

IDEQ Staff Report

February 24, 2008

STAFF REPORT

To: Pend Oreille River Watershed Advisory Group

From: DEQ Coeur d'Alene Regional Office Staff

Subject: DEQ Analyses of the *Idaho Pend Oreille River Model, Model Scenario Simulations, Revised Technical Report, October 2007*

This document contains an evaluation of the Idaho Pend Oreille River Model results revised in October 2007 and their status related to Idaho water quality standards and Total Maximum Daily Load development.

The most recent Idaho Pend Oreille River Model results are reported by Portland State University in *Idaho Pend Oreille River Model, Model Scenario Simulations, Revised Technical Report EWR-01-07, October 2007*. This technical report is available on the Pend Oreille River Watershed Advisory Group (WAG) Web site: http://www.deq.idaho.gov/about/regions/pend_oreille_river_tribs_wag. Some figures referred to in this staff report are contained in the full technical report accessible on the WAG Web site.

A previous technical report on the Pend Oreille River Model (*Technical Report EWR-01-07, March 2007*) was assessed by IDEQ in staff report "Pend Oreille Modeling Results, version 3" dated July 20, 2007. Subsequently, an hydrologic mistake in the model simulations was discovered. Portland State University conducted amended model simulations and reported these results in *Technical Report EWR-01-07, October 2007*. This staff report presents the DEQ staff analysis of the revised model simulations for the Pend Oreille River temperature conditions.

Please contact Robert Steed, DEQ Surface Water Ecologist at (208) 769-1422 with questions about this report.

Idaho Water Quality Criteria and Their Application

Beneficial Uses

A **designated use** is a beneficial use assigned to a specific water body in Idaho Water Quality Rules. The designated uses for the Pend Oreille River from Pend Oreille Lake to the Washington border are *cold water aquatic life*, *primary contact recreation* and *domestic water supply* (IDAPA 58.01.02.110.05 & IDAPA 58.01.02.110.07).

The Clean Water Act requires Idaho to recognize **existing uses**, which are uses that are/were actually attained in a water body on or after November 28, 1975 — whether or not they are designated uses. Idaho presumes most undesignated waters will support *cold water aquatic life* and either *primary or secondary contact recreation*. These are termed **presumed uses**. Designated, existing, and presumed uses must all be protected.

In designating uses, Idaho takes into consideration the use and value of the water body for public water supply; for protection of fish, shellfish, and wildlife; and for recreational, agricultural, industrial, and navigational purposes. While there may be competing beneficial uses in a river or a stream, federal law requires DEQ to protect the most sensitive of the beneficial uses.

Water Quality Standards

Idaho numeric temperature water quality standards require an instantaneous maximum of 22 °C or less with a maximum daily average of no greater than 19 °C for protection of the *cold water aquatic life* beneficial use. This standard addresses an instantaneous maximum (22 °C) or a daily average maximum (19 °C), which apply anywhere in the water column. The standard does not allow for manipulation of water temperature data, such as the calculation of volume-weighted temperatures (IDAPA 58.01.02.250.02). There are additional, more stringent temperature criteria for protection of salmonid spawning; however, salmonid spawning has not been identified as a beneficial use in this section of the Pend Oreille River and those criteria do not apply in this case.

When determining beneficial use support status, IDEQ may allow a **10% exceedance provision** that gives less weight to departures from water quality criteria for infrequent (<10%) exceedance of the temperature criteria. This provision only applies for determination of beneficial use support status; it does not apply when determining whether a particular discharge or activity violates water quality standards, and it is only admissible if aquatic habitat and biological data indicate that aquatic life beneficial use are otherwise supported (IDAPA 58.01.02.053.03). The 10% exceedance provision is typically only applied during consideration of listing status and requires that biological parameters indicate full support. The 10% exceedance provision is not intended to increase compliance benchmarks. The beneficial use support status for the Pend Oreille River had been previously determined, and listed. There are no biological parameters

indicating full support; therefore, the analysis herein is a determination of water quality standards exceedance and the 10% exceedance provision is not being applied.

Air temperature exemption provision: Idaho Water Quality Standards allow for exceedances of the temperature criteria when the air temperature of a given day is extremely high (temperature must exceed the ninetieth percentile of a yearly series of the maximum weekly maximum air temperature data calculated over the historic record measured at the nearest weather reporting station) (IDAPA 58.01.02.080.03).

IDEQ obtained air temperature records for a thirty-year record (1974-2004) at the Sandpoint Experiment Station of the National Climatic Data Center (48°18' N, 116°33' W) to determine the temperature at which the air temperature exemption provision is in effect on the Pend Oreille River during the summer of 2004. The Sandpoint Experiment Station is one of 10 climate divisions in Idaho set by the National Climatic Data Center. Climate divisions are standardized regions within each state that designate areas of similar climate regimes (NCDC, 2000). From the 30 year record, IDEQ calculated the 90th percentile of the annual series of maximum weekly maximum water temperatures. This temperature threshold is 97.0 °F (33.9 °C). The dates in 2004 when this temperature exemption is in effect are July 17, 26 and August 2, 3,13,16,17.

Natural conditions provision: There is no impairment of beneficial uses or violation of water quality standards where natural background conditions exceed any applicable water quality criteria, and natural background conditions shall not alone be the basis for determination of impairment or violation. DEQ has set a 0.3 °C limit on human-caused increase in water temperature above natural background temperatures when the estimated natural background temperature is above the applicable numeric criteria. Furthermore, the 0.3 °C increase limit for temperature must be applied cumulatively; in other words, this is the maximum allowable increase from all sources combined when natural background temperatures exceed applicable numeric criteria (IDAPA 58.01.02.053.04).

Beneficial Use Support Status

The Pend Oreille River is divided into three segments (assessment units) between Railroad Bridge and Albeni Falls Dam, and each segment is considered water quality impaired and is included in Section 5 of the 2002 and the proposed 2008 Integrated Report (2008 Integrated Report is not approved by EPA at this time). Temperature is identified as the cause of impairment to the Cold Water Aquatic Life beneficial use of the river. Among cold water fish, elevated water temperatures may result in reduced reproduction and growth, increased mortality and disease risk, and overall population reduction. While the majority of cold-water organisms (esp. aquatic insects) have not been evaluated in this water body, three salmonid fish species in the Pend Oreille River are likely to have reduced population strength as a result of excess water temperatures: adfluvial bull trout (*Salvelinus confluentus*), adfluvial cutthroat trout (*Oncorhynchus clarki*), and resident brown trout (*Salmo trutta*). Adfluvial bull trout and cutthroat trout live in Pend Oreille Lake, and migrate into rivers or streams (Priest River Watershed) to spawn. Excess temperatures have been shown to reduce successful migration, which has resulted in reduced population strength for both of these species. Resident brown trout

inhabit the Pend Oreille River in the reach between 27 km and 39 km. The population strength and distribution of brown trout are likely to be reduced by elevated temperatures. Future studies to further evaluate the specific impacts of excess temperature to bull trout, cutthroat trout, and brown trout, as well as the other cold water organisms, should be conducted in order to quantify and determine the extent of beneficial use impairment.

Evaluation of Temperature Model Results and Idaho Water Quality Criteria

Contractors from Portland State University were hired to run a CE-QUAL-W2 model, which simulates “natural” and existing temperature conditions in the Pend Oreille River in Idaho between Railroad Bridge and Albeni Falls Dam. For the purposes of this evaluation, the modeling results for the 2004 calendar represent a typical, above-normal temperature year as classified by the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center.

To determine whether existing water temperatures are exceeding Idaho water quality standards, DEQ compared the output from two model scenarios; Scenario 1 represents existing conditions and Scenario 8 represents natural background conditions. Further analyses were conducted to evaluate the effects of point source discharges, tributaries, Albeni Falls Dam, and shade. These are described in the *Technical Report EWR-01-07, October 2007*.

In a January 25, 2007 WAG meeting, DEQ discussed with the WAG the need to select specific areas along the river for evaluating differences between existing and natural conditions. Preliminary evaluation areas were discussed with the WAG—locations along the river were suggested for use, at which the warmest (near the surface) and coolest (spill out of the lake or deep pocket in mid-river) conditions, and the entire water column (longitudinal cross-sections) could be evaluated. Evaluation areas were determined and reviewed by the technical modeling team, with members from EPA, IDEQ, Washington Department of Ecology, and the Kalispel Tribe. In a March 20, 2007 WAG meeting, IDEQ explained the evaluation areas selected (Table 2). Evaluation areas were selected to represent relatively deep areas in both the upper and lower portions of the Pend Oreille River. Evaluation areas at 10 km and at 35 km downstream from Railroad Bridge include surface, bottom and volume-weighted temperatures. Another evaluation area is the outflow of Albeni Falls Dam. Additional evaluation areas include longitudinal surface temperatures, and longitudinal cross sections. Ultimately, 13 areas were selected to evaluate whether existing temperatures exceed Idaho water quality standards (Table 1).

Table 1. Evaluation areas selected for the Idaho Pend Oreille River Model.

Evaluation Area	Longitudinal Location	Water Column Location	Numeric Criterion Type	Temperature Criterion	2004 Date(s)	Figure in Technical Report
1	10 km from Railroad Bridge	Surface	Daily Average	19 °C	All year	2
2	10 km from Railroad Bridge	Bottom	Daily Average	19 °C	All year	4
3	10 km from Railroad Bridge	Volume-weighted	Daily Average	N/A ¹	All year	5
4	35 km from Railroad Bridge	Surface	Daily Average	19 °C	All year	6
5	35 km from Railroad Bridge	Bottom	Daily Average	19 °C	All year	7
6	35 km from Railroad Bridge	Volume-weighted	Daily Average	N/A ¹	All year	8
7	Albeni Falls Dam outflow	Entire water column	Daily Maximum	22 °C	All year	9
8	10 km from Railroad Bridge	Surface	Daily Maximum	22 °C	All year	10
9	35 km from Railroad Bridge	Surface	Daily Maximum	22 °C	All year	12
10	Entire Longitudinal Profile	Surface	Daily Maximum	22 °C	August 16	14
11	Entire Longitudinal Profile	Volume-weighted	Daily Average	N/A ¹	August 16	15
12	Entire Longitudinal Cross-Section	Entire water column	Daily Maximum	22 °C	August 16	18
13	Entire Longitudinal Cross-Section	Entire water column	Daily Maximum	22 °C	August 8	21

¹Idaho does not have water quality criteria for volume-weighted water temperatures. A surrogate criterion of 19 °C was evaluated for informational purposes only and is based on the 19 °C criterion used to evaluate other daily average water temperatures.

Assumptions and Modeling error

For the purposes of this evaluation, the CE-QUAL-W2 modeling results¹ for the 2004 Calendar represent a typical, above-normal² temperature year (Typical, above-normal air temperature year as classified by the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center).

To represent “natural conditions” of the Pend Oreille River for the purposes of this document, a simulation was created based on current conditions with the effects of Albeni Falls Dam removed, wastewater discharges eliminated, tributary stream temperatures at cool background conditions (below water quality criteria), and Pend Oreille River bank shading density at 50% (50% shade density was chosen in order to be consistent; a sensitivity analysis was performed that demonstrated that Pend Oreille River bank shade density had no cumulative effect on Pend Oreille River water temperatures).

Any river system that contains some level of flow modification from natural conditions will experience some temperature change when the evaluation involves changes at a 1 meter scale at any instance in time.

Modeling error has not been evaluated when comparing modeling scenarios. The use of the model to predict relative effects is consistent with standard modeling practices. The absolute accuracy of the parameters and the modeling coefficients used in the model is always subject to some uncertainty. The absolute accuracy (AME) of the model is not critically important when comparing scenarios, because any error in the model results would be similar between scenarios. Most modeling protocols acknowledge this approach as a valid use of models.

Evaluation Area: 1

Longitudinal Location:	10 km from Railroad Bridge
Modeling Report Reference:	Figure 2, page 6
Water Column Location:	Surface
Temperature Criterion Type:	Daily Average
Temperature Criterion:	19 °C
Date:	All year
Evaluation Date:	January 2008

Interpretation of model results indicate that surface daily average water temperatures at this location exceed both the 19 °C numeric temperature criterion and the natural background temperatures.

Description of criteria exceedances:

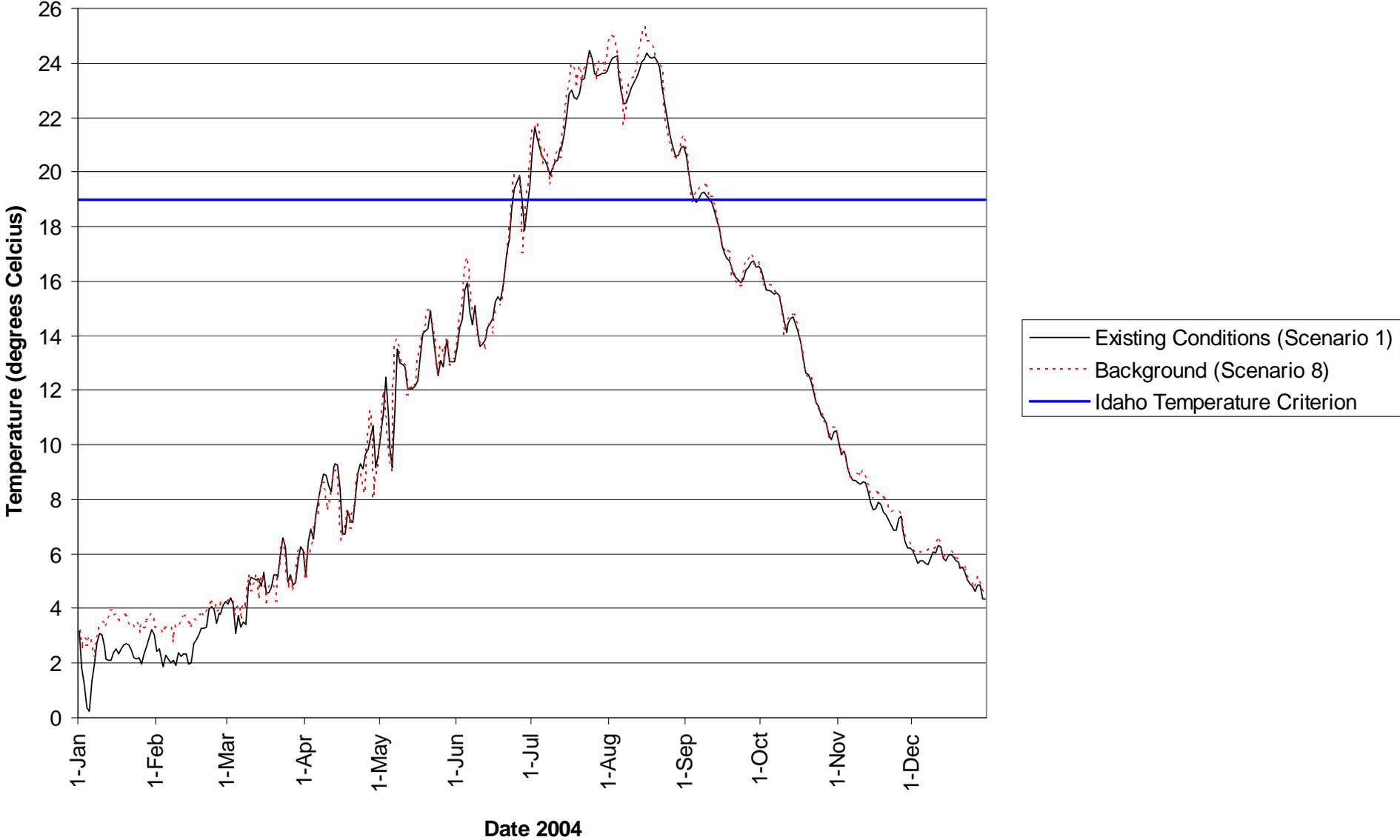
Existing conditions (Scenario 1): Existing surface daily average water temperatures (Scenario 1) exceed the Idaho 19 °C numeric temperature criterion on 74 days over the period June 24 to September 10. The maximum surface daily average water temperature under existing conditions was 24.47 °C on July 24.

Natural background conditions (Scenario 8): Natural background surface daily average water temperatures (Scenario 8) exceed the Idaho 19 °C numeric temperature criterion on 75 days over the period June 24 to September 11. The maximum surface daily average water temperature under natural background conditions was 25.33 °C on August 15.

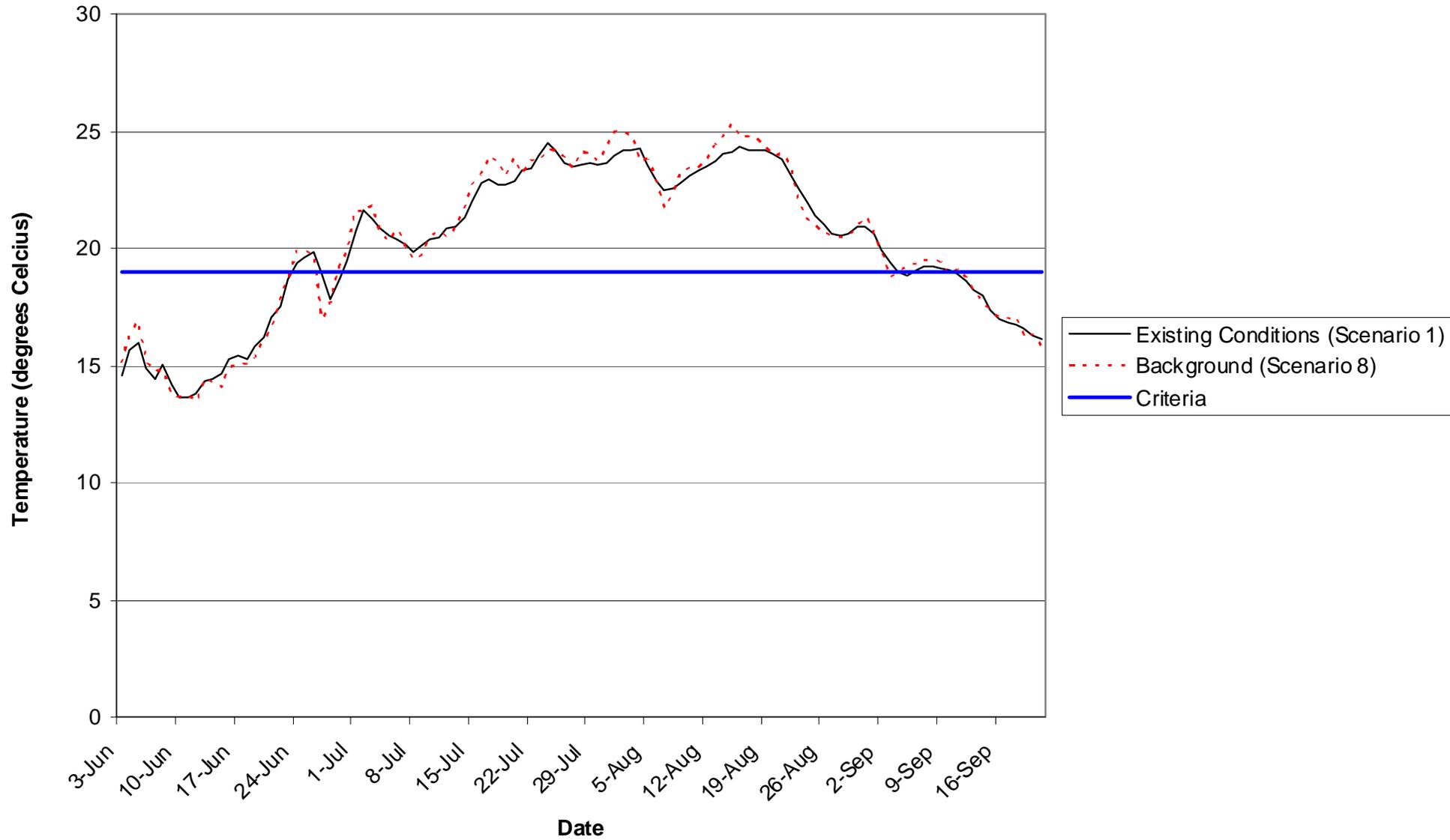
Combined comparisons: Existing surface daily average water temperatures (Scenario 1) exceeded natural background conditions (Scenario 8) by more than 0.3 °C and exceeded the numeric temperature criterion on 10 days from July 6 to September 3; the maximum exceedance was 0.79 °C on August 7. There were no exceedances on the dates exempt under the Idaho air temperature exemption provision.

Conclusion: Water temperatures at this location exceed Idaho water quality criteria.

Evaluation Area 1: Surface Daily Average Water Temperature, 10 km from Railroad Bridge



**Evaluation Area 1: Surface Daily Average Water Temperature,
10 km from Railroad Bridge, June 3 - Sept 21, 2004**



Evaluation Area:	2
Longitudinal Location:	10 km from Railroad Bridge
Modeling Report Reference:	Figure 4, page 7
Water Column Location:	Bottom
Temperature Criterion Type:	Daily Average
Temperature Criterion:	19 °C
Dates:	All year
Evaluation Date:	January 2008

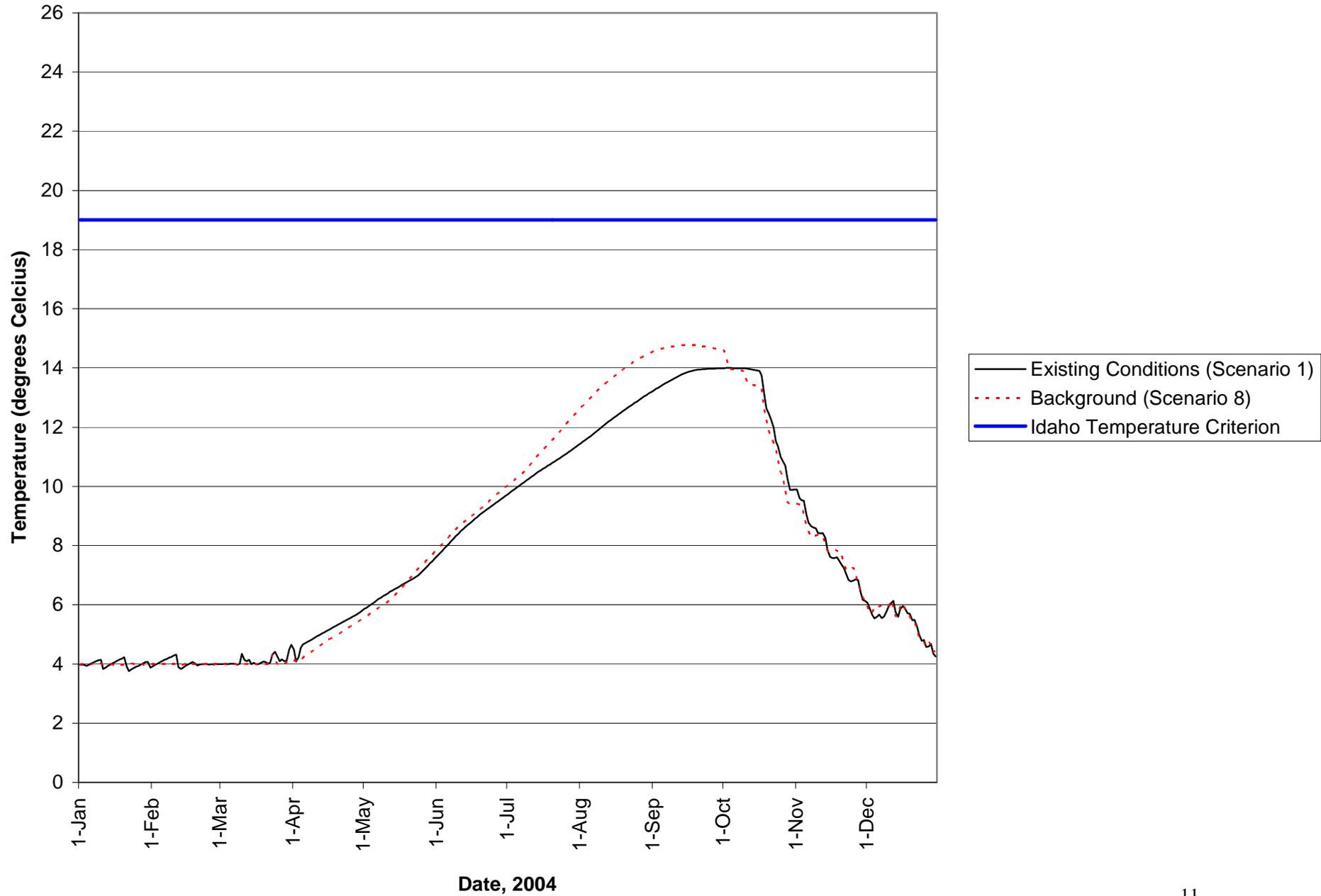
Interpretation of model results indicates that bottom daily average water temperatures at this location do not exceed the 19 °C numeric temperature criterion.

Description:

Under both existing conditions and natural background conditions, bottom daily average water temperatures do not exceed 15 °C. Current conditions at this location are predominantly cooler than estimated background conditions and are well below the Idaho numeric temperature criterion of 19 °C.

Conclusion: Water temperatures at this location DO NOT exceed Idaho water quality criteria.

Evaluation Area 2: Bottom Daily Average Water Temperature, 10 km from Railroad Bridge



Evaluation Area:	3
Longitudinal Location:	10 km from Railroad Bridge
Modeling Report Reference:	Figure 5, page 8
Water Column Location:	Volume-weighted
Temperature Criterion Type:	Daily Average
Temperature Criterion:	19 °C [<i>Idaho does not have temperature criteria for volume-weighted water temperatures. A surrogate criterion of 19 °C was evaluated for informational purposes only, and is based on the numeric criterion for other daily average water temperatures (e.g. surface, bottom).</i>]
Date:	All year
Evaluation Date:	January 2008

Interpretation of model results indicates that volume-weighted daily average water temperatures at this location exceed both the surrogate 19 °C numeric temperature criterion and the natural background temperatures.

Description of criteria exceedances:

Existing conditions (Scenario 1): Existing volume-weighted daily average water temperatures (Scenario 1) exceed the surrogate Idaho 19 °C numeric temperature criterion on 64 days over the period July 2 to September 3. The maximum volume-weighted daily average water temperature under existing conditions was 22.49 °C on August 19.

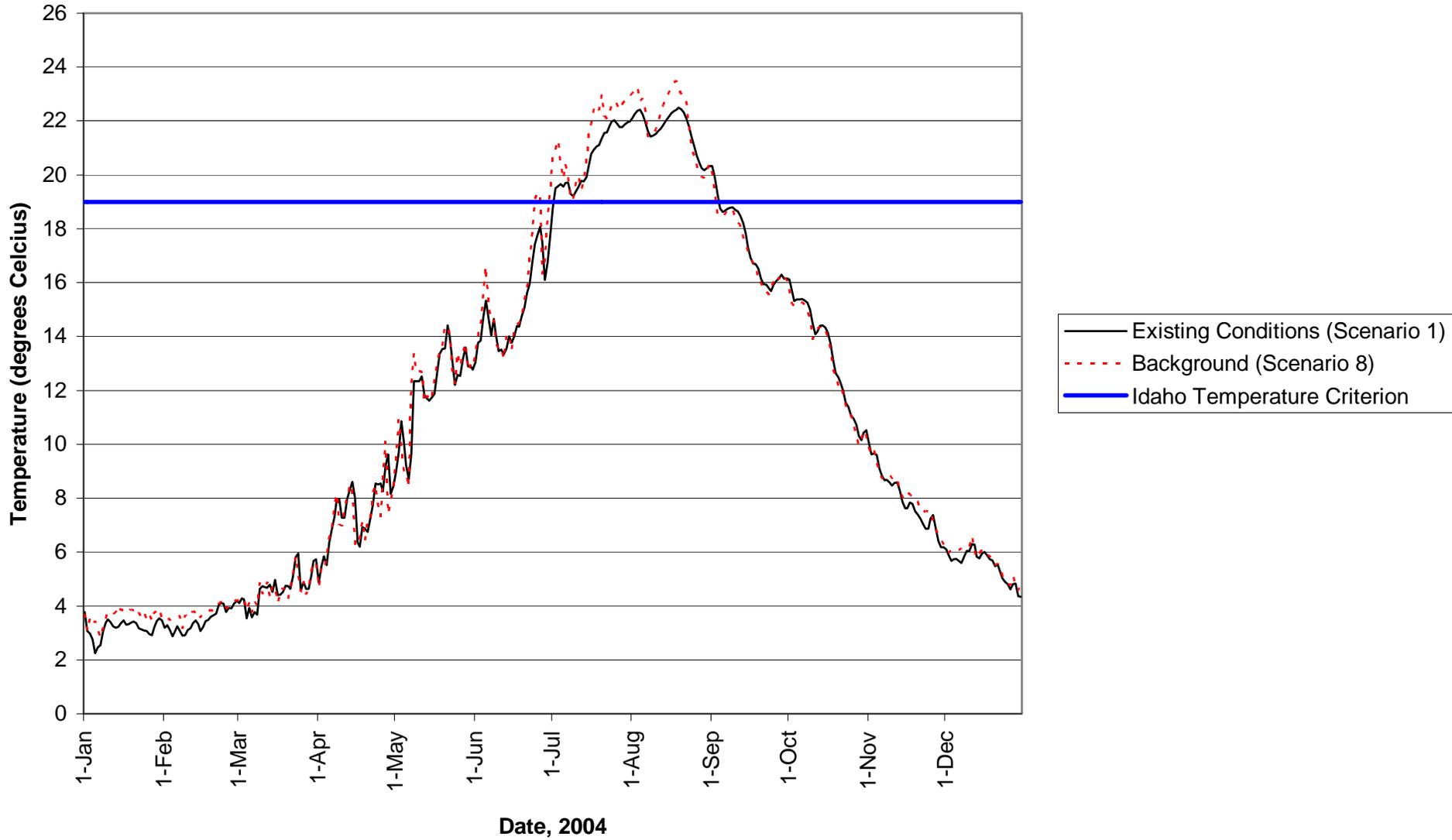
Natural background conditions (Scenario 8): Natural background volume-weighted daily average water temperatures (Scenario 8) exceed the surrogate Idaho 19 °C numeric temperature criterion on 68 days over the period June 24 to September 2. The maximum volume-weighted daily average water temperature under natural background conditions was 23.49 °C on August 18.

Combined comparisons: Existing volume-weighted daily average water temperatures (Scenario 1) exceeded natural background conditions (Scenario 8) by more than 0.3 °C and exceeded the numeric temperature criterion on 8 days from July 12 to September 3; the maximum exceedance was 0.77 °C on September 3. There were no exceedances on the dates exempt under the Idaho air temperature exemption provision.

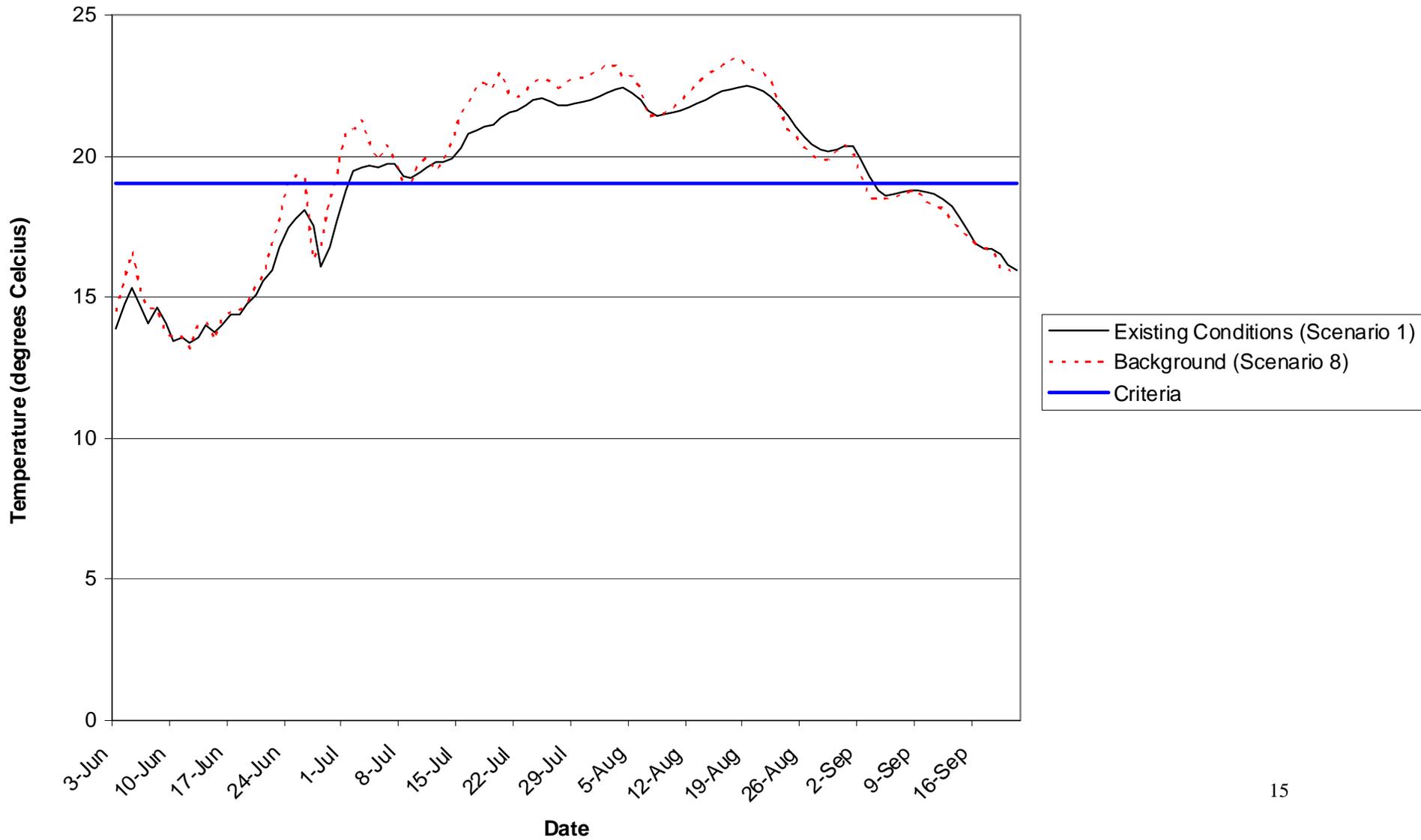
Conclusion: Water temperatures at this location would exceed Idaho water quality criteria if Idaho had a temperature standard addressing volume-weighted temperatures

and that standard required meeting a 19 °C numeric criterion or natural background conditions.

Evaluation Area 3: Volume-weighted Daily Average Water Temperature, 10 km from Railroad Bridge



**Evaluation Area 3: Volume-weighted Daily Average Water Temperature,
10 km from Railroad Bridge, June 3 - Sept 21, 2004**



Evaluation Area:	4
Longitudinal Location:	35 km from Railroad Bridge
Modeling Report Reference:	Figure 6, page 8
Water Column Location:	Surface
Temperature Criterion Type:	Daily Average
Temperature Criterion:	19 °C
Date:	All year
Evaluation Date:	January 2008

Interpretation of model results indicate that surface daily average water temperatures at this location exceed both the 19 °C numeric temperature criterion and the natural background temperatures.

Description of criteria exceedances:

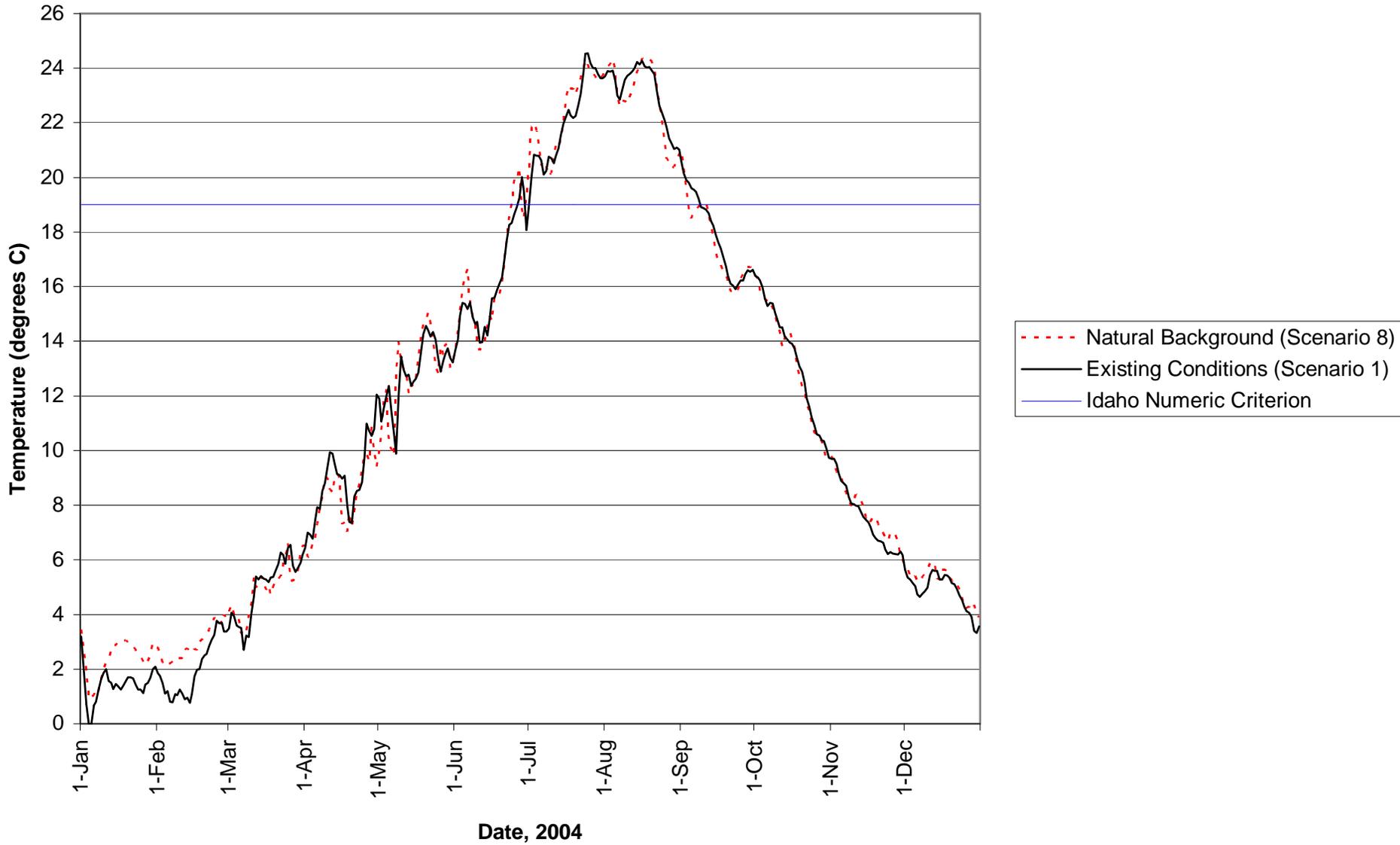
Existing conditions (Scenario 1): Existing surface daily average water temperatures (Scenario 1) exceed the Idaho 19 °C numeric temperature criterion on 72 days over the period June 27 to September 8. The maximum surface daily average water temperature under existing conditions was 24.54 °C on July 25.

Natural background conditions (Scenario 8): Natural background surface daily average water temperatures (Scenario 8) exceed the Idaho 19 °C numeric temperature criterion on 73 days over the period June 24 to September 11. The maximum surface daily average water temperature under natural background conditions was 24.36 °C on August 16.

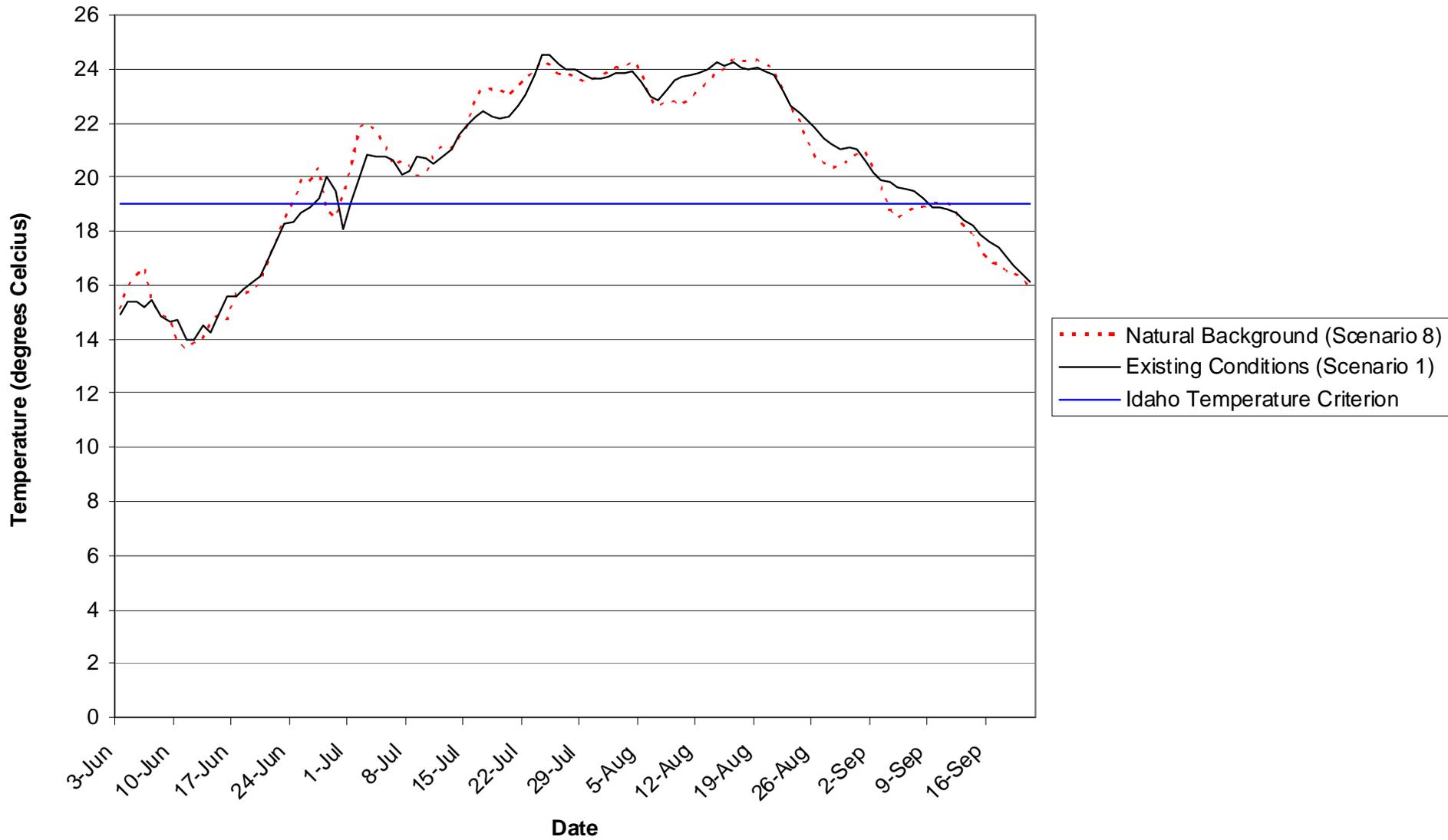
Combined comparisons: Existing surface daily average water temperatures (Scenario 1) exceeded natural background conditions (Scenario 8) by more than 0.3 °C and exceeded the numeric temperature criterion on 21 days from June 28 to September 3; the maximum exceedance was 1.17 °C on June 26. Two of these days (July 26 and August 13) are exempt from exceedance under the Idaho air temperature exemption provision. Therefore, there were 19 days of water quality criteria exceedance.

Conclusion: Water temperatures at this location exceed Idaho water quality criteria.

Evaluation Area 4: Surface Daily Average Water Temperature, 35km from Railroad Bridge



Evaluation Area 4: Surface Daily Average Water Temperature,
35 km from Railroad Bridge, June 3 - Sept 21, 2004



Evaluation Area:	5
Longitudinal Location:	35 km from Railroad Bridge
Modeling Report Reference:	Figure 7, page 9
Water Column Location:	Bottom
Temperature Criterion Type:	Daily Average
Temperature Criterion:	19 °C
Date:	All year
Evaluation Date:	January 2008

Interpretation of model results indicates that daily average water temperatures at this location exceed both the 19 °C numeric temperature criterion and the natural background temperatures.

Description of criteria exceedances:

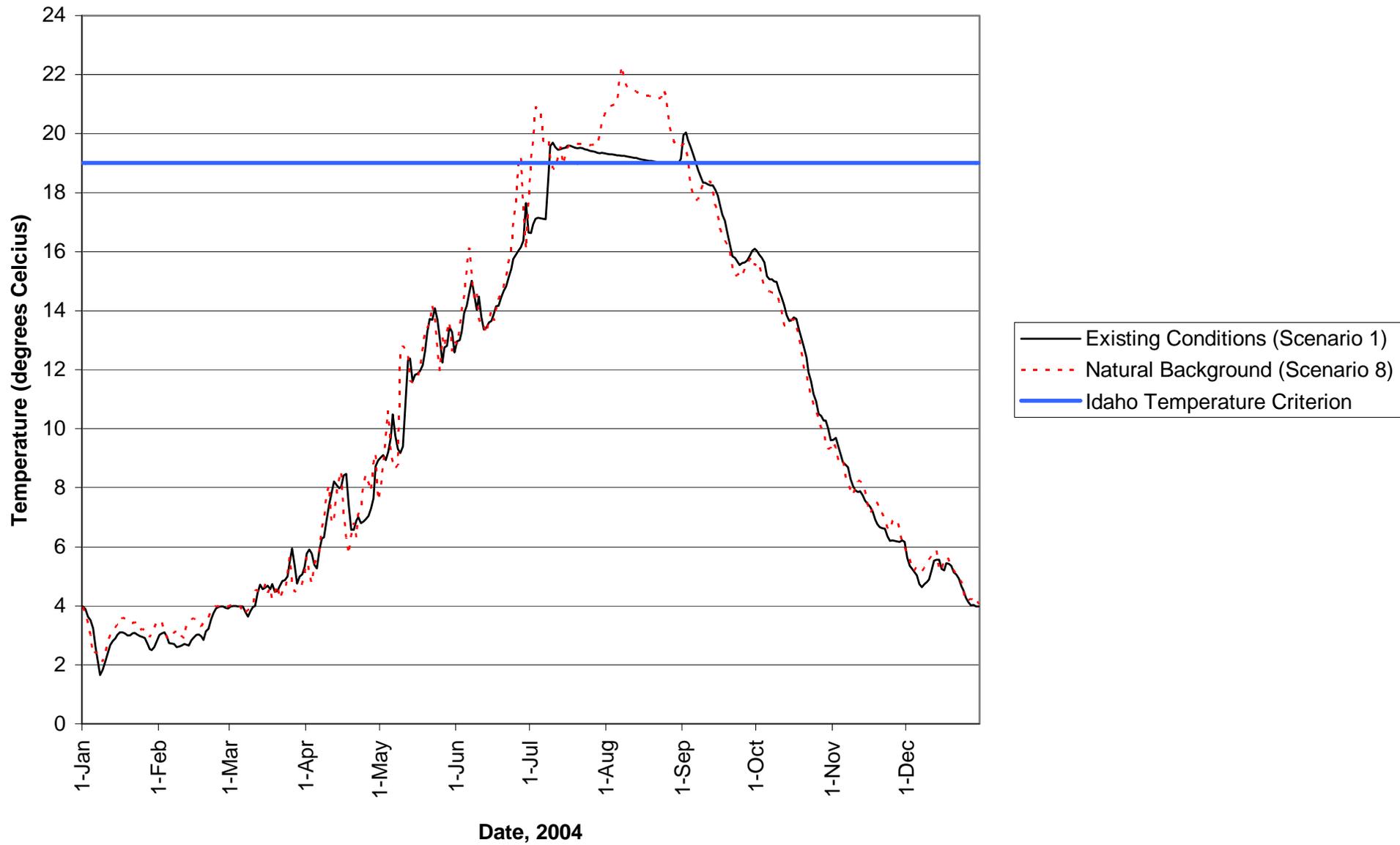
Existing conditions (Scenario 1): Existing daily average water temperatures (Scenario 1) exceed the Idaho 19 °C numeric temperature criterion on 57 days over the period July 9 to September 6. The maximum daily average water temperature under existing conditions was 20.04 °C on September 2.

Natural background conditions (Scenario 8): Natural background daily average water temperatures (Scenario 8) exceed the Idaho 19 °C numeric temperature criterion on 63 days over the period June 27 to September 3. The maximum daily average water temperature under natural background conditions was 22.29 °C on August 7.

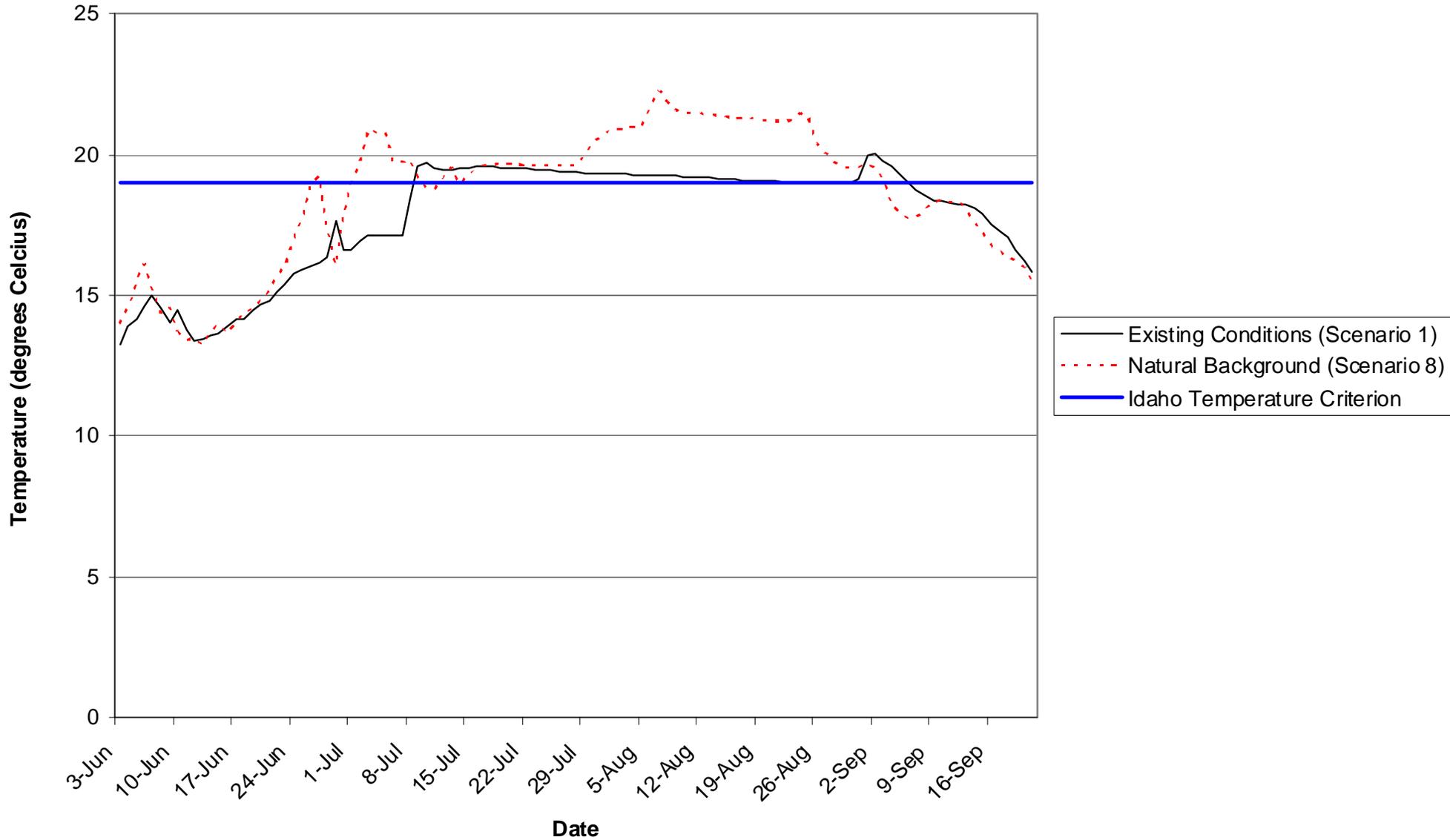
Combined comparisons: Existing daily average water temperatures (Scenario 1) at the bottom of the 35 km pool exceeded natural background conditions (Scenario 8) by more than 0.3 °C and exceeded the numeric temperature criterion on 9 days from to July 9 to September 6; the maximum exceedance was 1.40 °C on September 5. There were no exceedances on the dates exempt under the Idaho air temperature exemption provision.

Conclusion: Water temperatures at this location exceed Idaho water quality criteria.

Evaluation Area 5: Bottom Daily Average Water Temperature, 35 km from Railroad Bridge



Evaluation Area 5: Bottom Daily Average Water Temperature, 35 km from Railroad Bridge, June 3 - Sept 21, 2004



Evaluation Area:	6
Longitudinal Location:	35 km from Railroad Bridge
Water Column Location:	Volume-weighted
Modeling Report Reference:	Figure 8, page 10
Temperature Criterion Type:	Daily Average
Temperature Criterion:	19 °C [<i>Idaho does not have temperature criteria for volume-weighted water temperatures. A surrogate criterion of 19 °C was evaluated for informational purposes only, and is based on the numeric criterion for other daily average water temperatures (e.g. surface, bottom).</i>]
Date:	All year
Evaluation Date:	January 2008

Interpretation of model results indicates that volume-weighted daily average water temperatures at this location exceed both the surrogate 19 °C numeric temperature criterion and the natural background temperatures.

Description of criteria exceedances:

Existing conditions (Scenario 1): Existing volume-weighted daily average water temperatures (Scenario 1) exceed the surrogate Idaho 19 °C numeric temperature criterion on 66 days over the period July 3 to September 6. The maximum volume-weighted daily average water temperature under existing conditions was 22.46 °C on August 19.

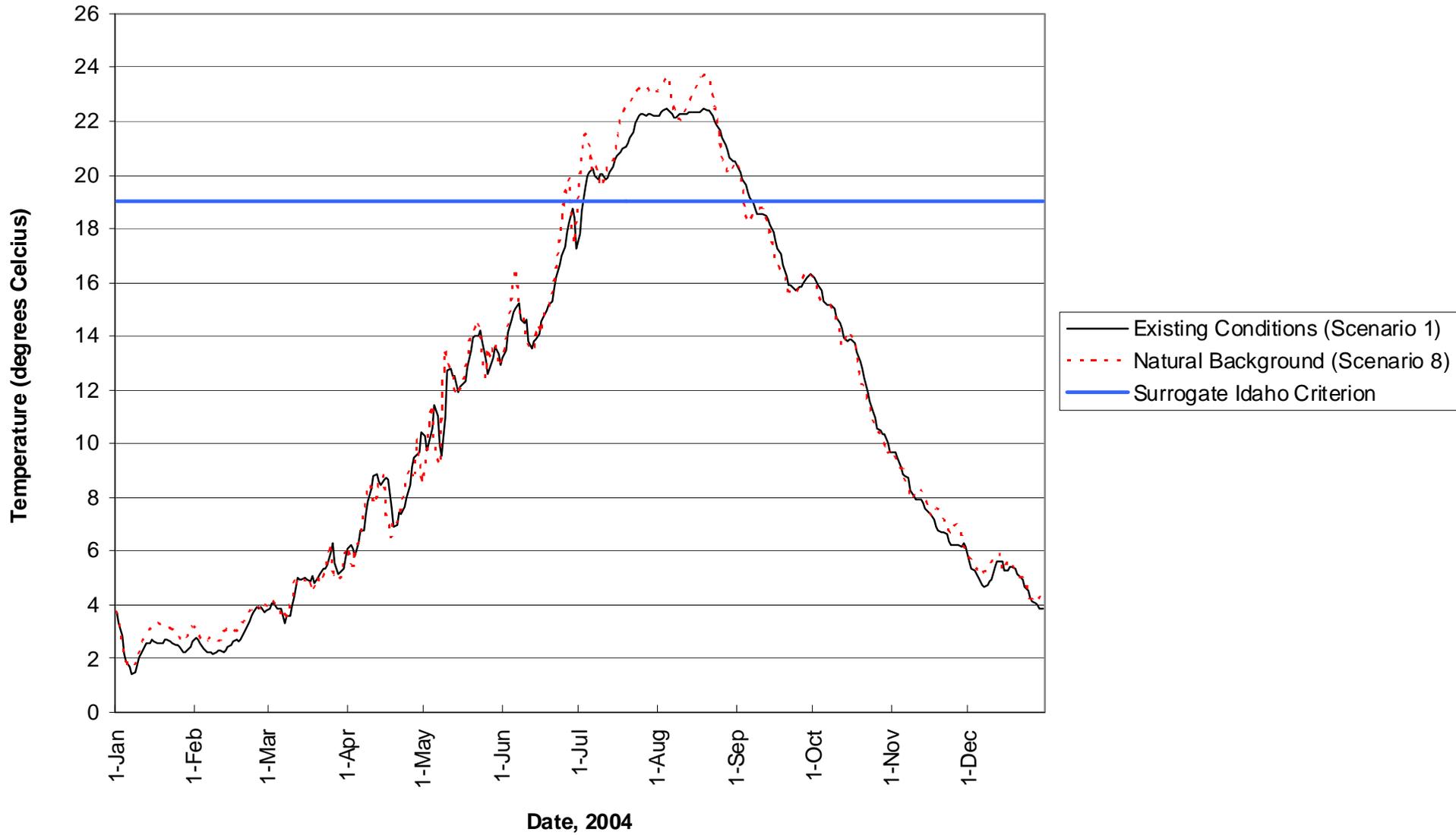
Natural background conditions (Scenario 8): Natural background volume-weighted daily average water temperatures (Scenario 8) exceed the surrogate Idaho 19 °C numeric temperature criterion on 68 days over the period June 25 to September 3. The maximum volume-weighted daily average water temperature under natural background conditions was 23.72 °C on August 19.

Combined comparisons: Existing volume-weighted daily average water temperatures (Scenario 1) exceeded natural background conditions (Scenario 8) by more than 0.3 °C and exceeded the numeric temperature criterion on 2 days (July 9 and August 26); the maximum exceedance was 0.86 °C on August 26. There were no exceedances on the dates exempt under the Idaho air temperature exemption provision.

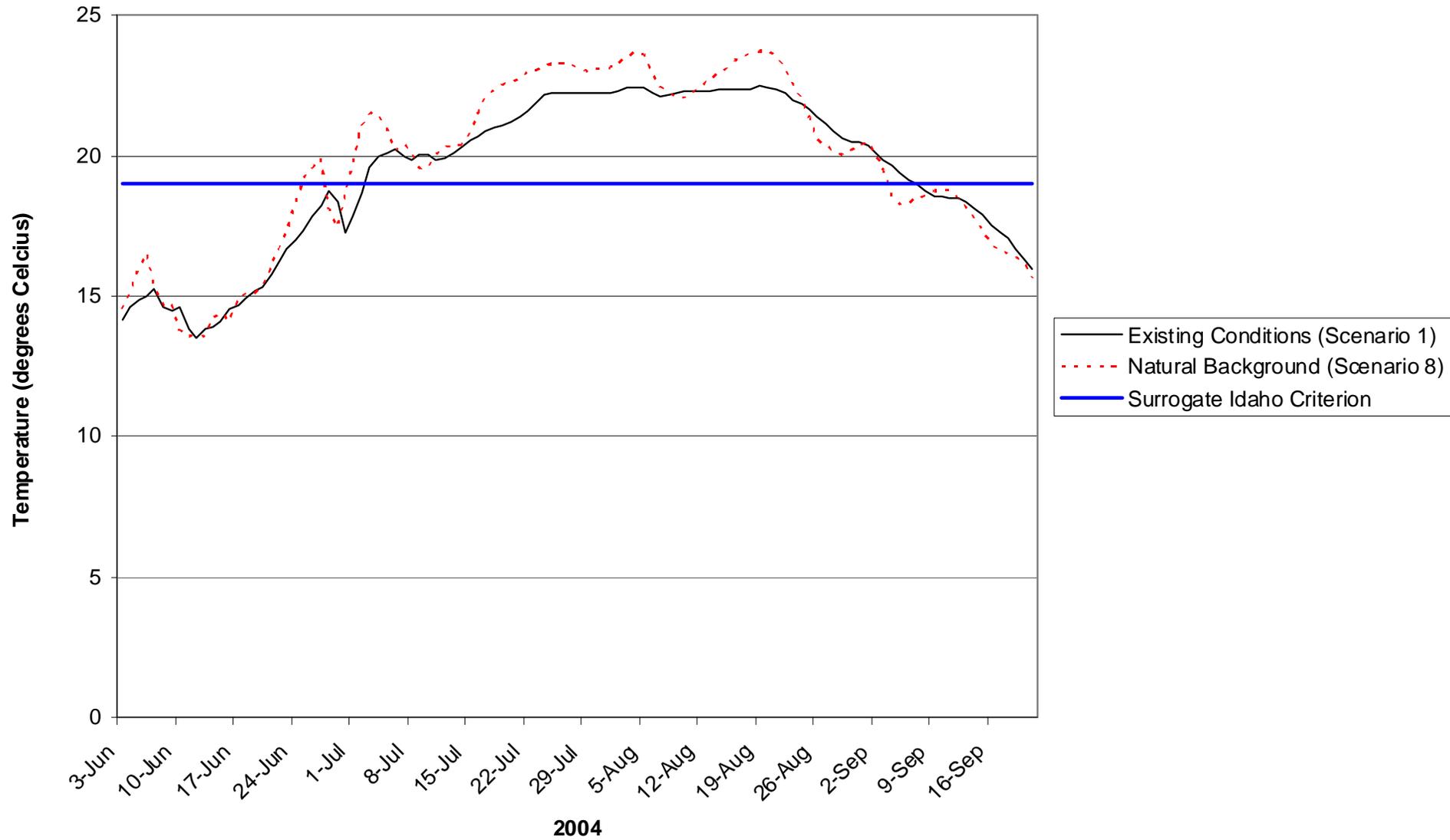
Conclusion: Water temperatures at this location would exceed Idaho water quality criteria if Idaho had a temperature standard addressing volume-weighted temperatures

and that standard required meeting a 19 °C numeric criterion or natural background conditions.

Evaluation Area 6: Volume-weighted Daily Average Water Temperature, 35 km from Railroad Bridge



**Evaluation Area 6: Volume-weighted Daily Average Water Temperature,
35 km from Railroad Bridge, June 3 - Sept 21, 2004**



Evaluation Area:	7
Longitudinal Location:	Albeni Falls Outflow
Modeling Report Reference:	Figure 9, page 12
Water Column Location:	Albeni Falls Dam Outflow
Temperature Criterion Type:	Daily Maximum
Temperature Criterion:	22 °C
Date:	All year
Evaluation Date:	February 2008

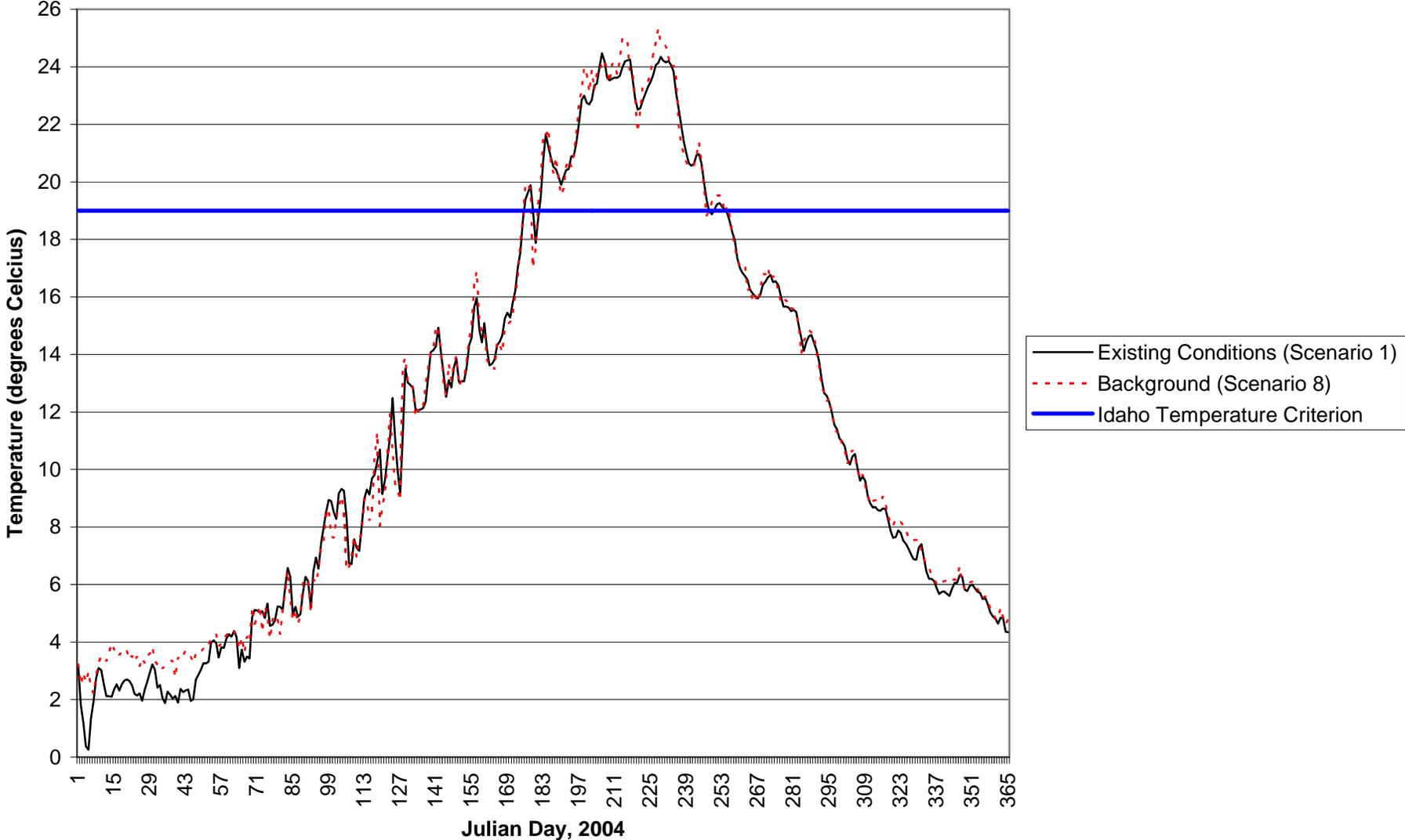
Interpretation of model results indicate that surface daily maximum water temperatures at this location do not exceed either the 22 °C numeric temperature criterion and the natural background temperatures.

Description of criteria exceedances:

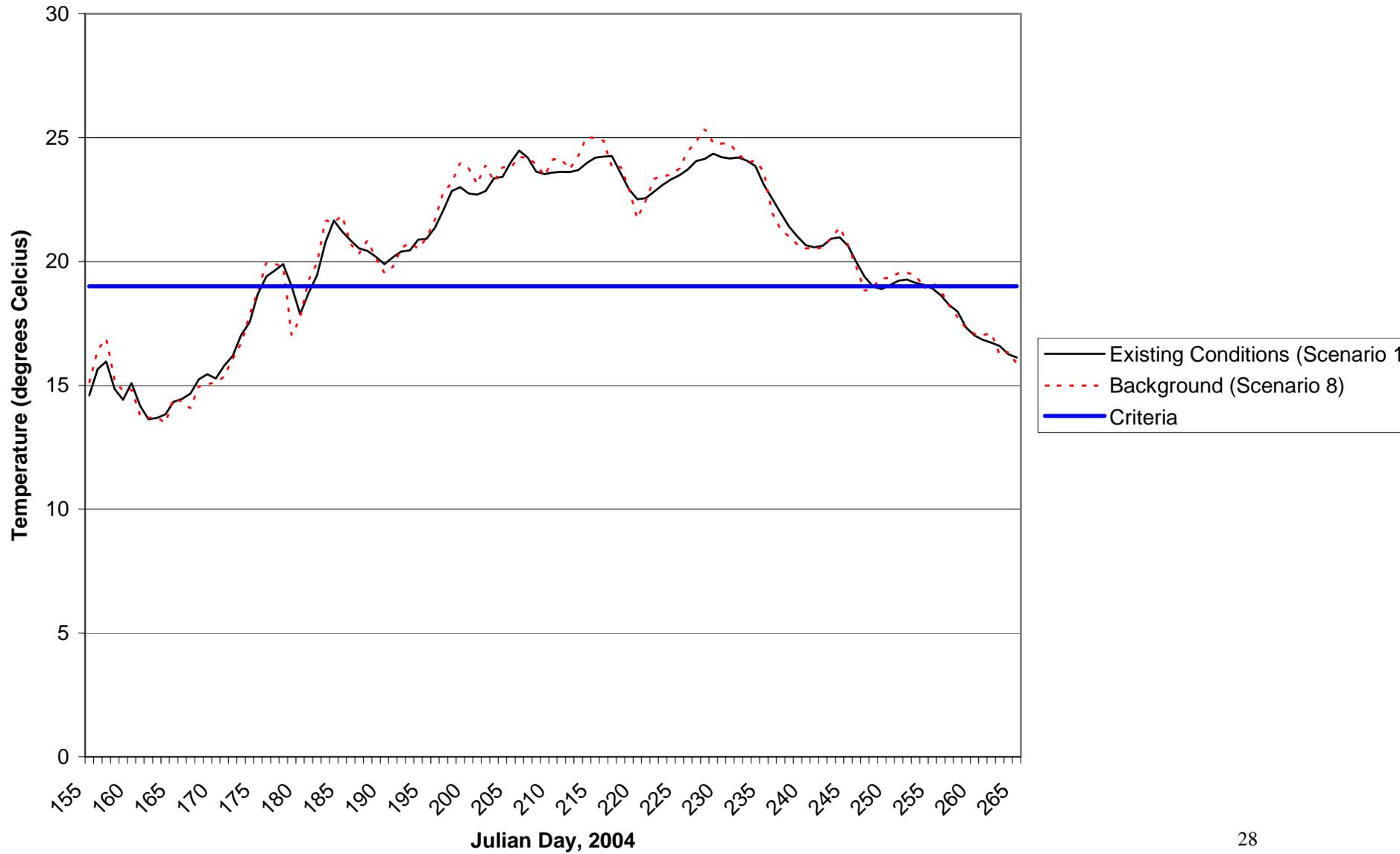
Under both existing conditions and natural background conditions, Albeni Falls Dam outflow water temperatures do not exceed both the Daily Maximum criteria of 22° C and the Natural Conditions Temperature. .

Conclusion: Water temperatures at this location DO NOT exceed Idaho water quality criteria.

Evaluation Area 7: Albeni Falls Outflow Water Temperature



Evaluation Area 7: Albeni Falls Outflow Water Temperature



Evaluation Area:	8
Longitudinal Location:	10 km from Railroad Bridge
Modeling Report Reference:	Figure 10, page 12
Water Column Location:	Surface
Temperature Criterion Type:	Daily Maximum
Temperature Criterion:	22 °C
Date:	All year
Evaluation Date:	January 2008

Interpretation of model results indicate that surface daily maximum water temperatures at this location exceed both the 22 °C numeric temperature criterion and the natural background temperatures.

Description of criteria exceedances:

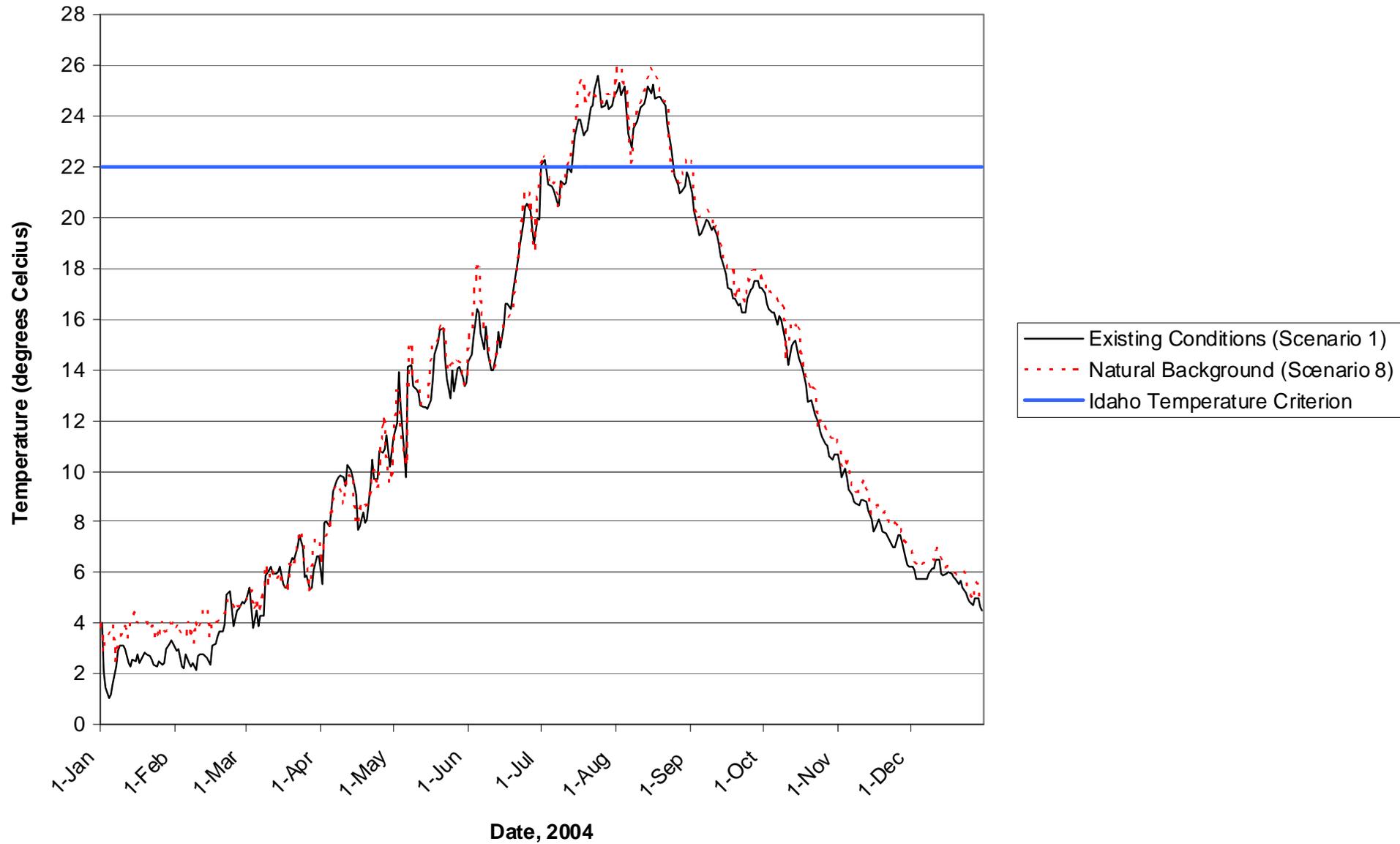
Existing conditions (Scenario 1): Existing surface daily maximum water temperatures (Scenario 1) exceed the Idaho 22 °C numeric temperature criterion on 44 days from July 1 to August 24, 2004. The maximum surface daily maximum water temperature under existing conditions was 25.62 °C on July 24.

Natural background conditions (Scenario 8): Natural background surface daily maximum water temperatures (Scenario 8) exceed the Idaho 22 °C numeric temperature criterion on 49 days from July 1 to September 1, 2004. The maximum surface daily maximum water temperature under natural background conditions was 25.97 °C on August 2.

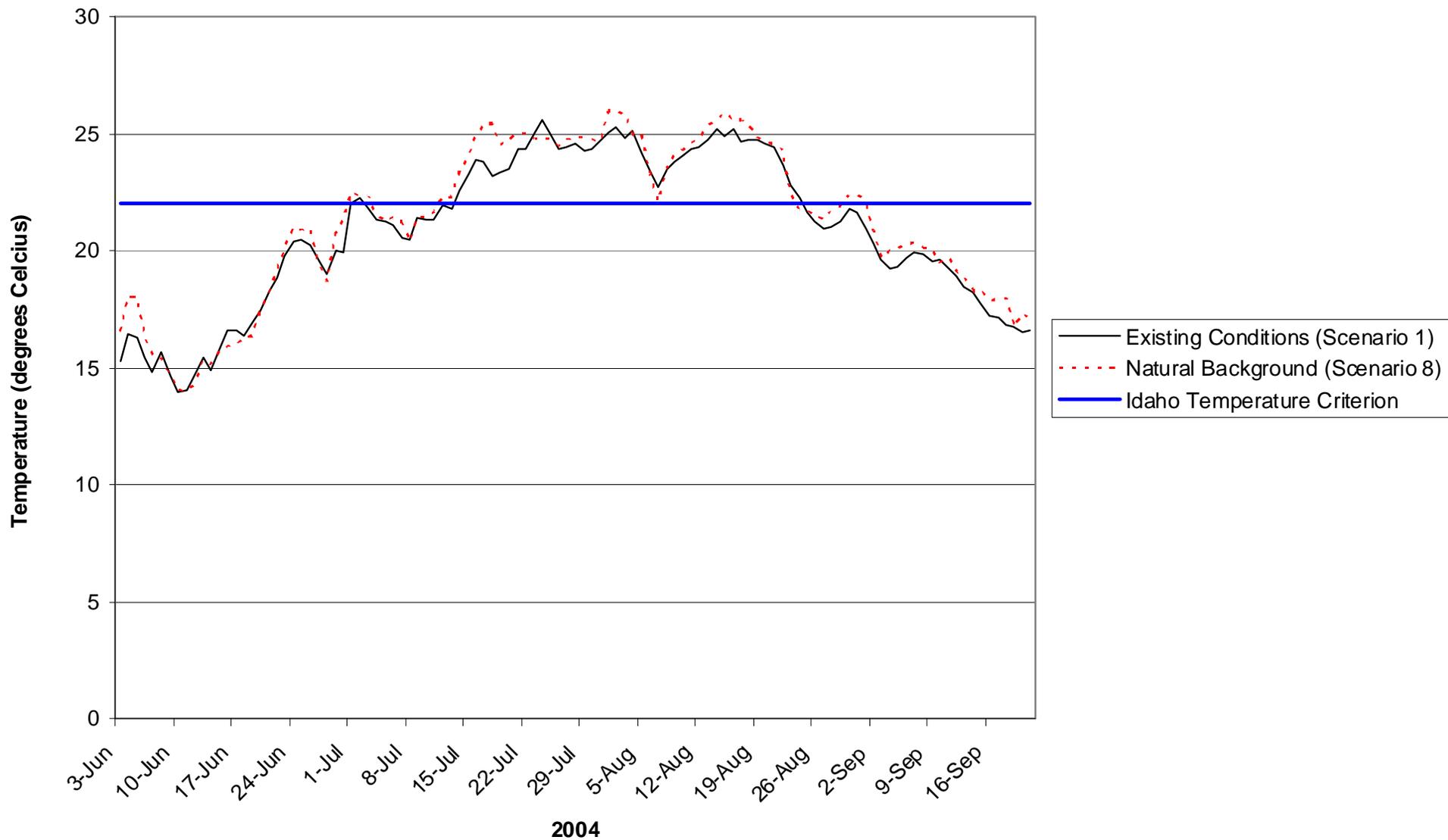
Combined comparisons: Existing surface daily maximum water temperatures (Scenario 1) exceeded natural background conditions (Scenario 8) by more than 0.3 °C and exceeded the numeric temperature criterion on 4 days (July 24 and August 7, 23 and 24); the maximum exceedance was 0.82 °C on July 24. There were no exceedances on the dates exempt under the Idaho air temperature exemption provision.

Conclusion: Water temperatures at this location exceed Idaho water quality criteria.

Evaluation Area 8: Surface Daily Maximum Water Temperature, 10 km from Railroad Bridge



Evaluation Area 8: Surface Daily Maximum Water Temperature, 10 km from Railroad Bridge, June 3 - Sept 21, 2004



Evaluation Area:	9
Longitudinal Location:	35 km from Railroad Bridge
Modeling Report Reference:	Figure 12, page 13
Water Column Location:	Surface
Temperature Criterion Type:	Daily Maximum
Temperature Criterion:	22 °C
Date:	All year
Evaluation Date:	January 2008

Interpretation of model results indicate that surface daily maximum water temperatures at this location exceed both the 22 °C numeric temperature criterion and the natural background temperatures.

Description of criteria exceedances:

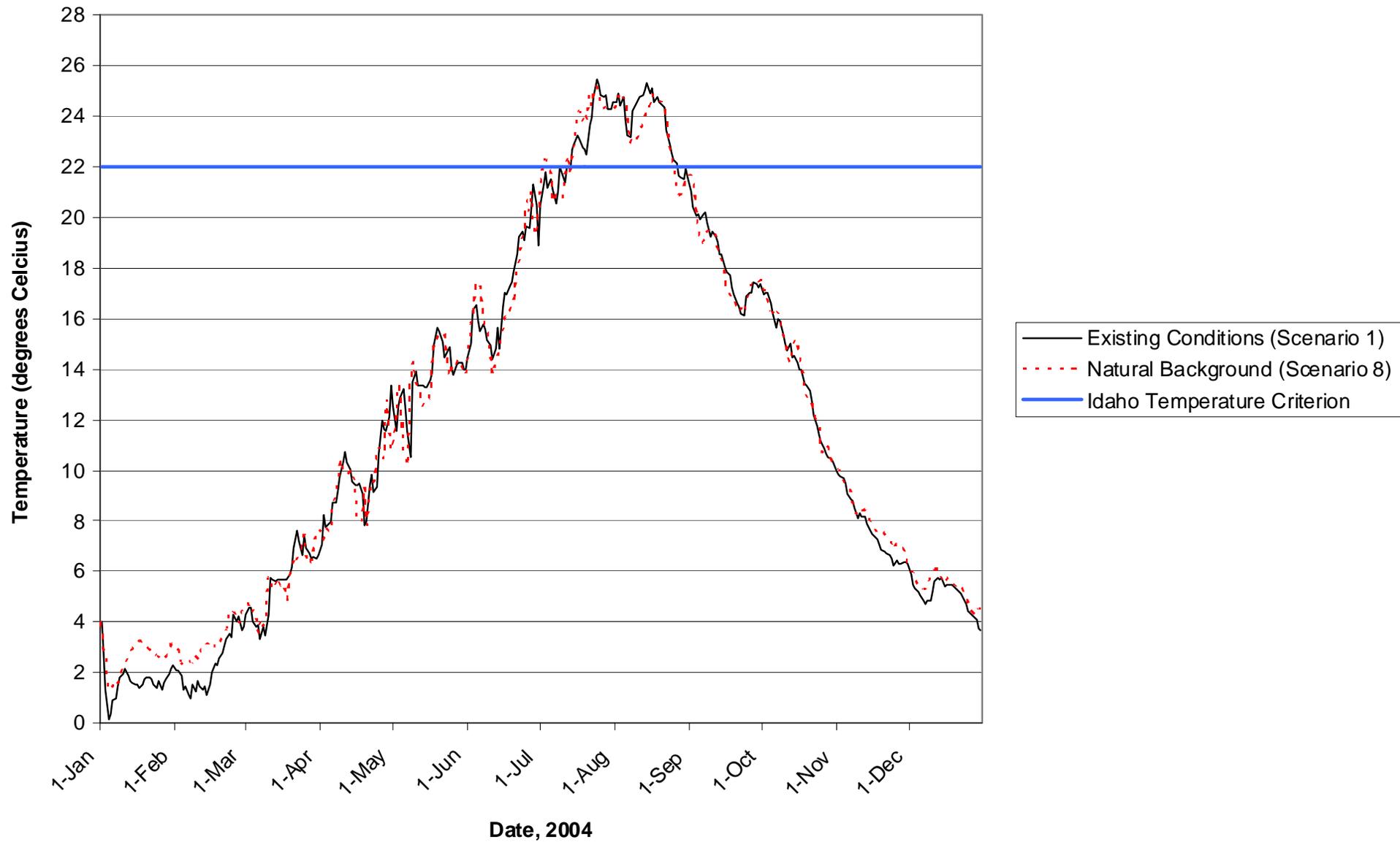
Existing conditions (Scenario 1): Existing surface daily maximum water temperatures (Scenario 1) exceed the Idaho 22 °C numeric temperature criterion on 45 days over the period July 9 to August 26. The maximum surface daily maximum water temperature under existing conditions was 25.46 °C on July 24.

Natural background conditions (Scenario 8): Natural background surface daily maximum water temperatures (Scenario 8) exceed the Idaho 22 °C numeric temperature criterion on 46 days over the period July 2 to August 24. The maximum surface daily maximum water temperature under natural background conditions was 25.19 °C on July 24.

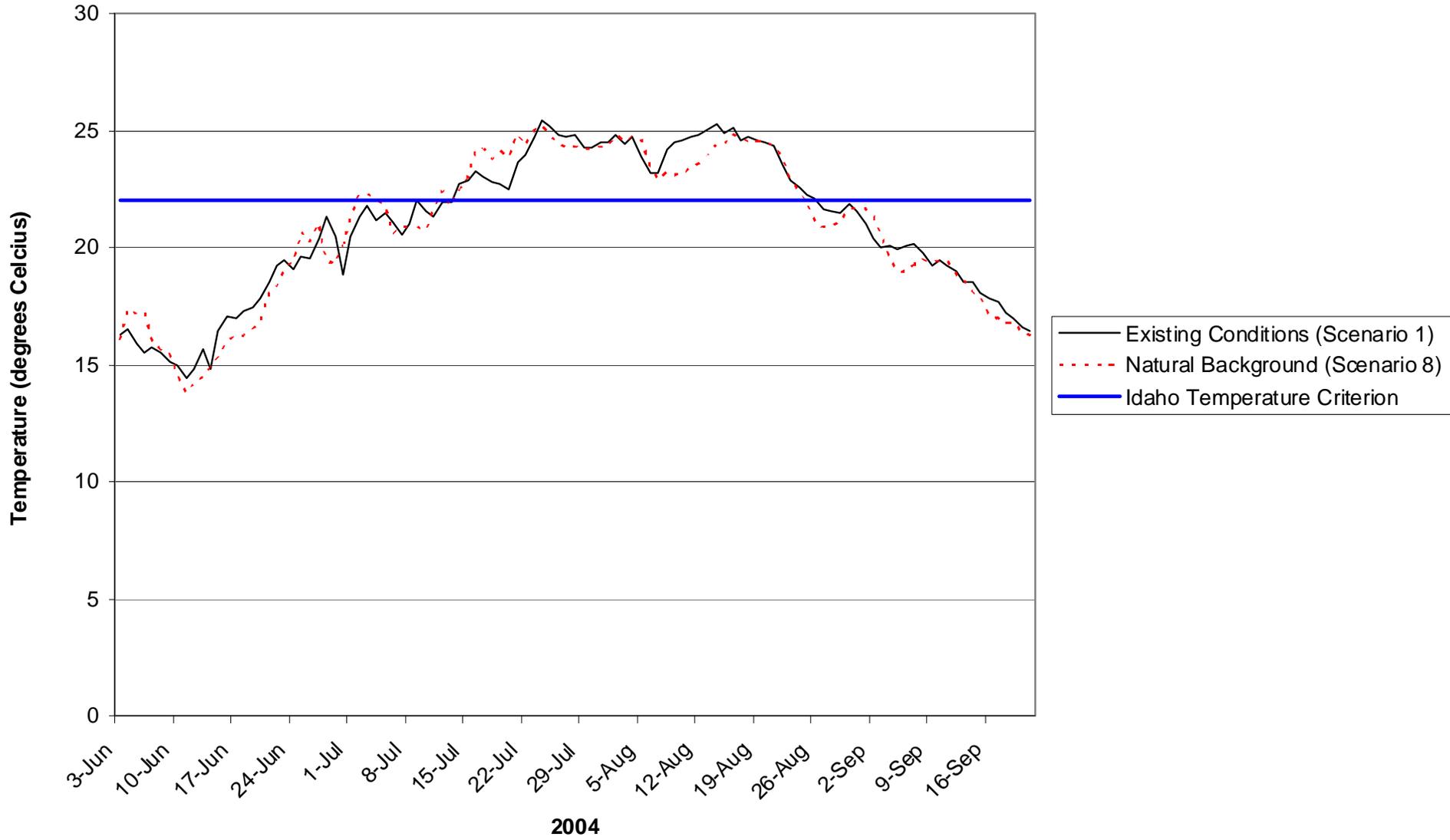
Combined comparisons: Existing surface daily average water temperatures (Scenario 1) exceeded natural background conditions (Scenario 8) by more than 0.3 °C and exceeded the numeric temperature criterion on 15 days from July 9 to August 26; the maximum exceedance was 1.46 °C on August 10. Three of the days (July 26, Aug 13, and Aug 15) are exempt from exceedance due to the Idaho air temperature exceedance provision. Therefore, there are 12 days during which Idaho water quality criteria are exceeded.

Conclusion: Water temperatures at this location exceed Idaho water quality criteria.

Evaluation Area 9: Surface Daily Maximum Water Temperature, 35 km from Railroad Bridge



**Evaluation Area 9: Surface Daily Maximum Water Temperature,
35 km from Railroad Bridge, June 3 - Sept 21, 2004**



Evaluation Area:	10
Longitudinal Location:	Longitudinal Profile
Modeling Report Reference:	Figure 14, page 15
Water Column Location:	Surface
Temperature Criterion Type:	Daily Maximum
Temperature Criterion:	22 °C
2004 Date:	August 16, 2004
Evaluation Date:	January 2008

Conclusion: Water temperatures at this location do not exceed Idaho water quality criteria due to the Idaho air temperature exceedance provision on August 16, 2004.

Evaluation Area:	11
Longitudinal Location:	Longitudinal Profile
Modeling Report Reference:	Figure 15, page 15
Water Column Location:	Volume-weighted
Temperature Criterion Type:	Daily Average
Temperature Criterion:	<i>19 °C [Idaho does not have temperature criteria for volume-weighted water temperatures. A surrogate criterion of 19 °C was evaluated for informational purposes only, and is based on the numeric criterion for other daily average water temperatures (e.g. surface, bottom).]</i>
2004 Date:	August 16, 2004
Evaluation Date:	January 2008

Conclusion: Water temperatures at this location do not exceed Idaho water quality criteria due to the Idaho air temperature exceedance provision on August 16, 2004

Evaluation Area:	12
Longitudinal Location:	Longitudinal Cross-section
Water Column Location:	Entire Water Column
Temperature Criterion Type:	Daily Maximum
Temperature Criterion:	22 °C
2004 Date:	August 16, 2004
Evaluation Date:	January 2008

Conclusion: Water temperatures at this location do not exceed Idaho water quality criteria due to the Idaho air temperature exceedance provision on August 16, 2004

Evaluation Area:	13
Longitudinal Location:	Longitudinal Cross-section
Modeling Report References	Figures 19-21 pg 18, 19 and Figures 59,60 A1
Water Column Location:	Entire Water Column
Temperature Criterion Type:	Daily Maximum
Temperature Criterion:	22 °C
Date:	August 8, 2004
Evaluation Date:	January 2008

This evaluation area is the water temperature of a longitudinal cross-section of the entire length of the Pend Oreille River in Idaho on a hot day when maximum entrainment of Pend Oreille Lake’s hypolimnion is occurring, August 8, 2004.

Temperatures ranged from 0.1 to 1.1 C warmer than natural conditions. Given Idaho Water Quality Standards “0.3 C warmer than natural conditions”, water temperatures would meet Idaho Water Quality Standards if they were between 0.0 °C and 0.8 °C cooler. At this area, current temperatures meet neither numeric criteria nor natural conditions requirements of Idaho Water Quality Standards.

Description of criteria exceedances:

Existing conditions (Scenario 1): Existing daily maximum water temperatures (Scenario 1) exceed the Idaho 22 °C numeric temperature criterion in most of the water column on August 8, 2004.

Natural background conditions (Scenario 8): Natural background daily maximum water temperatures (Scenario 8) also exceed the Idaho 22 °C numeric temperature criterion on August 8, 2004; however, exceedances occurred over a much smaller area.

Combined comparisons: Water temperatures in some locations are cooler under current conditions than they would be under natural conditions (Figure 21, and 59); however, there are large patches where an increase of 0.3 °C to 1.1 °C above natural background can be observed (Figure 60).

Existing surface water temperatures (Scenario 1) exceeded natural background conditions (Scenario 8) by more than 0.3 °C and exceeded the numeric temperature criterion between 0.1 and 0.8 over the river’s longitudinal profile on August 8, 2004.

Conclusion: Water temperatures at this compliance are exceed Idaho Water Quality Standards.

Table 2. Summary comparisons of Idaho Pend Oreille River Model results to Idaho water quality standards.

Evaluation Area	Longitudinal Location	Description	DEQ Finding
1	10 km from Railroad Bridge	Surface Daily Average 19 °C All year	Exceeds standards
2	10 km from Railroad Bridge	Bottom Daily Average 19 °C All year	Does not exceed standards
3	10 km from Railroad Bridge	Volume-weighted Daily Average N/A ¹ All year	Would exceed if Idaho standards addressed this volume-weighted criterion
4	35 km from Railroad Bridge	Surface Daily Average 19 °C All year	Exceeds standards
5	35 km from Railroad Bridge	Bottom Daily Average 19 °C All year	Exceeds standards
6	35 km from Railroad Bridge	Volume-weighted Daily Average N/A ¹ All year	Would exceed if Idaho standards addressed this volume-weighted criterion
7	Albeni Falls Dam outflow	Entire water column Daily Maximum 22 °C All year	Does not exceed standards
8	10 km from Railroad Bridge	Surface Daily Maximum 22 °C All year	Exceeds standards
9	35 km from Railroad Bridge	Surface Daily Maximum 22 °C All year	Exceeds standards
10	Entire Longitudinal Profile	Surface Continuous 22 °C August 16	Idaho criteria exemptions apply August 16, 2004 due to extreme air temperature.
11	Entire Longitudinal Profile	Volume-weighted Daily Average N/A ¹ August 16	Idaho criteria exemptions apply August 16, 2004 due to extreme air temperature.
12	Entire Longitudinal Cross-Section	Entire water column Continuous 22 °C August 16	Idaho criteria exemptions apply August 16, 2004 due to extreme air temperature.
13	Entire Longitudinal Cross-Section	Entire water column Continuous 22 °C August 8	Exceeds standards

¹Idaho does not have water quality criteria for volume-weighted water temperatures. A surrogate criterion of 19 °C was evaluated for informational purposes and is based on the 19 °C criterion used to evaluate other daily average water temperatures.

Evaluation of Sources of Excess Temperatures

- a) At current capacities and effluent temperatures, the three existing municipal wastewater treatment facilities (City of Priest River, City of Dover, and City of Sandpoint) produce no measurable increase in Pend Oreille River temperatures (Figures 22 - 32). Generally, effluent from these facilities is cooler than ambient river temperatures.
- b) The nine tributaries that discharge directly into the Pend Oreille River (Hornsby Creek, Carr Creek, Alder Creek, Priest River, Strong Creek and four small, unnamed tributaries), at current discharge amounts and temperatures, have no measurable, cumulative effect on the Pend Oreille River temperatures as modeled (Figures 33 - 43). It is believed that Priest River locally affects the Pend Oreille River until it is mixed; however, this effect could not be accounted for in the model. Since CE-QUAL-W2 is two-dimensional and cannot evaluate lateral mixing, only cumulative effects could be analyzed. Priest River temperatures should be addressed in future Priest River Subbasin Assessments and TMDLs, if warranted.
- c) A sensitivity analysis of bank shading along the Pend Oreille River demonstrated that bank shade has no measurable effect on Pend Oreille River temperatures (Figure 56).
- d) Model results show that elevated water temperatures relative to natural conditions in the Idaho portion of the Pend Oreille River are slight and due to the effects of Albeni Falls Dam (Figures 44 – 55). For the purpose of TMDL development and using EPA’s integrated report language, the “cause” (pollutant) of the cold water aquatic life impairment is excess temperature. The “source” (management practice) of this “cause” is “Impacts from Hydrostructure Flow Regulation/Modification.”

References

National Climatic Data Center, 2000a. Weather Observation Station Attributes. See website: <http://www.ncdc.noaa.gov>