UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Total Maximum Daily Load for the Temperature Impairment on Indian River

Jon M. Capacasa, Director
Water Protection Division

Date: 12/15/04

Temperature TMDL for Indian River, Delaware

December 14, 2004

U.S. Environmental Protection Agency
Region 3
1650 Arch Street
Philadelphia, Pennsylvania

Contents

Executive Summary 1

1. Introduction 3

2. Numeric Targets 5
   2.1. Applicable Water Quality Standards 5
   2.2. Numeric TMDL Target 5

3. Source Identification 6

4. TMDL Elements 12
   4.1. Wasteload Allocation 12
   4.2. Load Allocation 13
   4.3. Margin of Safety 13
   4.4. Critical Conditions 13
   4.5. Seasonal Variation 13

5. TMDL Implementation 15

6. Public Participation 16

References 17

Appendix 18

Figures

Figure 1. Regional location of Indian River 4
Figure 2. Location of the Indian River Generating Station 7
Figure 3. Area violating October-through-May temperature criteria, March 18, 1998 8
Figure 4. Area violating October-through-May temperature criteria, November 19, 1998 9
Figure 5. Areas with temperatures above the June-through-September temperature maximum criterion of 87 °F, July 22, 1998 9
Figure 6. Evaluation of non-human-induced conditions on July 22, 1998 (yellow areas exceed 87°F maximum water quality criterion) 10
Figure 7. Comparison of "ambient" temperatures and temperatures in the IRGS discharge and Island Creek 11
Figure 8. Calibration station locations 18
Figure 9. Observed temperatures and modeled temperatures at station WQ4 18
Figure 10. Observed temperatures and modeled temperatures at station WQ3 19
Figure 11. Observed temperatures and modeled temperatures at station WQ5 19
Figure 12. Observed temperatures and modeled temperatures at station E1 20
Figure 13. Observed temperatures and modeled temperatures at station D2 20
Figure 14. Observed temperatures and modeled temperatures at station WQ2 21
Figure 15. Observed temperatures and modeled temperatures at station N2 21
Figure 16. Observed temperatures and modeled temperatures at station N2 22
Figure 17. Observed temperatures and modeled temperatures at station WQ6 22
Figure 18. Observed temperatures and modeled temperatures at station IP1 23

Tables

Table 1. Wasteload allocations for the Indian River Power Plant 12

Executive Summary

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA's) Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify and list those waters within their boundaries that are water quality limited, to prioritize them, and to develop Total Maximum Daily Loads (TMDLs) for the pollutants of concern. A water quality limited water is a waterbody in which water quality does not meet applicable water quality standards, or is not expected to meet applicable standards, after application of technology-based effluent limitations for point sources. A TMDL is the allowable load of a specific pollutant that can be discharged into a waterbody and still protect water quality. TMDLs consist of wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources, and a margin of safety (MOS). A TMDL is based on the relationship between pollutant sources and in-stream water quality and provides the scientific basis for a state to establish water quality-based controls to reduce pollutant loads from both point and nonpoint sources to restore and maintain the quality of the state's water resources.

Two segments of the Indian River were originally included on Delaware's 1996 Section 303(d) list of water quality limited waters for violating the applicable temperature criteria. These segments were included on the state's 1998, 2002 and draft 2004 Section 303(d) Lists. This temperature TMDL addresses the following segments:

- Indian River (DE140-004)—Saline tidal portion of river from Millsboro Pond to Power Plant intake (4.6 miles)
- Upper Indian River Bay (DE140-E02)—Upper portion of estuary from power plant cooling water intake to Pepper Creek, including Island Creek (0.95 mi2)

This TMDL is established to maintain applicable temperature criteria in Indian River and Island Creek, including:

- Maximum increase above natural conditions shall be 4 °F from October through May.
- Temperature rise during June through September shall be limited by the following conditions:
  - No human-induced increase of the true daily mean temperature above 84 °F shall be allowed.
  - No human-induced increase of the daily maximum temperature above 87 °F shall be allowed.

The only source that increases temperatures in Indian River above natural background conditions is the Indian River Generating Station (IRGS), owned and operated by NRG Energy, Inc. The IRGS is located on the southern bank of the Indian River and has been in operation since November 1957. IRGS withdraws water from Indian River to use as cooling water and discharges heated water to Island Creek, a small tributary to Indian River. Because Indian River is influenced by tides from Indian River Bay, water from Island Creek enters Indian River and can be flushed back upstream in Indian River. Therefore, the IRGS discharge impacts Island Creek as well as portions of Indian River upstream and downstream of Island Creek.

The Generalized Environmental Modeling System for Surface Waters (GEMSS) was developed to simulate water quality as part of a flushing study conducted for the Inland Bays in 2001 and was reconfigured for this TMDL to evaluate the impact of the IRGS discharge on instream temperature in Island Creek and Indian River.

The applicable water quality standards are based on allowable human-induced increases above natural background temperatures and the only known source causing temperature increases is the Indian River Generating Station. Therefore, the TMDL is allocated as a wasteload allocation to the IRGS. The

temperature TMDL establishes a WLA for the IRGS that will allow for the attainment of the applicable water quality criteria, as summarized below.

Wasteload allocations for the Indian River Power Plant

Season	Wasteload Allocation
October through May	1.26×10^{10} BTU/day
June through September	No increase of the true daily mean ambient temperature above 84 °F
	No increase of the daily maximum ambient temperature above 87 °F

The WLA is established as an "end-of-pipe" allocation and must be met at the IRGS discharge outfall on Island Creek. While water quality standards allow for a mixing zone for thermal pollutants, Island Creek does not provide enough dilution capacity to act as a mixing zone. Because there is minimal dilution afforded by the natural flow of Island Creek, instream conditions would violate the criteria for the allowable thermal mixing zone and, therefore, water quality standards must be met at the IRGS discharge outfall for Island Creek and Indian River to meet temperature standards.

Implementation of the Indian River temperature TMDL will be addressed through the NPDES permit consistent with EPA Regulations. EPA understands there is currently an ongoing review of NRG Energy's study to support a request for a variance from Delaware's water quality standards for temperature in accordance with Section 316(a) of the Clean Water Act.

1. Introduction

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA's) Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify and list those waters within their boundaries that are water quality limited, to prioritize them, and to develop Total Maximum Daily Loads (TMDLs) for the pollutants of concern. A water quality limited water is a waterbody in which water quality does not meet applicable water quality standards, or is not expected to meet applicable standards, after application of technology-based effluent limitations for point sources. A TMDL is the allowable load of a specific pollutant that can be discharged into a waterbody and still protect water quality. TMDLs consist of wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources, and a margin of safety (MOS). A TMDL is based on the relationship between pollutant sources and in-stream water quality and provides the scientific basis for a state to establish water quality-based controls to reduce pollutant loads from both point and nonpoint sources to restore and maintain the quality of the state's water resources.

Two segments of the Indian River were originally included on Delaware's 1996 Section 303(d) list of water quality limited waters for violating the applicable temperature criteria. These segments were included on the state's 1998, 2002 and draft 2004 Section 303(d) Lists. This temperature TMDL addresses the following segments:

- Indian River (DE140-004)—Saline tidal portion of river from Millsboro Pond to Power Plant intake (4.6 miles)
- Upper Indian River Bay (DE140-E02)—Upper portion of estuary from power plant cooling water intake to Pepper Creek, including Island Creek (0.95 mi2)

The temperature-impaired segments of the Indian River are within the Indian River/Indian River Bay watershed—one of Delaware's three Inland Bays. The Inland Bays consist of three interconnected bodies of water—Rehoboth Bay, Indian River Bay and Little Assawoman Bay—located in southeastern Sussex County (Figure 1).

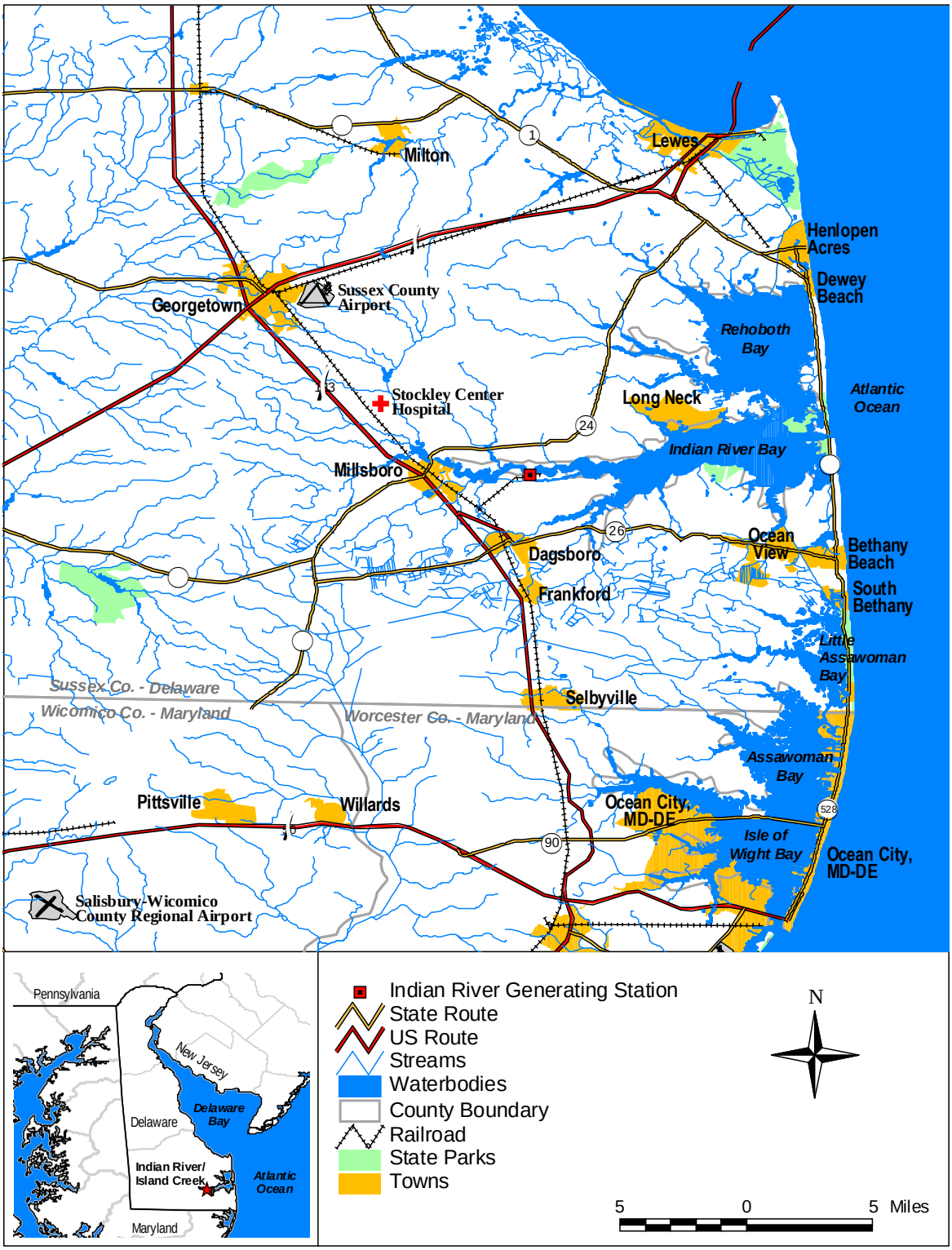

Figure 1. Regional location of Indian River

2. Numeric Targets

TMDLs are established for impaired waters to determine the appropriate loading which will allow the water to meet the applicable water quality standards. The TMDL's numeric target identifies the specific goals or endpoints for the TMDL that equate to attainment of water quality standards. The numeric target may be equivalent to a numeric water quality criterion where one exists, or it may represent a quantitative interpretation of a narrative standard. This section reviews the applicable water quality standards for temperature and identifies an appropriate numeric target for the development of the TMDLs.

2.1. Applicable Water Quality Standards

The State of Delaware Surface Water Quality Standards, as amended July 11, 2004, establish water quality standards for waters in the state. The water quality standards establish the designated uses to be protected and the water quality criteria for the protection of these uses. The segments of the Indian River addressed in this TMDL are marine waters (defined as containing natural levels of salinity in excess of 5 ppt) and are designated for the following uses:

- Industrial water supply
- Primary contact recreation
- Secondary contact recreation
- Fish, aquatic life and wildlife (including shellfish propagation)
- Exceptional recreational or ecological significance (ERES Water) (marine portions only)

The following are the marine water quality criteria for temperature, applicable to areas outside of regulatory mixing zones:

- Maximum increase above natural conditions shall be 4 °F from October through May.
- Temperature rise during June through September shall be limited by the following conditions:
  - No human-induced increase of the true daily mean temperature above 84 °F shall be allowed.
  - No human-induced increase of the daily maximum temperature above 87 °F shall be allowed.

The Department may mandate additional limitations on a site-specific or seasonal basis to provide incremental protection for early life stages of fish.

2.2. Numeric TMDL Target

The TMDL target is the numeric endpoint used to evaluate the loading capacity and represents attainment of applicable water quality standards. Indian River has applicable numeric water quality criteria for temperature, and the TMDL will be developed to meet those criteria (as described in Section 2.1).

3. Source Identification

The temperature criteria applicable to the Indian River are based on human-induced increases above natural conditions. The only source that increases temperatures in Indian River above natural background conditions is the Indian River Generating Station (IRGS), owned and operated by NRG Energy, Inc. The IRGS is located on the southern bank of the Indian River (Figure 2). IRGS has four coal-fired steam electric generating units with a combined generating capacity of approximately 800 Megawatts (Mwe). Unit 1 began commercial operations in November 1957, with the three other units coming online as recently as October 1980. Except for routine maintenance and downtime, all units operate continuously.

Units 1, 2, and 3 employ once-through cooling systems and Unit 4 employs a closed-cycle, recirculating cooling system with a cooling tower. Cooling water for three of the IRGS's four coal-fired stream-electric units is withdrawn from the Indian River via an intake canal. Make-up water for the fourth generating unit is withdrawn from the discharge canal of the other three units. Heated water from units 1, 2, and 3, and blowdown from unit 4, are discharged via a canal into the upper reaches of Island Creek. Island Creek is a small tributary that empties into the Indian River downstream of the plant at Ware Cove. Figure 2 presents the location of the IRGS discharge to Island Creek.

Delaware Department of Natural Resources and Environmental Control (DNREC) issued a National Pollutant Discharge Elimination System (NPDES) permit to the IRGS in 1977 (No. DE0050580; State Permit No. WPCC 30130/76). This permit granted an alternate heat dissipation area and established a maximum allowable discharge temperature of 107 °F from Outfalls 001 through 006 (once-through cooling water for Units 1, 2, and 3) and a maximum allowable discharge temperature of 96 °F from Outfall 027 (Unit 4 cooling tower blowdown). The permit established that no heat should be added to the river except in the designated heat dissipation area subject to the following conditions:

1. The heat dissipation area shall be defined as the area enclosed by the 4 °F excess temperature contour on the bottom;
2. The heat dissipation area shall be confined to an area of less than 300 acres under all conditions;
3. The total rate of heat rejection from the entire facility to Island Creek shall not exceed 1.97×10^9 BTU/hr at any time; and
4. The rate of plant-induced temperature change in the heat dissipation area shall not cause mortality to fish or shellfish.

The NPDES permit expired in September 1992 and was administratively extended pending the permittee's request for reissuance of IRGS's NPDES permit. As discussed in more detail in the Response to Comments document for this TMDL, EPA finds that the 316(a) variance that the facility may have had in association with the pre-1988 permits was not properly renewed during the issuance of the 1988 permit. Absent a valid 316(a) variance, the water body was evaluated for Section 303(d) list purposes using the applicable water quality criteria in accordance with Section 303(d)(1)(A). As identified in Section 2 of the TMDL, those numeric criteria apply to this watershed and were the basis of the identification of this water on the 303(d) list. The TMDL has been developed to achieve the criteria identified in Section 2.

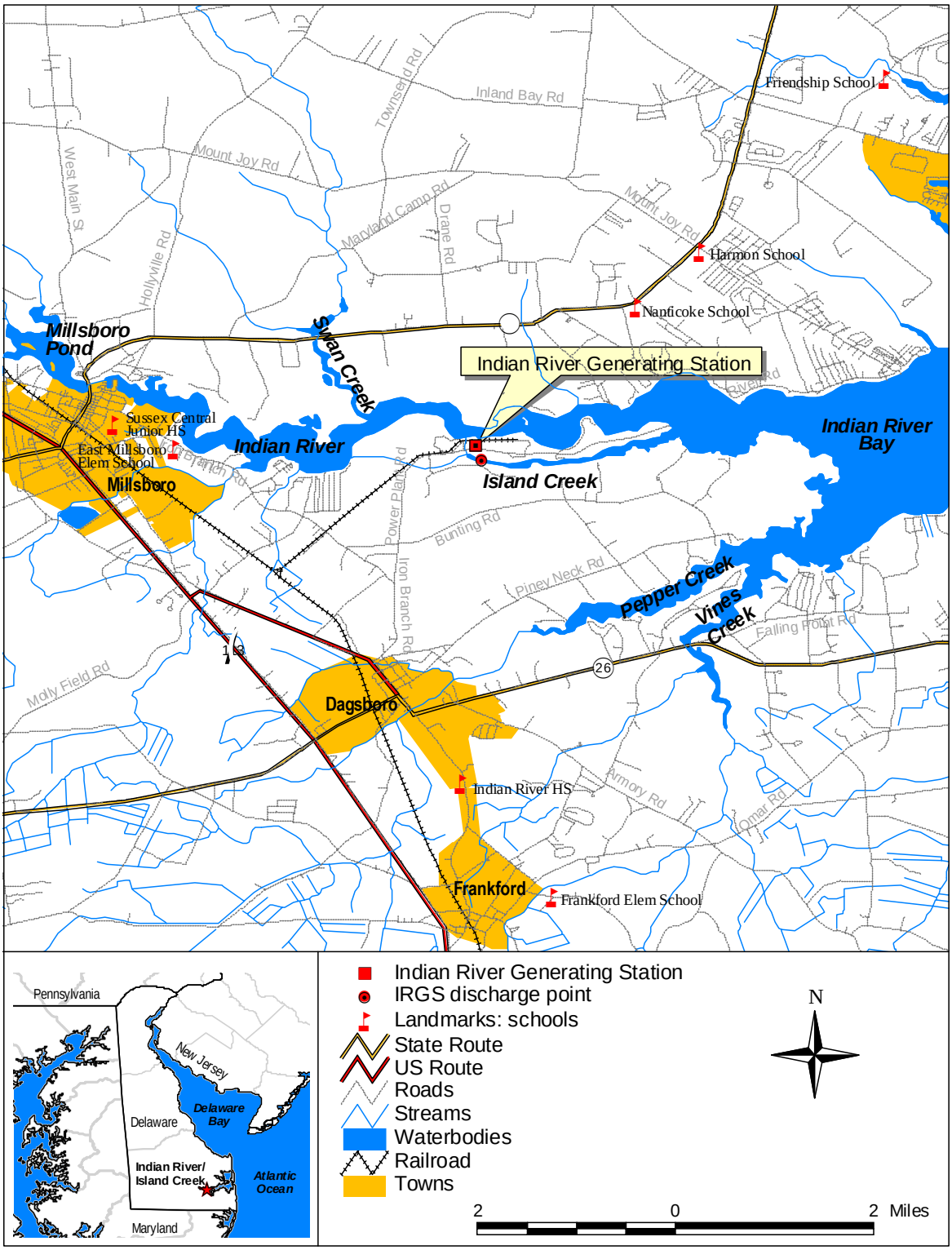

Figure 1. Location of the Indian River Generating Station

The IRGS obtains water from the Indian River for cooling purposes and discharges heated water into Island Creek. Because of the tidal nature of Indian River, when water from Island Creek enters Indian River, it can be flushed back upstream in Indian River as the tides go in and out. Therefore, the IRGS discharge impacts Island Creek as well as portions of Indian River upstream and downstream of Island Creek. The Generalized Environmental Modeling System for Surface Waters (GEMSS) was developed to simulate water quality as part of a flushing study conducted for the Inland Bays in 2001 (ENTRIX, 2004). GEMSS was reconfigured to represent permitted flow and a critical heat load from the IRGS to illustrate the impact of the IRGS discharge on instream temperature in Island Creek and Indian River. Figures 3 through 5 represent snapshots on selected critical days, showing the extent of the thermal plume resulting from the IRGS discharge under critical conditions. Figures 3 and 4 illustrate instream conditions compared to the Fall through Spring criterion which prohibits more than a 4 °F increase in ambient temperatures. The yellow areas on the plots delineate the thermal plumes and represent the area in which water quality standards are violated (i.e., the resulting temperature is more than 4 °F above the background ambient temperature). Figure 5 shows a critical day during the summer period, compared to the summer criterion which prohibits increases in temperature above a daily maximum greater than 87 °F. The yellow areas represent those areas greater than 87 °F. It should be noted that the model predicts temperatures greater than 87 °F in many areas not impacted by IRGS.

Further information on the GEMSS modeling system and its application to Indian River are contained in ENTRIX, Inc. and J. E. Edinger Associates (2004). Calibration results for the GEMSS modeling system are included in the Appendix to support its use in evaluating the IRGS discharge and its effect on Island Creek for this TMDL.

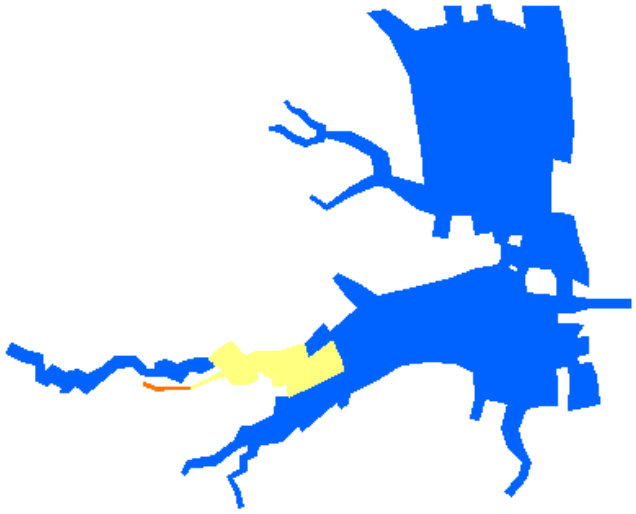

Figure 2. Area violating October-through-May temperature criteria, March 18, 1998

Figure 3. Area violating October-through-May temperature criteria, November 19, 1998

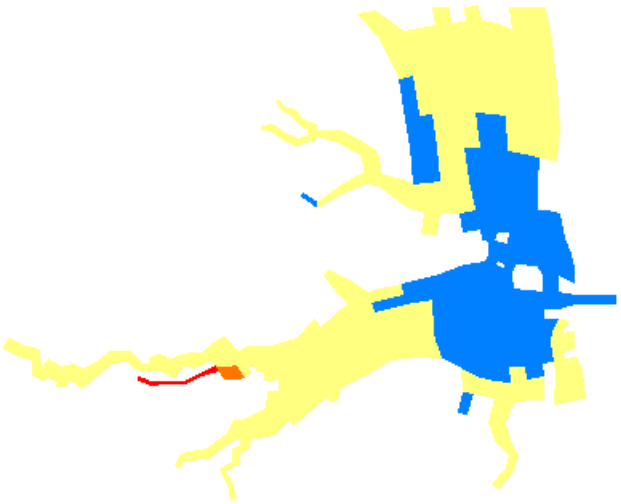

Figure 4. Areas with temperatures above the June-through-September temperature maximum criterion of 87 ^{o}F, July 22, 1998

Evaluation of temperature criteria and the resulting temperature of the IRGS discharge (because they withdraw water from the system) rely on ambient temperatures in Island Creek and Indian River. To illustrate ambient conditions, the IRGS discharge was removed entirely from the model (i.e., no withdrawal or discharge was represented), and the model was run for an extended time period. Results from this scenario are shown in Figure 6 for a critical summer condition (July 22, 1998). Yellow areas on the map represent modeled daily maximum temperatures above 87 °F, while blue areas represent areas below that level.

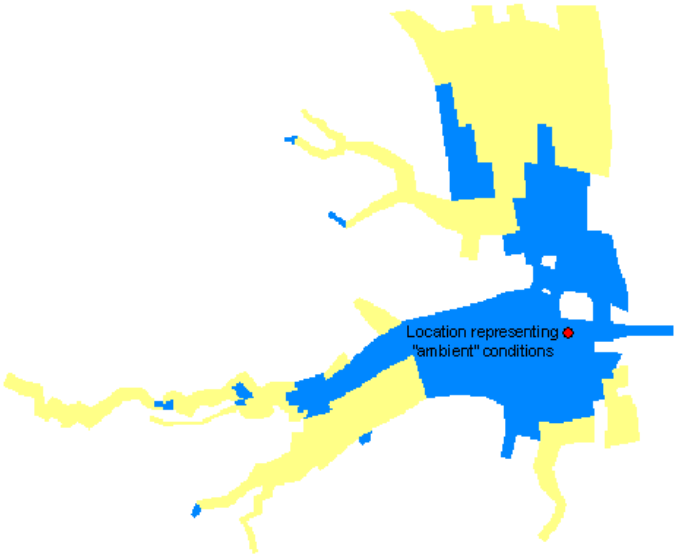

Figure 5. Evaluation of non-human-induced conditions on July 22, 1998 (yellow areas exceed 87°F maximum water quality criterion)

To further illustrate ambient temperature and the effect of the IRGS discharge, Figure 7 compares ambient temperatures to temperatures of the IRGS discharge and Island Creek for the summer of 1998. (Ambient temperatures outside of the plume are the results for a model cell located downstream of the plume, near the inlet to the bay. The location is noted in Figure 6 with a red dot.) The model scenario in Figure 7 represents a constant temperature of 84 °F in the IRGS discharge. As shown in the figure, ambient temperatures outside of the IRGS plume vary as much as 20°F, while Island Creek temperatures remain fairly constant, typically within 1 °F of the IRGS discharge temperature. This demonstrates that there is minimal dilution at the location receiving the IRGS discharge.

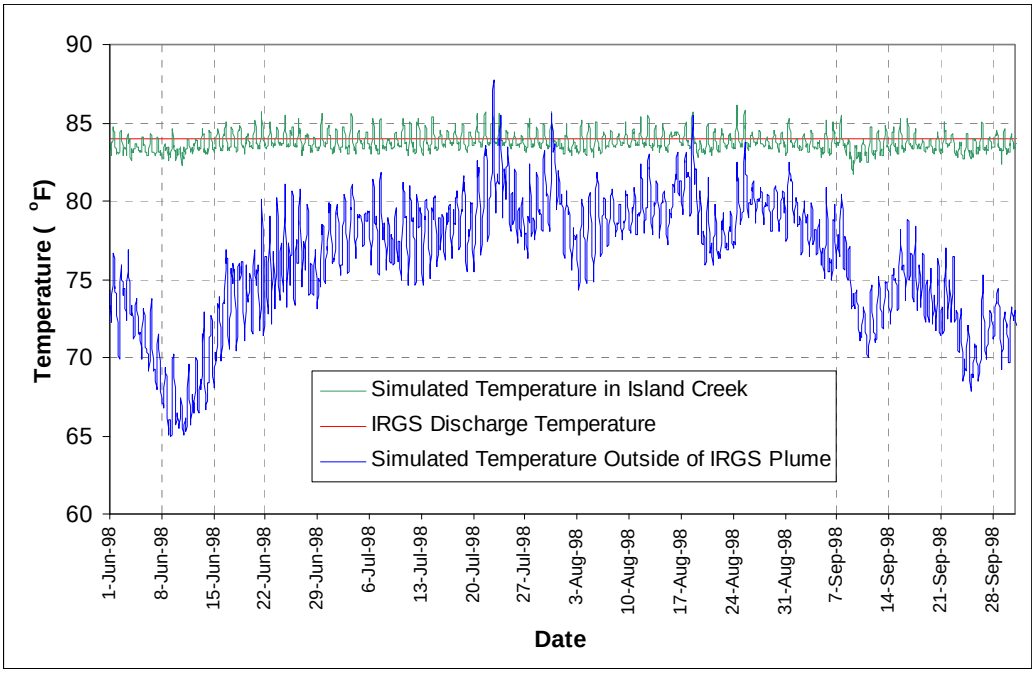

Figure 6. Comparison of "ambient" temperatures and temperatures in the IRGS discharge and Island Creek

4. TMDL Elements

A TMDL is the total amount of a pollutant that can be assimilated by the receiving water while still achieving water quality standards. TMDLs are comprised of the sum of individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and background levels. In addition, TMDLs must consider seasonal variation and critical conditions and include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. Conceptually, this definition is denoted by the following equation:

$$TMDL = \sum WLAs + \sum LAs + MOS$$

This section discusses the required elements of a TMDL, including WLA, LA, MOS, critical conditions and seasonal variation.

4.1. Wasteload Allocation

The applicable water quality standards are based on allowable human-induced increases above natural background temperatures and the only known source causing temperature increases is the Indian River Generating Station. Therefore, the TMDL is allocated as a wasteload allocation to the IRGS.

Regulations state that TMDLs can be expressed in terms of mass per time or by other appropriate measures. Because the water quality standards are based on a daily maximum or a maximum increase above the daily maximum and mean of the ambient temperature, the allowable thermal load is constantly changing, depending on the background temperature in Indian River and the season. Therefore the temperature TMDL establishes a temperature-based WLA for the IRGS equivalent to the June through September water quality criteria and an energy based WLA for the October through May water quality criteria, as summarized in Table 1.

Table 1. Wasteload allocations for the Indian River Power Plant

Season	Wasteload Allocation
October through May	1.26×10^{10} BTU/day
June through September	No increase of the true daily mean ambient temperature above 84 °F
	No increase of the daily maximum ambient temperature above 87 °F

The WLA is established as an “end-of-pipe” allocation and must be met at the IRGS discharge outfall on Island Creek. While water quality standards allow for a mixing zone for thermal pollutants, Island Creek does not provide enough dilution capacity to act as a mixing zone. Delaware Water Quality Standards define mixing zones for thermal pollutants as those waters between the point of discharge and the point at which the receiving water temperature criteria are met, with the following limitations:

1. The greatest offshore extension of the mixing zone shall not exceed 50 percent of the width of the waterbody at the point of discharge (6.4.2.1.)
2. Thermal mixing zone cross-sectional area as measured in a vertical plane perpendicular to the receiving water flow shall not occupy more than 25 percent of the cross-sectional area of the receiving water as measured from the point of discharge to the opposite shore (6.4.2.2)

Although the existing GEMSS model does not allow for evaluation of the lateral or vertical variability of temperature within a modeling segment, it is assumed that the IRGS discharge would exceed these criteria

in Island Creek because the creek is effluent-dominated. NRG Energy's 316(a) demonstration (ENTRIX 2001) indicates that the original flow of Island Creek represents less than 0.01 percent of the discharge from the IRGS, providing little to no dilution capacity. (IRGS has a permitted flow of 378 million gallons per day for outfalls 001-006.) Because there is minimal dilution afforded by the natural flow of Island Creek, instream conditions would violate the criteria for the allowable thermal mixing zone and, therefore, water quality standards must be met at the IRGS discharge outfall for Island Creek and Indian River to meet temperature standards.

A numeric heat load allocation was calculated for Island Creek (i.e., the amount of heat required to raise the temperature 4 ^{o}F in Island Creek) for compliance with the October through May water quality criteria. This was determined to be 1.26×10^{10} British Thermal Unit (BTU) per day, based on the amount of heat necessary to raise the 378 million gallons of intake water to the facility 4 ^{o}F. A BTU is the amount of heat required to raise one pound of water 1 ^{o}F at 1 atm. It was necessary to convert the gallons of water from the facility to pounds in order to determine the WLA.

4.2. Load Allocation

As discussed above, there is no load allocation for this TMDL since there are no nonpoint or background sources causing impairment. The IRGS is the only source creating any "human-induced" increases in temperature above the natural background.

4.3. Margin of Safety

A margin of safety (MOS) must be included in a TMDL to account for any uncertainty concerning the relationship between pollutant loading and water quality. The MOS can be implicit (e.g., incorporated into the TMDL analysis through conservative assumptions), explicit (e.g., expressed in the TMDL as a portion of the loadings) or a combination of both. The MOS was included implicitly in the temperature TMDL for Indian River. Because the WLA is equal to the temperature criteria at end-of-pipe, there is an inherent MOS during parts of the year. For example, in September, the daily average ambient temperature is usually considerably lower than 84 °F. The lower temperatures within Island Creek would create an additional assimilative capacity for the effluent, allowing Island Creek to attain the applicable criteria with a higher thermal input from the plant. Additionally, the heat load allocation (1.26×10^{10} BTU/day for Island Creek) was determined using the flow from the IRGS facility, there is an additional volume of water within Island Creek which would allow for an increased assimilative capacity.

4.4. Critical Conditions

The critical conditions for the TMDL occur during the summer months when ambient water temperatures are higher and flows in Island Creek are lower, providing minimal dilution for the IRGS discharge. Because the WLA is based on the water quality criteria, it inherently considers critical conditions by establishing seasonal criteria. The summer criteria recognizes summer as the critical period and includes a maximum temperature target rather than just an allowable increase.

4.5. Seasonal Variation

The TMDL is equivalent to the water quality criteria, which include seasonal criteria. The criteria, and therefore the TMDL, inherently account for seasonal variations by establishing different targets for October through May and the critical summer period of June through September.

5. TMDL Implementation

Implementation of the Indian River temperature TMDL will be addressed through the NPDES permit consistent with EPA regulations. EPA understands there is currently an ongoing review of NRG Energy's study to support a request for a variance from Delaware's water quality standards for temperature in accordance with Section 316(a) of the CWA .

Section 316(a) of the Clean Water Act applies to point source facilities (i.e., facilities required to have NPDES permits) that have a thermal component to their discharge. Also, these facilities must be subject to water quality and technology-based standards under Sections 301 and 306 of the Clean Water Act. Section 316(a) is a variance provision that allows permitting authorities to impose alternative thermal effluent limitations less stringent than applicable water quality or technology-based standards if the discharger can demonstrate that a "balanced, indigenous population of shellfish, fish and wildlife" can be maintained in the waterbody receiving the thermal discharge. Regulations at 40 CFR 125.73 allow existing dischargers to demonstrate "that no appreciable harm has resulted from the normal component of discharge (taking into account the interaction of such thermal components with other pollutants and the additive effect of other thermal sources)."

NRG Energy completed a Section 316(a) Demonstration study, prepared by ENTRIX, Inc., and compiled in a report entitled, *An Ecological Risk-Based 316(a) Demonstration for the Indian River Power Plant, Volume I Text, Appendices A-I* (January 2001). NRG Energy's draft demonstration is the product of a two-year study initiated in 1998, designed to assess the potential effects of the thermal discharge from the IRGS on selected components of the Indian River ecosystem. In addition, this demonstration is intended to satisfy the State of Delaware requirement for a resource assessment for "Waters of Exceptional Recreational and Ecological Significance" (ERES), as specified in Section 11.5 of the State of Delaware's Surface Water Quality Standards (DNREC, 1999).

The 316(a) study is currently under review by EPA Region 3.

6. Public Participation

Public participation is a requirement of the TMDL process and is essential to its success. At a minimum, the public must be allowed at least 30 days to review and comment prior to establishing a TMDL. Also, EPA must provide a summary of all public comments and responses to those comments to indicate how the comments were considered in the final decision.

The public comment period for this TMDL was from October 27, 2004 through November 26, 2004 and a public meeting was held on November 10, 2004 at the Millsboro Town Hall. One set of written comments regarding the TMDL was received during the comment period. An appendix has been included to this document which captures the comments to the TMDL and EPA's responses.

Appendix

This section presents the calibration results of the GEMSS model for 1998. Figure 8 presents the locations of the calibration stations and Figures 9 through 18 present the calibration plots comparing observed temperatures to model-predicted temperature.

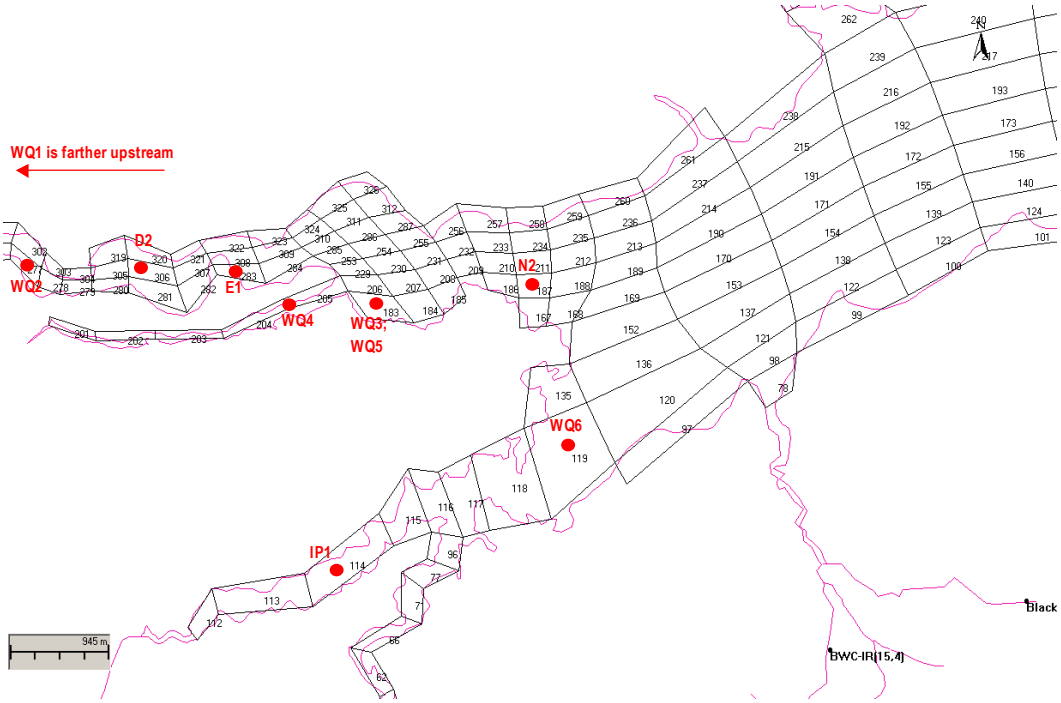

Figure 1. Calibration station locations

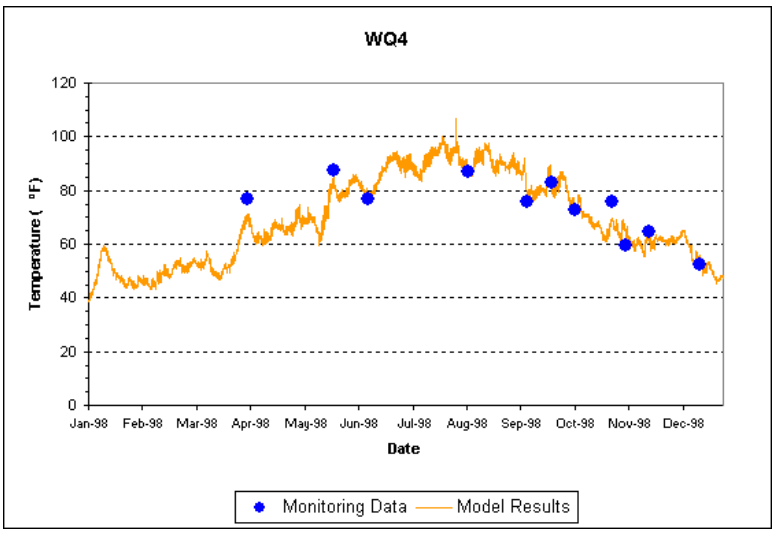

Figure 2. Observed temperatures and modeled temperatures at station WQ4

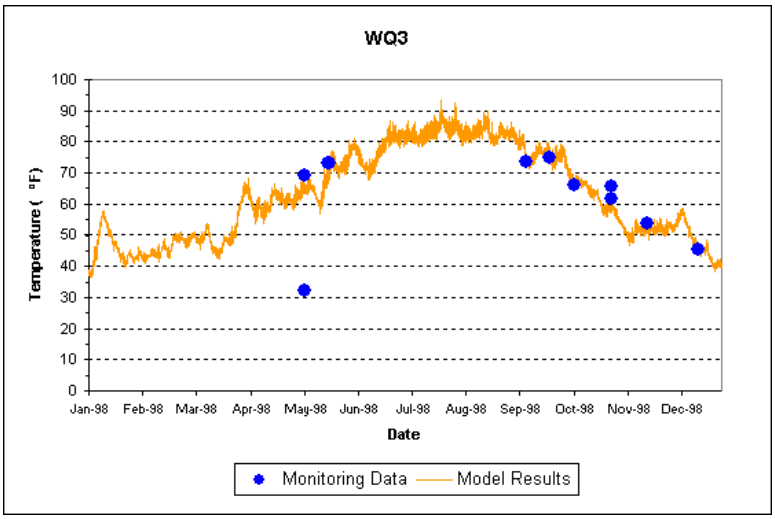

Figure 3. Observed temperatures and modeled temperatures at station WQ3

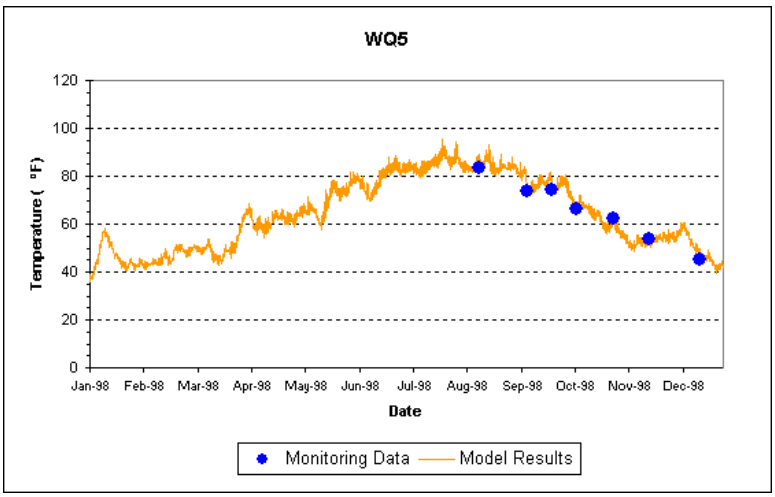

Figure 4. Observed temperatures and modeled temperatures at station WQ5

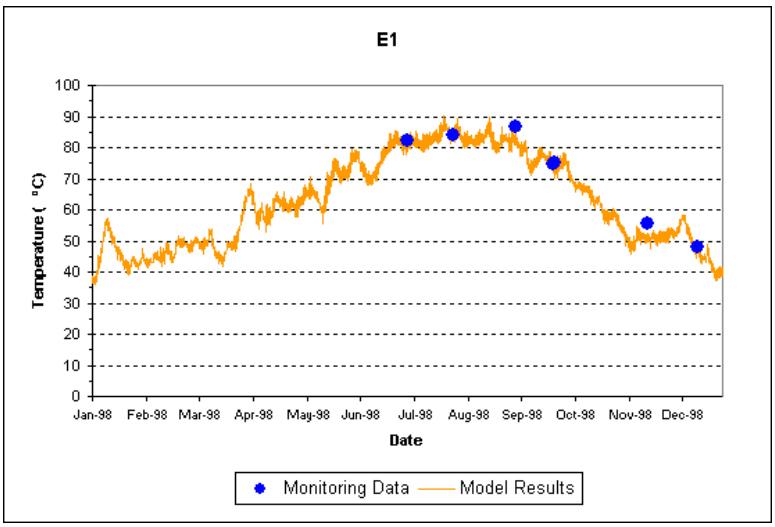

Figure 5. Observed temperatures and modeled temperatures at station E1

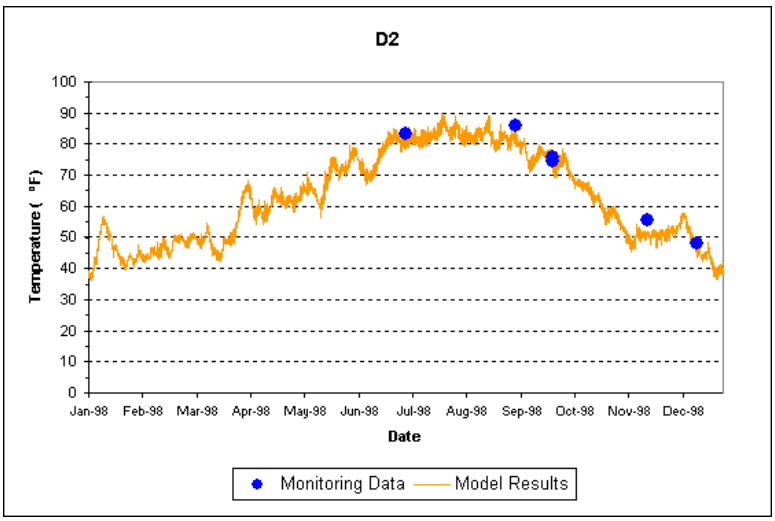

Figure 6. Observed temperatures and modeled temperatures at station D2

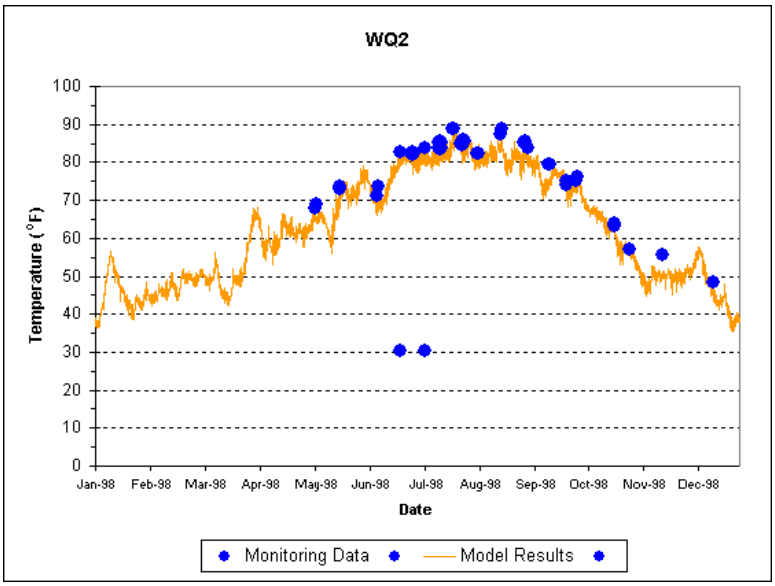

Figure 7. Observed temperatures and modeled temperatures at station WQ2

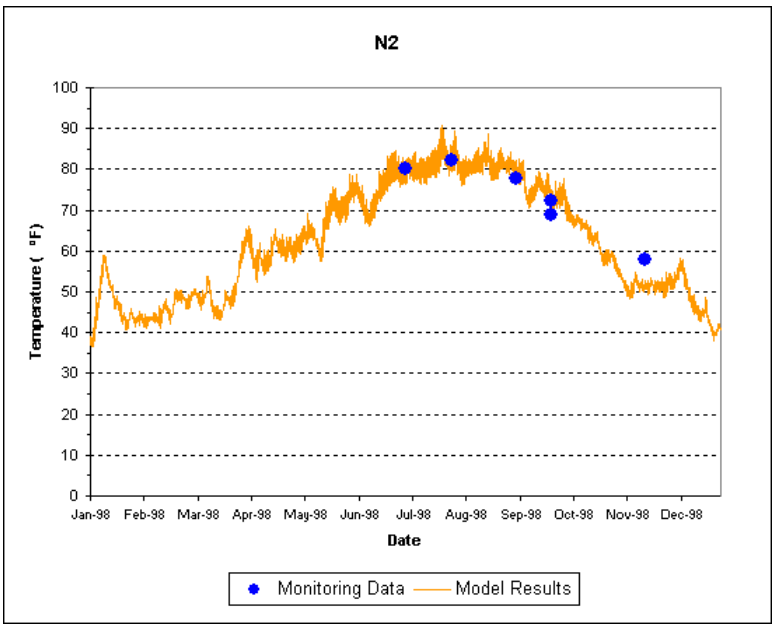

Figure 8. Observed temperatures and modeled temperatures at station N2

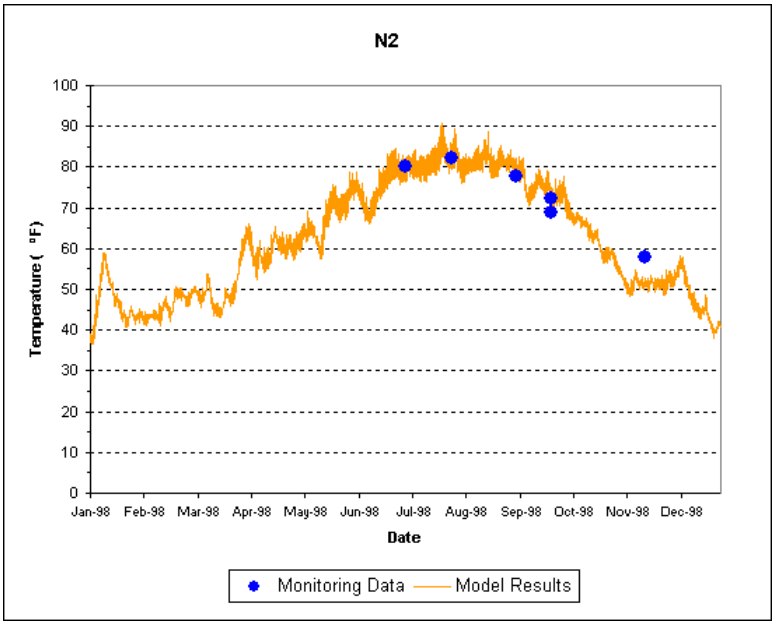

Figure 9. Observed temperatures and modeled temperatures at station N2

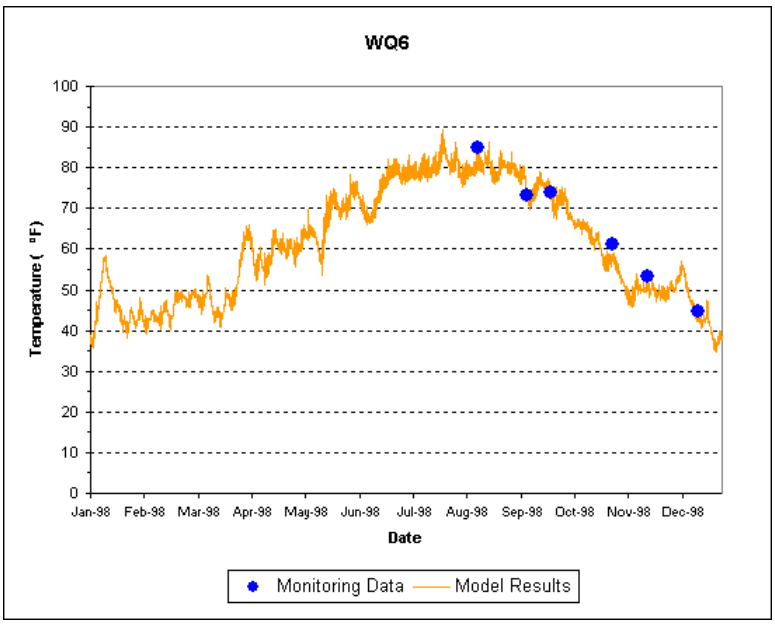

Figure 10. Observed temperatures and modeled temperatures at station WQ6

References

ENTRIX, Inc. and J. E. Edinger Associates, Inc. 2004. Enhancement and Expansion of Hydrodynamic and Water Quality Modeling System for the Delaware Inland Bays for TMDL Analysis. Prepared for Delaware Department of Natural Resources and Environmental Control.

ENTRIX, Inc. 2001. An Ecological Risk-Based 316(a) Demonstration for the Indian River Power Plant. Prepared for Conectiv, Wilmington, DE.

EPA Response and Comment Document regarding
Indian River Temperature TMDL
December 14, 2004

Commentors: NRG Indian River Operations Inc. was the sole commentor by a November 22, 2004 letter. EPA has summarized the comments and provides a response.

1. Comment: In developing the TMDL's proposed WLA, EPA Region III ignored the "existing 316(a) variance" and refused to allow for a mixing zone, even though Delaware regulations allow for mixing zones.

EPA Response: Based on the record, current requirements and comments submitted regarding this issue, it does not appear that EPA or DNREC has determined that NRG's thermal discharge would currently assure the protection and propagation of a balanced indigenous population (BIP). The current permit issued in 1988 (administratively extended after its expiration in 1992) does contain alternative effluent limits that appear to be less stringent than what would be required under current water quality criteria for temperature. DNREC staff report that these alternative effluent limits were not adequately public noticed as a 316(a) variance renewal request as required by federal regulations, and further that DNREC never formally approved that request for the renewal of such a variance. It appears from the Fact Sheet accompanying the 1987 permit that there was a 1976 study by the permittee establishing a basis for a 316(a) variance and alternative effluent limits in a previous permit. DNREC apparently included the previous alternative effluent limits based on that 1976 study, but never formally or procedurally satisfied the requirements for renewing the 316(a) variance. While NRG (and its predecessors) had the benefit of the relaxed alternative effluent limits based on a previous 1976 study, those limits have not been validly renewed and have not been determined to assure the protection and propagation of the BIP. EPA understands that the permittee in a letter dated March 28, 1992 again requested renewal of the 316(a) variance along with alternative effluent limits in its application for reissuance of the NPDES permit. Both EPA and DNREC permit records and correspondence with the permittee from that time period to date reinforce the position that the permittee has not yet demonstrated to the satisfaction of DNREC or EPA that the renewal of the variance (or alternative effluent limits) has yet been justified. While there is some ambiguity, based on our review of the available records EPA finds that the 316(a) variance renenwal request did not receive the requisite public review and formal approval. Certainly since the expiration of the 1988 permit, both EPA and DNREC have clearly communicated to NRG the deficiencies in the original 1976 study and request for renewal of the

variance and that the permittee would need to do much more to demonstrate a basis for renewal of the 316(a) variance. EPA acknowledges that the permittee is addressing those concerns with the development of the new studies and that EPA and DNREC are working with the permittee on evaluation of those studies as a basis for renewing the 316(a) variance. Section 316(a) of the CWA and implementing regulations do not authorize the continuation of such alternative effluent limitations without the timely renewal and demonstration that such alternative effluent limits are sufficient to protect the BIP based on the plants initial study supplemented by adequate demonstration of actual performance. Based on the available record, EPA does not find that there was a validly renewed 316(a) variance during the time period since 1988, and finds further that following the expiration of that permit, the discharger has not yet adequately supported the renewal of such a variance. See 40 CFR 125.72 including the regulatory note.

Regardless of the existence of a 316(a) variance, such a variance does not eliminate the underlying water quality standards and criteria.. While Section 316(a) of the CWA allows particular thermal discharges to demonstrate that a less stringent alternative effluent limit may be appropriate, such a demonstration is not the basis for a permanent variance and must be renewed on a periodic basis. The current EPA criteria for determining a 316(a) request or renewal of alternative effluent limits are set forth at 40 CFR Part 125 Subpart H. Since EPA has found that there was not a valid renewal of the 316(a) variance with the reissuance (and now expiration) of the 1988 permit, for 303(d) listing purposes and TMDL development, the process evaluates water quality to the established water quality standard. In other words since neither EPA nor DNREC have currently determined that alternative effluent limits are justified, both agencies look to the underlying water quality criteria as the basis for 303(d) listing and TMDL development. If subsequent to the establishment of this TMDL and WLA, the permitting authority determines that the new 316(a) study justifies the granting of a 316(a) variance expressed as alternative effluent limits, and after appropriately considering and addressing any public comments, an NPDES permit with such alternative effluent limits could be consistent with the CWA and NPDES requirements for as long as that variance and alternative effluent limits were justified (and timely renewed).

2. Comment: The impaired segment of Indian River was listed in error, there were no violations in segment DE 140-004 during the September 1998 through August 2003 monitoring cycle and the violations observed in Segment DE 140-002 were collected within the heat dissipation area identified in the variance.
   a. Temperature data alone are not sufficient for a thermal listing based on CWA

303(d)(1)(B) states must use a "balanced indigenous population test".

b. The TMDL does not insure that there will be a balanced indigenous population within the listed segments. The TMDL does not address any biological issues despite the CWA's clear direction in 303(d)(1)(D)

EPA response: Since EPA has found that there was not a valid renewal of the 316(a) variance with the reissuance (and now expiration) of the 1988 permit, for 303(d) listing purposes and TMDL development, DNREC appropriately evaluated the water quality using the established water quality standard under Section 303(d)(1)(A). In other words since neither EPA nor DNREC have currently determined that alternative effluent limits are justified under Section 316(a), both agencies look to the underlying water quality criteria as the basis for 303(d) listing and TMDL development. Absent a valid 316(a) variance, violations of the applicable numeric water quality criteria are sufficient to list a waterbody under Section 303(d)(1)(A). Neither the TMDL nor the Section 303(d) Listing requirements or guidance require additional biological sampling to justify that listing. EPA notes that these sections of the Indian River and Island Creek have been identified (and approved by EPA) on Delaware's 1996, 1998 and 2002 Section 303(d) Lists. Such a listing is consistent with EPA's finding that no valid 316(a) variance was in place during that time period. DNREC has also proposed listing this segment on the 2004 list. Data from sampling station 306331 documents clearly demonstrate exceedances of the applicable temperature criteria justifying the identification of this segment on the 303(d) list starting with the 1996 Section 303(d) List pursuant to Section 303(d)(1)(A). Should the 316(a) variance be renewed, DNREC may consider the identification of impaired water quality using the procedures identified in Section 303(d)(1)(B) as the commentor suggests. Section 303(d)(1)(B) does offer an alternative listing process if the waterbody currently has a valid 316(a) thermal variance.

3. The TMDL should be developed in a phased approach, in the first phase the TMDL should attempt to document an impairment of the biological community and in the second phase the TMDL should work on the development of WLAs.

EPA Response: In instances when the state has an established numeric criteria for the pollutant which is causing the water quality impairment, the TMDL is established to attain that criteria. Such a criteria was established to protect the stream's designated uses consistent with the requirements of Section 303(c) of the CWA. Monitoring data showing exceedances of such numeric criteria (as in this case) are evidence of stream impairment. The

TMDL process was not developed to create site specific criteria for each of the waters listed on the Section 303(d) List. TMDLs are plans designed to ensure that the applicable criteria may be achieved. The commentor may request the State to consider a site specific water quality criterion should its request for a 316(a) variance is denied. EPA notes that NRG is actively working with EPA and DNREC in pursuit of a renewal of a 316(a) variance.

4. Comment: In order to meet the WLA of the TMDL, the facility will be required to incur significant costs that would render it non-competitive and inoperable due to its costs.

EPA Response: The goal of the TMDL process is to develop a plan that when implemented will allow for the attainment of water quality criteria regardless of specific costs. If the commentor pursues a site specific water quality criteria pursuant to the procedures set forth in 40 CFR 131.10(g), such costs and impacts associated with achieving the water quality criteria may be addressed under a use attainability analysis (UAA) or water quality variance. As the commentor is well aware, the request for a 316(a) variance and less stringent alternative effluent limits may also afford NRG significant cost savings. If the request for a renewal of the 316(a) variance and associated alternative effluent limits are ultimately granted by the NPDES permitting authority, NRG would not need to pursue a separate site specific water quality variance.

5. Comment: EPA should recognize the economic costs not only to the facility but to the community as well and factor these costs into TMDL development.

EPA Response: EPA recognizes that there are costs associated with implementing a TMDL supporting the applicable water quality criteria. As discussed above in response to Comment 4, and in previously published EPA guidance on the water quality standards and TMDL program, the CWA does afford consideration of cost in certain limited circumstances but generally not in the TMDL development process. For instance, EPA allows the consideration of costs in the development of technology based effluent standards. The CWA and implementing regulations also allows states to consider costs in the development or modification of water quality standards and uses based on a use attainability analysis (UAA) under 40 CFR 131.10(g) Under those same provisions, states can also consider costs in the development of a temporary water quality variance.

6. Comment: Section 303(g) of the Clean Water Act states “Water Quality Standards relating to heat shall be consistent with the requirements of Section 316 of this Act”, 3169a) takes precedence over any conflicting thermal standards, including the implementation of antidegradation policies. Because the draft TMDL seeks to impose

conditions based on Delaware's current thermal standards it too is subject to 303(g)'s requirements that thermal water quality standards be consistent with 316(a) variances.

EPA Response: As discussed above, EPA does not find that NRG currently has a valid 316(a) variance. Based on that finding, Section 303(g) is not applicable and EPA does not need to respond to that portion of the comment. However, if such a 316(a) variance request is renewed and alternative effluent limits appropriately established, while the underlying water quality criteria would not be amended, such alternative effluent limits would allow the discharger to temporarily exceed those criteria during the effective time period of the 316(a) variance. In this case, since there is no current 316(a) variance in effect, the TMDL was developed to attain the applicable water quality criteria.