kcal/day)	7Q10 Year Spawning Use Allocations (kcal/day)
Background	0.00	5.563E+11	3.616E+11
NPDES point sources	0.09	2.503E+09	2.503E+09
Dam and reservoir operations	0.00	0.000E+00	0.000E+00
Anthropogenic warming from tributaries	0.12	3.338E+09	3.338E+09
Other nonpoint sectors	0.00	0.000E+00	0.000E+00
Reserve capacity	0.09	2.503E+09	2.503E+09
-	Total Allocated Load	5.647E+11	3.700E+11
-	Loading Capacity	5.647E+11	8.345E+09

10 Water quality management plan

As described in OAR 340-042-0040(4)(l)(A)-(O), an associated WQMP is a required element of a TMDL and must include the following components: (A) Condition assessment and problem description; (B) Goals and objectives; (C) Proposed management strategies design to meet the TMDL allocations; (D) Timeline for implementing management strategies; (E) Explanation of how TMDL implementation will attain water quality standards; (F) Timeline for attaining water quality standards; (G) Identification of persons, including DMAs, responsible for TMDL implementation; (H) Identification of existing implementation plans; (I) Schedule for submittal of implementation plans and revision triggers; (J) Description of reasonable assurance of TMDL implementation; (K) Plan to monitor and evaluate progress toward achieving TMDL allocations and water quality standards; (L) Plan for public involvement in TMDL implementation; (M) Description of planned efforts to maintain management strategies over time; (N) General discussion of costs and funding for TMDL implementation; and (O) citation of legal authorities relating to TMDL implementation.

DEQ sought and considered input from various persons, including DMAs, responsible for TMDL implementation and other interested public and prepared the Snake River WQMP as a stand-alone rule document.

11 Reasonable assurance

OAR 340-042-0030(9) defines Reasonable Assurance as “a demonstration that a TMDL will be implemented by federal, state or local governments or individuals through regulatory or voluntary actions including management strategies or other controls.” OAR 340-042-0040(6)(g) states that “to establish reasonable assurance that the TMDL’s load allocations will be achieved requires determination that practices capable of reducing the specified pollutant load: (1) exist; (2) are technically feasible at a level required to meet allocations; and (3) have a high likelihood of implementation.” Likewise federal regulations (40 CFR § 130.2(i)) and EPA’s TMDL guidance describes that when a TMDL is developed for waters impaired by both point and nonpoint sources and WLAs are based on an assumption that NPS load reductions will occur, the TMDL must provide “reasonable assurances” that NPS control measures will achieve expected load reductions (EPA, 1991).

The Snake River TMDLs were developed to address both point and nonpoint sources with TMDL load reductions set at a level estimated to attain the applicable temperature criteria with consideration of opportunities for effective measures to reduce those contributions. Reasonable assurance that Oregon’s three-point test is met, needed load reductions will be achieved for nonpoint sources, and that antidegradation requirements and narrative water quality criteria will be attained is based primarily on an accountability framework incorporated into the WQMP. The accountability framework includes identification of pollutant reduction strategies by source and activity, identification of persons and agencies responsible to implement the strategies, timelines and measurable objectives, tracking implementation progress and water quality conditions, and DEQ action when responsible persons or agencies fail to implement. Section 7 of the WQMP (Reasonable Assurance of Implementation) discuss this framework directly.

The WQMP also includes a general discussion of implementation costs and available funding programs, identification of state legal authorities that aid in implementation of management strategies, and DEQ’s adaptive management approach DMA implementation if sufficient progress towards TMDL attainment is not being made. The entirety of the WQMP and its execution along with the implementation plans of persons and agencies responsible for TMDL implementation represents reasonable assurance that nonpoint source load reductions will be achieved.

12 References

DEQ (Oregon Department of Environmental Quality). 2003. Staff report to the Environmental Quality Commission from Stephanie Hallock, Director. “Agenda Item D, Rule Adoption: Water Quality Standards, Including Temperature Criteria, OAR Chapter 340, Division 41, December 4, 2003, EQC Meeting.”

DEQ (Oregon Department of Environmental Quality). 2008a. Temperature Water Quality Standard Implementation – A DEQ Internal Management Directive.