Section 1

Step 1: Determine applicable criteria

- Understanding Oregon's temperature standard history — 2.1
- Using Fish Use Maps to Determine Designated Uses — 2.2.1
- Determing Numeric and Narrative Criteria Based on Designated Uses — 2.2.2

Step 2: Determine listing status of the receiving

- Determine if the receiving waterbody has a valid TMDL — 2.3.1
- Determine if the waterbody is impaired for temperature and which narrative criteria apply — 2.3

Step 3: Conduct Reasonable Potential Analysis

- Determine which RPAs to conduct and conduct all applicable RPAs — 2.4
- If the data are not available to conduct the RPAs, collect the necessary data — 3

Step 4: Determine Permit Limits

- Determine Permit Limits based on applicable RPAs — 2.5
- If the data are not available to determine permit limits, collect the necessary data — 3

Step 5: Develop a Compliance Plan

- Evaluate the various management practices and compliance alternatives — 4
- Select those management practices and compliance strategies that are best for your facility — 5.1
- Develop a compliance plan — 5.2

TEMPERATURE COMPLIANCE GUIDANCE MANUAL

Contents

Figure 2-1: Flowchart for determining the applicable designated uses for a receiving waterbody

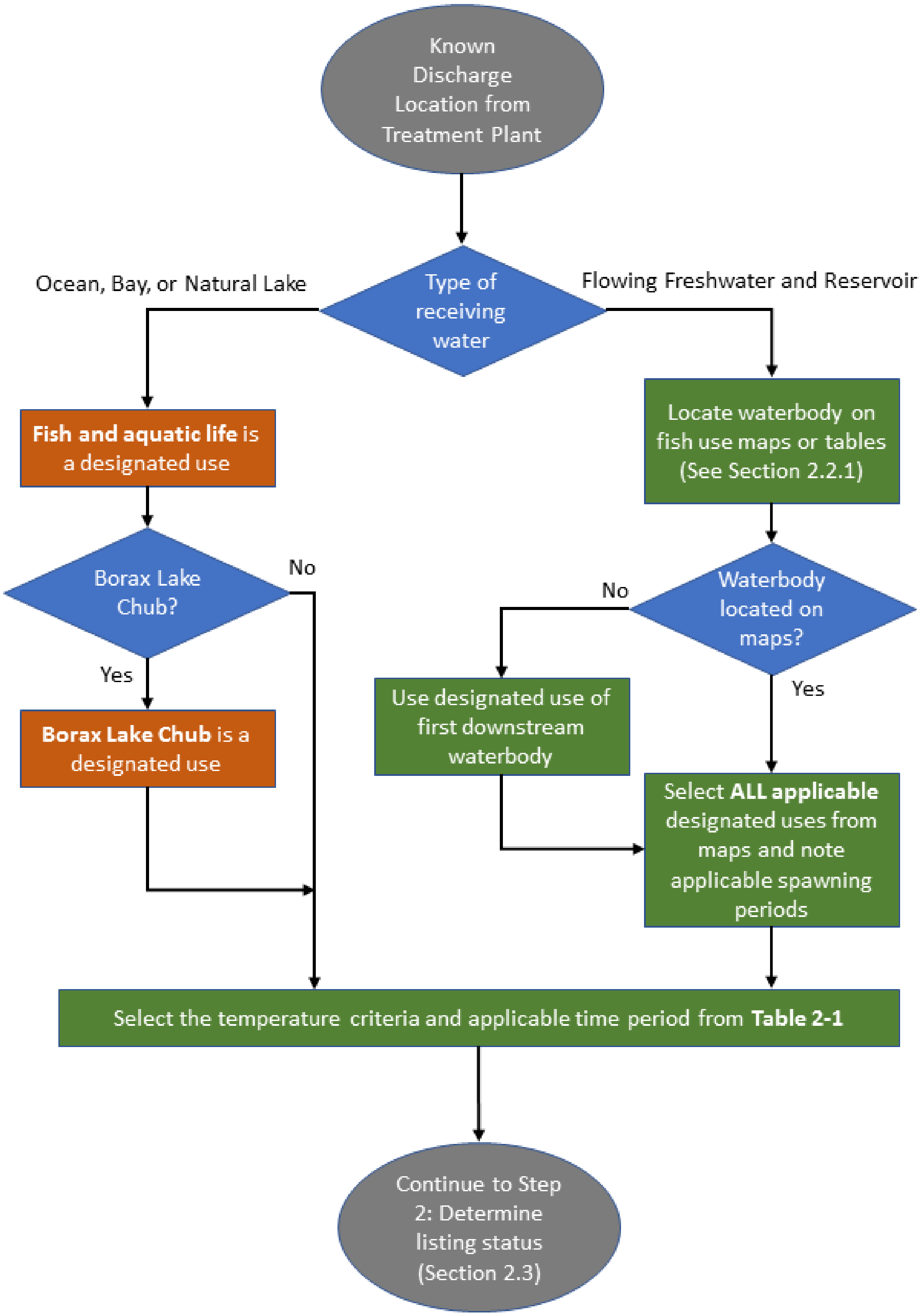


Figure 2-2: Example use of fish use maps

*Figure 170A: Fish Use Designations**
John Day Basin, Oregon

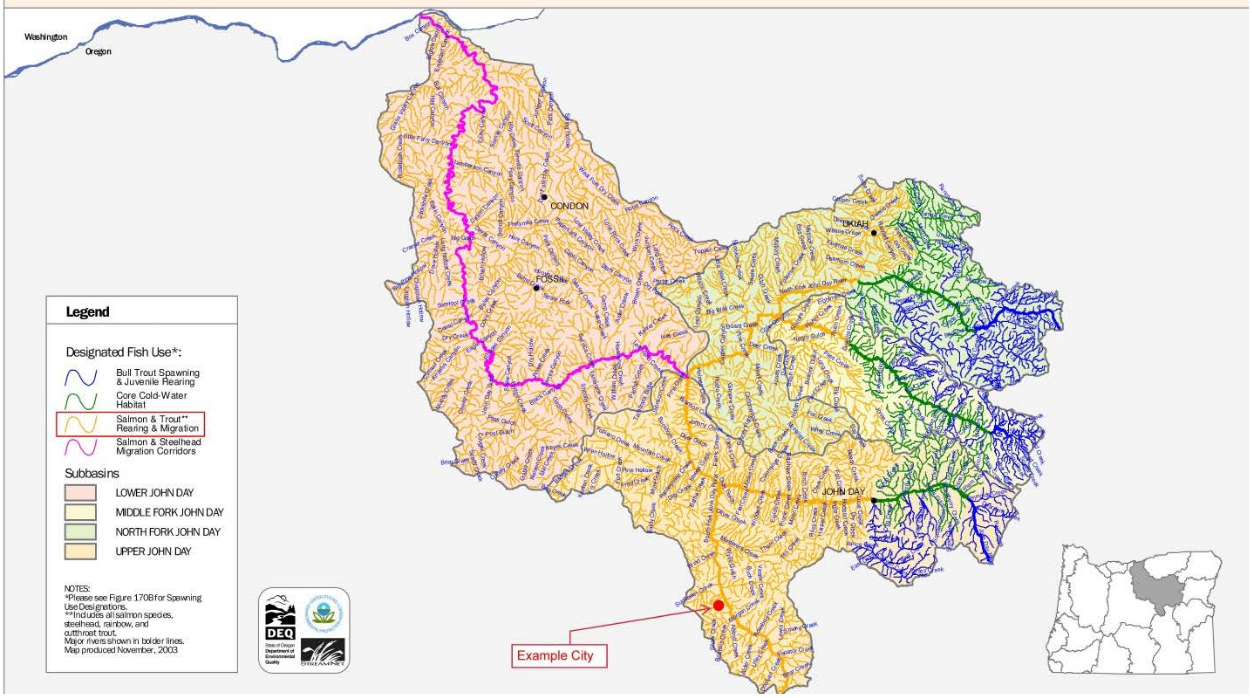


*Figure 170B: Salmon and Steelhead Spawning Use Designations**
John Day Basin, Oregon

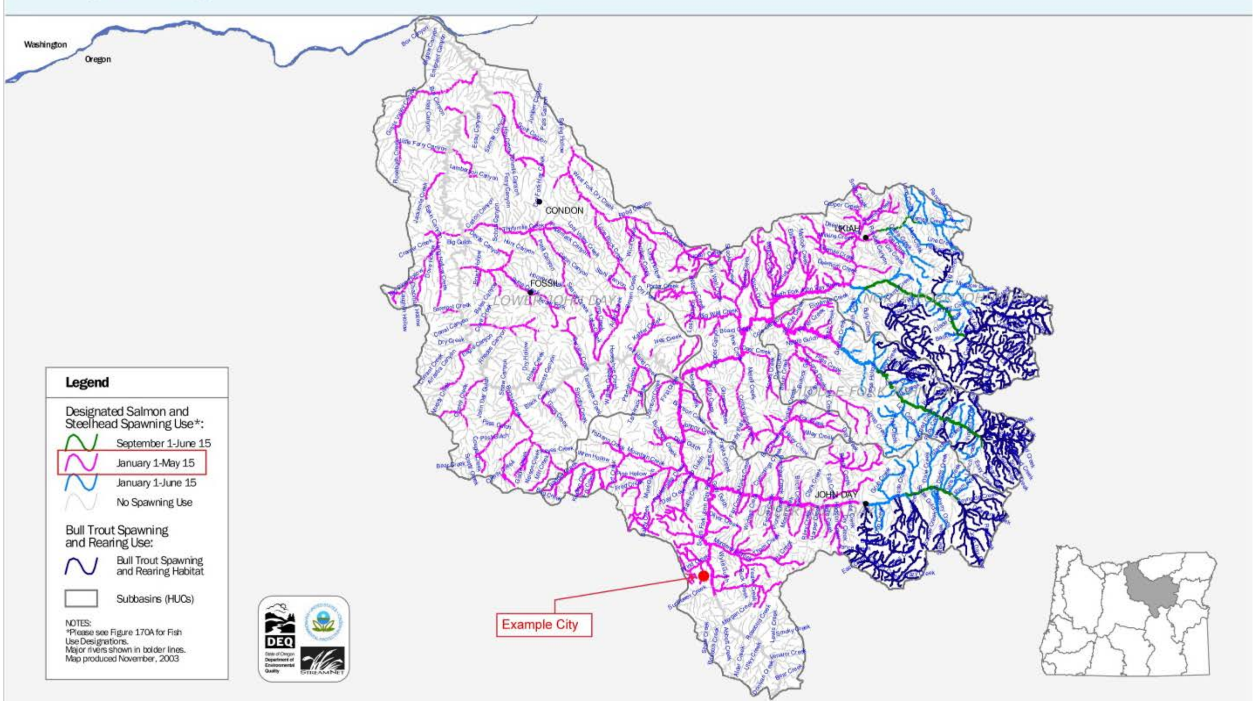
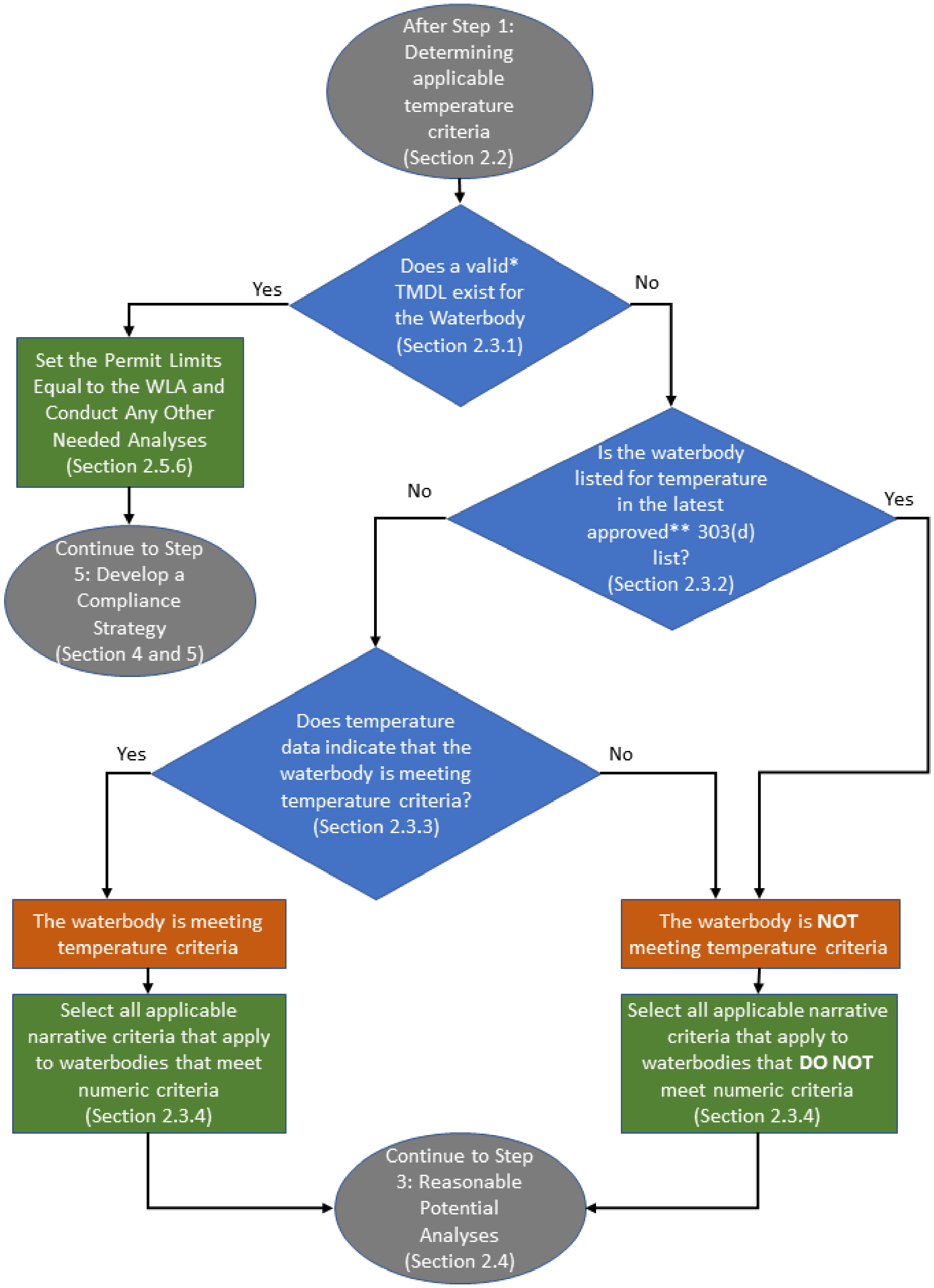


Table 2-1: Numeric and Narrative Temperature Criteria Associated with Each Beneficial Use. Adapted from Table 2-1 and Table 2-2 of the Temperature IMD (DEQ, 2008).

Designated Use	Applicable Period	Applicable Criteria
Bull Trout Spawning and Juvenile Rearing	Year round	• 12.0 ºC • Thermal Plume Narrative • HUA Narrative
	Aug 15-May 15	Bull Trout Spawning Narrative (where applicable)
	June 1-Sept 30	Cold-Water Protection Narrative, Summer
Salmon and Steelhead Spawning	Spawning dates from fish use maps	• 13.0 ºC • Cold-Water Protection Narrative, Spawning
	Year Round	• Thermal Plume Narrative • HUA Narrative
Core Cold-Water Habitat	Year round	• 16.0 ºC • Thermal Plume Narrative • HUA Narrative
	June 1-Sept 30	Cold-Water Protection Narrative, Summer
Salmon and Trout Rearing and Migration	Year round	• 18.0 ºC • Thermal Plume Narrative • HUA Narrative
	June 1-Sept 30	Cold-Water Protection Narrative, Summer
Migration Corridor (Salmon and Steelhead)	Year round	• 20.0 ºC • Cold-Water Refugia Narrative • Thermal Plume Narrative • HUA Narrative • Seasonal Thermal Pattern Narrative (only for Snake and Columbia Rivers)
	June 1-Sept 30	Cold-Water Protection Narrative, Summer
Lahonton Cutthroat Trout	Year round	• 20.0 ºC • Thermal Plume Narrative • HUA Narrative
	June 1-Sept 30	Cold-Water Protection Narrative, Summer
Redband Trout	Year round	• 20.0 ºC • Thermal Plume Narrative • HUA Narrative
	June 1-Sept 30	Cold-Water Protection Narrative, Summer
Cool-Water Species	Year Round	• Cool-Water Narrative • HUA Narrative
Fish and Aquatic Life (Oceans, Bays, Natural Lakes)	Year Round	Natural Lakes/Oceans and Bays Narrative
Borax Lake Chub	Year Round	Borax Lake Chub Narrative

Figure 2-3: Flow chart for determining listing status



* Some TMDLs may have been invalidated. See Section 2.6.

** The 303(d) list is updated regularly by DEQ and may include streams which were not previously listed or that previously were included in invalidated TMDLs. See the latest 303(d) listings from DEQ http://www.deq.state.or.us/WQ/assessment/assessment.htm

Table 2-2: Potential TMDL scenarios and the resulting effects on narrative criteria for waterbodies that do not meet numeric criteria in natural condition (most in the state)

Scenario	TMDL Status	Effect on Criteria
1	TMDL disapproved, but WLAs in effect until new TMDL is developed	Old WLA used to set permit limits
2	TMDL disapproved, and WLAs changed to 0 for waterbodies that do not meet numeric criteria in natural condition	WLA becomes 0; Permittees must meet numeric criteria at end-of-pipe (no mixing zone, no HUA allowed)
3	TMDL disapproved and point sources revert back to pre-TMDL conditions	HUA for a point source is based on 0.3 ºC after mixing with 25% of the 7Q10 or the mixing zone (whichever is smaller); If this results in more lenient permit limits than occurred under the TMDL, may trigger anti-backsliding
4	TMDL redone without the NCC and approved by EPA	New WLA used to set permit limits

From the 2008 Temperature Standard Implementation IMD: RPA for Numeric Criteria & Cold-Water Protection
(Section 5.3-5.5)
Allowed HUA at edge of mixing zone (accounting for cold-water protection) _or_ 25% of 7Q10 (summer)
up to 0.3C @ 7 day average river temperature >12.8C, not to exceed the biological criterion
Spawning season cold-water protection: Allowed increase after mixing with 100% of river flow:
up to 0.3C @ 7 day average river temperature >12.8C, not to exceed the biological criterion
up to 0.5C @ 60 day maximum river temperature = 10.0-12.8C
up to 1.0C @ 60 day maximum river temperature < 10.0C

Equation 1: Pre-TMDL Temperature Increase RPA
ΔTmz = (Te - Tc) / D, where:
ΔTmz = temperature increase at edge of mixing zone (should be <0.3)
Te = effluent temperature 7dAM
Tc = applicable biological temperature criterion, in C
Tr = 7 day average maximum river temperature, in C
D = dilution = (Qe + Qr) / Qe, where:
Qe =effluent weekly average dry-weather design flow (ADWDF; i.e. 7dAvg); or monthly ADWDF x 1.5
Qr = 25% x river 7Q10 low flow (lowest 10-year 7-day average flow), or assigned mixing zone if more restrictive

Equation 2: RPA for streams meeting numeric critieria
Trmz = (Te - Tr) / D, where:
Trmz = temperature at edge of mixing zone
Te = effluent temperature 7dAM
Tc = applicable biological temperature criterion, in C
Tr = annual maximum 7 day average maximum river temperature, in C
D = dilution provided in regulatory mixing zone
If Tr > (Tc - 0.3C) and Trmz > Tc + 0.3C, there is reasonable potential.

Equation 3: RPA for summer cold-water protection
ΔT = (Te - Tr) / D, where:
ΔT = change in river temperature, needs to be <0.3C
Qe = maximum weekly ADWDF [question, is ADWDF seasonal? is there a maximum?]
Te = summer maximum effluent temperature 7dAM
Tr = summer maximum stream temperature 7dAM, in C
D = dilution using 100% of 7Q10

From the 2008 Temperature Standard Implementation IMD: Permit Limits
(Section 6)
Overview: RPA triggers need for effluent limit, as WLA (if TMDL) or ETL (both in Kcal/day) or as a temperature limit (max effluent temp).
A WLA/ETL gives flexibility to reduce discharge as well as temp.

Equation 1 (Section 6.2): Max Temp; pre-TMDL HUA

$Te = \Delta T (D) + Tc = \Delta T \times [(Qe + Qr) / Qe)] + Tc$

- Te = maximum allowable effluent temp
- ΔT = is the HUA (≤ 0.3C)
- D = dilution = (Qe + Qr) / Qe
- Qe = weekly average dry-weather design flow (= monthly ADWDF x 1.5)
  in cfs (= 1.547 cfs/mgd)
- Qr = 25% of 7Q10 river flow (in cfs)
- Tc = applicable numeric criterion, in C

Equation 2 (Section 6.2): Excess Thermal Load (ETL - no TMDL)

ETL limit = Qe x D x ΔTps x Cf, in kcal/day

- Qe = weekly average dry-weather design flow (= monthly ADWDF x 1.5)
  in cfs (= 1.547 cfs/mgd)
- D = dilution = (Qe + Qr) / Qe
- Qr = 100% 7Q10 river flow (in cfs)
- ΔTps = is the HUA (0.3C)
- Cf = conversion factor = 2,446,665 [units: kcal x s / (day x C x ft^3)]

For compliance:

- Qe (Te - Tc) x Cf ≤ ETL limit
  - Te = effluent temperature ,in C
  - Tc = numeric temp criterion

Equation 3 (Section 6.3): Permit Limit to meet Numeric Criteria (max T)

$Te = (\Delta Tps \times D) + Tr = ((Tc - Tr) \times D) + Tr$

- Te = maximum allowed effluent temp
- ΔTps = Tc - Tr
- Tc = numeric criterion
- Tr = max 7dAM river temp
- D = dilution at 7Q10 river flow

From the 2008 Temperature Standard Implementation IMD: TMDL ETL calcs
(Section 4.9; note: cold-water protection also applies, if stricter than WLA ETL)

Equation 1A: Excess Thermal Load (WLA)

ETL = ΔTps x (Qe + Qr) x Cf (in Kcal/day)

- ΔTps = maximum allowable point source temperature increase
- Qe = effluent flow, in cfs
- Qr = river 7Q10 low flow, in cfs (lowest 10-year 7-day average flow)
- Cf = conversion factor = 2,446,665 [units: kcal x s / (day x C x ft^3)]

Equation 1B: Excess Thermal Load (WLA)

ETL = Qe x (Te - Tc) x Cf (in Kcal/day)

- Qe = effluent flow, in cfs
- Te = effluent temperature, 7DMA (7dAM), in C
- Tc = applicable biological temp criterion, C
- Cf = conversion factor = 2,446,665 [units: kcal x s / (day x C x ft^3)]

Equation 2: Excess Thermal Load (WLA) (alternative)

ΔTps = [Qe / (Qe + Qr)] x (Te - Tc)

- all variables defined as above

Table 4-1 Best Management Practices Reference Table

Strategy Category (in order of typical priority)	Strategy Description	BMP / Application
1. Typical NPDES Permit Strategies (Section 4.2)	Ensure the permit considers all applicable factors to avoid unnecessarily restrictive temperature requirements, and explore permitting options to help attain compliance.	• Mixing zone analysis • Bubble permits / alliances
2. Pre-Treatment Reductions (Section 4.3)	Reduce the overall heat load entering the treatment plant by either reducing the temperature or reducing the flow.	• Pretreatment of identified heat loads • Public awareness/education • Limiting discharge to the collection system
3. Water Quality Trading (Section 4.4)	Trading provides an often cost-effective and environmentally beneficial solution to temperature compliance by reducing thermal loading elsewhere in the watershed.	• Riparian shading • Flow augmentation • Channel restoration • Point-to-point trades • Credit banking
4. Treatment Process Modifications (Section 4.5)	May be necessary if it is found from in-plant monitoring that certain treatment processes increase the waste stream temperature significantly.	• Covering basins • Disinfection alternatives evaluation • Recycling and/or eliminating cooling water discharge • Energy conservation
5. Discharge Alternatives (Section 4.6)	These management practices would not make changes to the actual temperature of the wastewater, but would eliminate or modify the discharge to reduce the impact on the receiving water.	• Outfall/discharge relocation • Diffuser Alterations • Reservoir detention/seasonal storage • Indirect discharge/infiltration
6. Natural Treatment (Section 4.7)	As opposed to indirect discharge or watershed restoration, natural treatment provides physical cooling of the effluent prior to discharge.	• Tree farms • Wetlands • Treatment ponds • Hyporheic injection/blending
7. Recycled Water Use (Section 4.8)	Diverting effluent to recycled water uses reduces the total flow – and therefore the total thermal load – on the receiving waterbody.	• WPCF reuse • Community reuse
8. Lower-Energy Temperature Reduction Technologies (Section 4.9)	Reduce the temperature of the wastewater effluent prior to discharge. These may be very expensive and may be cost prohibitive.	• Cooling ponds • Spray ponds • • Waste heat recovery
9. Alternative NPDES Permit Strategies (Section 4.10)	If any of the above compliance strategies will not work, it may be possible to meet compliance using alternative permitting strategies, but these are often difficult to obtain.	• Site-specific criteria • Use attainability analysis • Variances
10. Higher-Energy Temperature Reduction Technologies (Section 4.11)	Tend to be highly energy-intensive and expensive. Should only be used as a last resort. If these are the only option available options, it may be possible to obtain an alternative compliance mechanism rather than build one of these.	• Cooling towers • Chillers