

Attachment A

Charles River Temperature Limits by Time of Year in the Zone of Passage and Habitat (ZPH)¹

Time of Year	Max. Temperature ²	Dissolved Oxygen	Location
March 30 - April 1*	Not to exceed 4 hour average ³ of 13.3°C (56.0°F) at each Monitoring Point ⁴ in the ZPH.	Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.	Monitoring Stations ⁷ 2, 3, 4, 5, 6, 7 and 8. Each Monitoring Point in the ZPH must meet this temperature limit.
April 2 - April 14*	Not to exceed a 4 hour average of 16.1°C (61.0°F) at each Monitoring Point.	Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.	Monitoring Stations 2, 3, 4, 5, 6, 7 and 8. Each Monitoring Point in the ZPH must meet this temperature limit.
April 15 - April 30**	Not to exceed 4 hour average of 18.3°C (65.0°F) at each Monitoring Point in the ZPH.	Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.	Monitoring Stations 2, 3, 4, 5, 6, 7 and 8. Each Monitoring Point in the ZPH must meet this temperature limit.
May 1 - May 10**	Not to exceed 4 hour average of 19.1°C (66.4°F) at each Monitoring Point in the ZPH.	Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.	Monitoring Stations 2, 3, 4, 5, 6, 7 and 8. Each Monitoring Point in the ZPH must meet this temperature limit.
May 1 - May 14**	Not to exceed a 4 hour average of 18.3°C (65.0°F) at each Monitoring Point.	Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.	Monitoring Station 8. Each Monitoring Points located at 2.0 ft. and 6.0 ft. must meet this temperature limit.
May 11 - May 14**	Not to exceed a 4 hour average of 20.0°C (68.0°F) at each Monitoring Point in the ZPH.	Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.	Monitoring Stations 2, 3, 4, 5, 6, and 7. Each Monitoring Point in the ZPH must meet this temperature limit.

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May 15 - May 22**	Not to exceed a 4 hour average of 20.0°C (68.0°F) at each Monitoring Point in the ZPH.	Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.	Monitoring Stations 2, 3, 4, 5, 6, 7 and 8. Each Monitoring Point in the ZPH must meet this temperature limit.
May 23 - May 31**	Not to exceed a 4 hour average of 21.1°C (70.0°F) at each Monitoring Point in the ZPH.	Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.	Monitoring Stations 2, 3, 4, 5, 6, 7 and 8. Each Monitoring Point in the ZPH must meet this temperature limit.
June 1 to June 7**	Not to exceed a 4 hour average of 21.1°C (70.0°F) at each Monitoring Point.	Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.	Monitoring Station 8. Each Monitoring Point, located at 2.0 ft. and 6.0 ft., must meet this temperature limit.
June 1 - June 7**	Not to exceed a 4 hour average of 22.2°C (72.0°F) at each Monitoring Point in the ZPH..	Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.	Monitoring Stations 2, 3, 4, 5, 6, and 7. Each Monitoring Point in the ZPH must meet this temperature limit.
June 8 - June 11	Not to exceed a 4 hour average of 23.9°C (75.0°F) at each Monitoring Point in the ZPH.	Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.	Monitoring Stations 2, 3, 4, 5, 6, 7 and 8. Each Monitoring Point in the ZPH must meet this temperature limit.

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<p>June 12 - Oct. 31</p> <p>Additional Special Day-Time Limits:</p> <p>Additional Special Night-Time Limits:</p>	<p>Not to exceed a 4 hour average of 28°C (83.0°F) at each Monitoring Point in the ZPH.</p> <p>A compliance temperature of 81° F or less shall be met in each of the four daytime temperature-averaging periods (4 am – 8 am; 8 am – 12 noon; 12 noon – 4 pm; and 4 pm – 8 pm) at either the six- or the twelve-foot monitoring depths at Monitoring Stations 2, 3, and 7.</p> <p>A compliance temperature of 81° F or less shall be met for at least one of the two nighttime temperature-averaging periods (8 pm – 12 midnight; or 12 midnight – 4 am) at the two-foot monitoring depth at Monitoring Stations 2, 3, & 7. These nighttime conditions do not have to be met within the same four-hour block at all three monitoring stations.</p>	<p>Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.</p> <p>Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.</p> <p>Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.</p>	<p>Monitoring Stations 2, 3, 4, 5, 6, 7 and 8.</p> <p>Monitoring Stations 2, 3 and 7</p> <p>Monitoring Stations 2, 3, and 7</p>
<p>November 1 to March 29 (chill period)** **</p>	<p>Not to exceed a 4 hour average of 10.0°C (50.0°F) at each Monitoring Point in the ZPH.</p>	<p>Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.</p>	<p>Monitoring Stations 2, 3, 4, 5, and 6</p>

Time of Year	Max. Temperature ²	Dissolved Oxygen	Location
<p>The Chill Period Shall Begin on:</p> <p>1) Nov. 1, providing that 1) Max. Temperature provisions are met (see next column)</p> <p>2) if not begun under condition 1) above, then between November 1 and November 14, when 2) Max Temperature provisions are met (see next column)</p> <p>3) if not begun under conditions 1) or 2) above, then beginning on November 15, provided that 3) Max Temp. provisions are met (see next column)</p>	<p>(The numbered items below correspond to the same numbered items in the “Time of Year” column)</p> <p>1) Maintain water temperatures in the In-Zone transect ZPH, based on a temperature average of the 2.0 ft. and 6.0 ft. Monitoring Points over a four hour period, at or below 10.0°C (50.0°F) for three consecutive days.</p> <p>2) Condition 1 (see Time of Year column) has been met, or when Monitoring Station 1 temperature averaged from the 2.0 ft. and 6.0 ft. Monitoring Points over a four hour period, is at or below 10.0°C (50.0°F) for three consecutive days.</p> <p>3) if conditions 1) and 2) have not been met, maintain the river temperatures in the ZPH at no more than 10.0°C (50.0°F). If background temperature exceeds 10.0°C (50.0°F), ZPH may rise to 1.1°C (2.0°F) above background temperature. Background temperature, for this purpose only, is defined as the warmer of the 2.0 ft. or 6.0 ft. Monitoring Points located at Monitoring Station 1. Once Max Temperature conditions 1) or 2) are met, this condition no longer applies.</p>	<p>Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.</p>	<p>Monitoring Stations 2, 3, (4, 5 and 6, if in the ZPH) based on a temperature average of Monitoring Points at 2.0 ft. and 6.0 ft.</p>

Time of Year	Max. Temperature ²	Dissolved Oxygen	Location
<p>The Chill Period will end on March 29th, when 149 days have met the Max. Temperature provisions:</p> <p>1) if by March 29th the temperatures have not met Max Temperature provisions for 149 days, then the Facility will operate in accordance with</p> <p>1) Max. Temperature provisions (see next column) until 149 days are met</p> <p>2) The chill period will end after being in effect for 149 days or on April 13th, whichever comes first</p>	<p>1) maintain the river temperatures in the ZPH at no more than 10.0°C (50.0°F). If background temperature exceeds 10.0°C (50.0°F), ZPH may rise to 1.1°C (2.0°F) above background temperature. Background temperature, for this purpose only, is defined as the warmer of the 2.0 ft. or 6.0 ft. Monitoring Points located at Monitoring Station 1.</p>	<p>Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH.</p>	<p>Monitoring Stations 2, 3, (4, 5 and 6, if in the ZPH) based on a temperature average of Monitoring Points at 2.0 ft. and 6.0 ft.</p>

Time of Year	Max. Temperature ²	Dissolved Oxygen	Location
All Year	1) The maximum temperature differential limit of 2.8°C (5°F) or “Delta T of 2.8 °C (5°F)” will be determined by comparing a) the 24 hour block time average (00:00 [midnight]-23:59) of temperatures recorded at Monitoring Points at 2.0 ft and 6.0 ft. (averaged together) at Station 1 with b) the 24 hour block average (00:00 [midnight]-23:59) of the temperatures recorded at Monitoring Points at 2.0 ft. and 6.0 ft. (averaged together) at each of the Monitoring Stations in the ZPH.	Not less than 5.0 mg/l ^{5,6} as the most recent instantaneous value recorded at least weekly at each Monitoring Point in the ZPH..	Compare the average of the 2.0 ft. and 6.0 ft. Monitoring Points at Monitoring Station 1, with the the 2.0 ft and 6.0 ft average at each of Monitoring Stations 2, 3, 4 and 8 in the ZPH. At Station 7 only, the average of the 6.0 ft and 12.0 ft Monitoring Points (instead of the 2.0 ft and 6.0 ft average) may be compared with the Monitoring Station 1 average, if this will result in compliance with the Delta T limit.

* The Start Date of this temperature limit will be the day after the yellow perch chill period ends, if later than March 29.

** If the Monitoring Station 1 (background station) temperature, averaged from the 2.0 ft and 6.0 ft Monitoring Points over a four hour period, exceeds the established limits identified for a given time period, then the Station 1 average temperature becomes the applicable temperature limit. Exception: For six non-consecutive 24 hour periods only during the time-frame from April 15 to June 7, if the Monitoring Station 1 average temperature is at or above the prescribed limit, the Facility will be allowed to operate such that the river temperatures downstream of Monitoring Station 1 in the ZPH are 1.1°C (2.0°F) above background up to a maximum temperature of 22.2°C (72.0°F); except for the June 1 to June 7 time period, where the temperature may be 1.1°C (2.0°F) above the Monitoring Station 1 average temperature up to a maximum temperature of 23.3°C (74.0°F). To ensure that all six (6) 24 hour periods are not used within a brief time frame, only three (3) exceedances will be allowed in any four week period. Unused days will not be carried over to future years.

*** If “Chill Period” temperature has not been met by November 1, then Chill Period Limits will be in effect when the Monitoring Station 1 (background station) temperature averaged from the 2.0 ft. and 6.0 ft. Monitoring Points over a four hour period, reach 10.0°C (50.0°F) or below for three consecutive days.

Footnotes:

1. The “Zone of Passage and Habitat” (ZPH) is the area of the lower Charles River Basin that is viable habitat (temperature and dissolved oxygen levels causing no acute or chronic effects), spanning from the upstream location of the Zone Boundary Transect to the downstream location of the New Charles River Dam and Locks (Attachment B). The ZPH is defined by compliance with temperature and dissolved oxygen limits at the following Monitoring Points: All Monitoring Points at Station 2 must be met at all times. This station is located upstream of the Longfellow Bridge, approximately half the distance between the Boston and Cambridge shores of the Charles River. The ZPH also includes, at all times, all Monitoring Points at Station 3 (Boston side). The ZPH includes, at all times, all Monitoring Points at Station 4, with the exception of the 2 foot monitoring point. The ZPH includes, at all times, a sufficient number of Monitoring Points at Stations 5 and 6 such that at least ½ of the total number of Monitoring Points that meet the dissolved oxygen limit of 5.0 mg/l in the In-Zone Transect (Stations 3, 4, 5 and 6) meet the temperature limit in effect. These Monitoring Points must be contiguous with Monitoring Points at Station 4. In addition, the ZPH includes, at all times that Monitoring Station 7 (located at the Science Museum lock) is required, at least two contiguous Monitoring Points (2.0 ft. and 6.0 ft., or 6.0 ft and 12.0 ft.). The ZPH also includes, at all times that Monitoring Station 8 (upstream of the New Charles River Dam and Locks) is required, the 2.0 ft. and 6.0 ft. Monitoring Point.
2. Should the 4 hour average temperature of the average of the 2.0 ft. and 6.0 ft. Monitoring Points of Monitoring Station 1 near the Boston University Bridge (Background Station) exceed any of the applicable temperature limits specified in this table for the corresponding time period, the temperature at Monitoring Station 1 will become the maximum temperature limit until the average temperature at 2.0 ft. and 6.0 ft. of the Monitoring Points at Monitoring Station 1 fall below the applicable maximum temperatures herein.
3. The 4 hour average consists of a minimum of one instantaneous measurement, at evenly spaced time intervals and taken within each of the four discrete one hour time periods (minimum of four total readings). If more than one reading is used within a discrete hour, the readings must be taken at evenly spaced time intervals within the hour (e.g. every 15 minutes) and the same number of readings, at the same temporal spacing, must be used for all hours within the four hour average block for the calculation of the four hour average temperature. Four hour averages shall be reported daily for the following four hour time blocks: day-time blocks 4:00 - 7:59, 8:00 - 11:59, 12:00 - 15:59, 16:00 - 19:59 and night-time blocks 20:00 - 23:59, 0:00 - 3:59.
4. A Monitoring Point is an underwater probe at a discrete depth which records temperature and other water quality parameters when specified.
5. Dissolved oxygen concentrations are for all depths except where indicated.
6. A dissolved oxygen concentration below 5 mg/l, when measured at a Monitoring Point required to be in the ZPH, is not a violation of the permit limit. If the dissolved oxygen concentration is less than 5 mg/l at any Monitoring Point, then that Monitoring Point is not considered to be located in suitable habitat. Therefore, that Monitoring Point will no longer be a temperature compliance point. In the case of the In-Zone Transect (Monitoring Stations 3, 4, 5 and 6) a Monitoring Point with a dissolved oxygen level below 5 mg/l will not be used in the calculation to verify that at least ½ of the Monitoring Points of the In-Zone Transect meet the temperature limit in effect for a corresponding time period.
7. A Monitoring Station is a vertical array of temperature and other sensors suspended by a buoy or attached to a permanent structure in the Charles River.