July 10, 2006

Delivered by Hand
Crystal E. Newcomer, P.E., Program Manager
Water Management Program
Pennsylvania Department of Environmental Protection
Southcentral Regional Office
909 Elmerton Avenue
Harrisburg, PA 17110-8200

Re: PPL Brunner Island, LLC
NPDES Permit No. PA0008281
East Manchester Township, York County
Draft NPDES Permit Reissuance, 36 Pa. Bull. 2814-15 (June 10, 2006)

Dear Ms. Newcomer:

On behalf of itself and its members, and on behalf of Robert J. Clouser and Michael R. Helfrich (the Lower Susquehanna Riverkeeper®), Citizens for Pennsylvania's Future (PennFuture) submits these comments on the draft NPDES Permit No. PA0008281 (draft Permit) for the Brunner Island Steam Electric Station owned and operated by PPL Brunner Island, LLC in East Manchester Township, York County, Pennsylvania. Throughout this letter, we will refer to the steam electric generating station as "the Brunner Island Plant" or "the Plant," and to the limited liability company that owns and operates the Plant as "PPL-BI."

The Commenting Parties

PennFuture is a public interest membership organization dedicated to creating a just future in which the environment, communities and the economy thrive. Its members include individuals who recreate in and along the Susquehanna River downstream from the cooling water discharge channel at the Brunner Island Plant. One focus of PennFuture's work is to improve and protect water resources and water quality throughout the Commonwealth through public outreach and education, advocacy, and litigation.

Robert J. Clouser is the owner of Clouser's Fly Shop in Royalton, Pennsylvania, a fly fishing tackle and guiding service he has operated full time since 1982. Mr. Clouser is also a well-known and longstanding steward of the Susquehanna River and its fishery. He was instrumental in convincing the Pennsylvania Fish and Boat Commission to adopt the "Big Bass Program" special regulations in 1990 (58 Pa. Code § 65.9), which resulted in a dramatic resurgence of the Susquehanna River's bass fishery. Mr. Clouser's fly fishing business is located near the Susquehanna River and is dependent on the river and its fishery. The business includes guiding clients on bass fishing trips on the Lower Susquehanna River from July through September, a majority of which include areas of the Susquehanna River downriver from the discharge channel at the Brunner Island Plant.

Michael R. Helfrich is an individual who is licensed by the international Waterkeeper® Alliance to serve as the Lower Susquehanna Riverkeeper®.[1] Mr. Helfrich regularly uses the Susquehanna River, including areas downriver from the discharge channel at the PPL Brunner Island Plant, for canoeing and fishing. In his current position as the Lower Susquehanna Riverkeeper®, Mr. Helfrich is a professional steward and advocate for the Lower Susquehanna River and its tributaries. His responsibilities include patrolling and monitoring the waters and lands of the Susquehanna River watershed below Sunbury, Pennsylvania, and taking actions to protect, maintain, and improve the river and its watershed.

Background

On January 9, 2006, PennFuture served PPL-BI and the required government officials with a Notice of Ongoing Violations and Intent to File Citizen Suit pursuant to Section 505(b) of the federal Clean Water Act, 33 U.S.C. § 1365(b). The notice letter identified more than 1,500 violations of NPDES Permit No. PA000828, the Clean Water Act, the Pennsylvania Clean Streams Law, and their implementing regulations. The notice letter focused on violations of the water quality criterion in 25 Pa. Code § 93.7(a) (Table 3) and the related implementation provision in 25 Pa. Code § 96.6(b) that prohibit a discharge of heated wastewater from changing the temperature of any waters of the Commonwealth by more than two degrees (F) during a one-hour period (the "two degree hourly change criterion"). On March 27, 2006, PPL-BI and the Pennsylvania Department of Environmental Protection (PADEP) entered into a Consent Order and Agreement that was incorporated into a Stipulated Settlement filed before the Commonwealth Court of Pennsylvania at No. 202 M.D. 2006 on that same date. The Commonwealth Court adopted the Stipulated Settlement as an Order of the Court on March 30, 2006.

In addition to requiring the payment of civil penalties for past violations, the Stipulated Settlement provided for corrective actions through the incorporation of revised effluent limitations and other permit conditions in the Plant's NPDES Permit, which were attached as Exhibit A to the Stipulated Settlement. PPL-BI agreed in the Stipulated Settlement not to challenge the final effluent limits and conditions in the NPDES Permit if they are substantially the same as those in Exhibit A to the Stipulated Settlement. PADEP remains free (as it must) to change or add to those effluent limitations and permit conditions in response to comments submitted on the draft NPDES Permit, but in that event, PPL-BI has the right to challenge the changed or additional requirements.

The most important permit condition to which PPL-BI consented is Part C.III of the draft Permit, which requires PPL-BI to install draft mechanical cooling structures at the Brunner Island Plant by December 31, 2009 to lower the temperature of the up to 795 million gallons of once-through condenser cooling water used by the Plant each day. At the time of the settlement, we hailed this plan to add water cooling technology at a power plant built in the 1960s as important for restoring and protecting the Lower Susquehanna River in the vicinity of the Brunner Island Plant, and as a precedent for discontinuing the discharge huge volumes of once-

[1] Lower Susquehanna Riverkeeper® is a member of Waterkeeper® Alliance. Riverkeeper is a registered trademark and service mark of Riverkeeper, Inc. and is licensed for use herein. Waterkeeper is a registered trademark and service mark of Waterkeeper Alliance, Inc. and is licensed for use herein.

through cooling water without any significant reduction in temperature at other power plants in Pennsylvania and elsewhere. Though we advocate closed-loop cooling systems as the best technology available for minimizing both the thermal impacts of cooling water discharges and the impingement and entrainment impacts of cooling water intake structures, see 33 U.S.C. § 1326(b), we remain convinced that the Stipulated Settlement's fundamental requirement to install and operate draft mechanical cooling structures at the Plant is an important step forward for the Lower Susquehanna and an important precedent for eliminating un-cooled, large-volume discharges of heated wastewaters.

We reserved judgment in March about the details of the agreement between PADEP and PPL-BI, where bedeviling problems sometimes reside. We address a number of these details in the comments that follow. We begin with the six most troubling aspects of the proposed effluent limits and conditions in the draft Permit: 1) the fairly small changes from the Plant's current annual thermal load that would be required by the Permit; 2) the use of a 5,000 foot-long mixing zone; 3) the selection of the alternative, "316(a) variance" criteria; 4) starting with complete shutdown of the cooling towers during the three winter months rather than a more gradual and cautious approach; 5) the translation of the two degree hourly change criterion into an effluent limitation specified as a maximum hourly change in the Plant's heat rejection rate (addressed in Comments Nos. 5 and 6); and 6) the proposal to delay the effectiveness of the maximum discharge temperature limitation of 110°F until the cooling structures begin operation in 2009 or 2010.

Comments

1. The numbers in Appendix D to the Water Quality Protection Report suggest that the recommended heat rejection rate effluent limitations will not alleviate the appreciable harm to the aquatic community caused by the current thermal load from the Brunner Island Plant.

The Water Quality Protection Report for the draft Permit (Protection Report) states that PADEP's biologists found what they "believed to be appreciable harm to the aquatic communities for approximately 3 miles downstream of Outfall 001 [the end of Brunner Island Plant's cooling water discharge channel] along the western shore of the river, to the area of Haldeman Riffles (near the confluence with Codorus Creek)." (p. 4) It goes on to say that "[t]he Department will be modifying the 316(a) variance in this permit to institute requirements that the Department believes will eliminate the source of the appreciable harm to the river." (Id.) The numbers in Appendix D to the Protection Report, however, suggest that the recommended heat rejection rate effluent limits would not require substantial reductions from the actual thermal loads that have caused appreciable harm to a considerable stretch of the river.

A. The Plant's "acceptable" annual thermal load is higher than its current annual thermal load.

Appendix D to the Protection Report includes four columns of heat rejection or thermal load rates (in MBTU/day) for the Brunner Island Plant for the nineteen month or half-month periods for which Chapter 93 specifies maximum temperature criteria:

1) current actual – based on the Plant's 2003 DMR data;
2) current permitted – the Plant's theoretical maximum of 167,040 MBTU/day;
3) "acceptable" – the "[a]cceptable thermal loads based on meeting criteria at the 1-mile mixing zone point, using the Temperature Spreadsheet Model, Version 3.0" (where the "criteria" are the recommended 316(a) variance criteria of "8 degrees F above Chapter 93 criteria during winter (Dec – Feb), 4 degrees F above criteria during April, and 2 degrees F above criteria the rest of the year"); and
4) "recommended" – the heat rejection rate effluent limits appearing in the draft Permit, all but two of which are lower than the "acceptable" rates.

Assuming that the 2003 DMR data are representative of recent operations of the Brunner Island Plant, the current actual thermal load rates listed in Appendix D – or more accurately, the current actual thermal loads in MBTU obtained by multiplying those rates by the appropriate number of days in each of the nineteen periods – are what has resulted in the appreciable harm to the aquatic biological community in the Susquehanna River. One way to quickly gauge those "acceptable" thermal load rates as determined by PADEP's temperature model is to compare the annual thermal load they would deem "acceptable" against the current (actual) annual thermal load that has caused appreciable harm to the river's aquatic biological community. It is troubling to discover that the "acceptable" thermal load would exceed the current actual load.

We performed a number of different comparisons of the acceptable and actual thermal loads. In all cases, we calculated thermal loads in MBTU by multiplying the acceptable and actual load rates by the applicable number of days in the period (using 29 for February) and then adding the resulting figures. Using the rates in Appendix D, the "acceptable" loading of 48,309,711 MBTU per year from the Brunner Island Plant would be nearly 7 million MBTU per year higher than the current thermal load of 41,337,340 MBTU per year. In other words, the rates that PADEP's temperature model finds "acceptable" would allow a 16.9 percent increase in the thermal load entering the Susquehanna River from the Brunner Island Plant.

In part to reduce the impact of the seemingly anomalous "acceptable" rate of 266,586 MBTU/day for the period October 16-31 in Appendix D, PennFuture performed a second set of calculations in which all of the "acceptable" thermal load rates in Appendix D that exceed the Plant's theoretical maximum rate of 167,040 MBTU/day were reduced to that lower, permitted rate. With those adjustments, the modified "acceptable" loading of 46,164,980 MBTU per year would be about 4.8 million MBTU per year higher than the current thermal load of 41,337,340 MBTU per year, and thus would find "acceptable" an 11.7 percent increase in the Plant's annual thermal load to the river.

Even when the analysis is confined to the nine non-winter months during which the Permit would require operation of the cooling towers, the "acceptable" thermal loading as determined by PADEP's temperature model would exceed the actual current thermal loads. The "acceptable" loading of 37,438,678 MBTU per year for the months of March through November would be more than 7.3 million MBTU (and 24.25 percent) higher than the current actual thermal load of 30,131,586 MBTU for that same period. Using the procedure described above to reduce any higher acceptable rates to the permitted maximum, the "modified acceptable" thermal

load of 31,151,989 for the non-winter months would be about one million MBTU higher than the current actual loading, and thus would allow a 3.3 percent increase from the current level.

We recognize that the "recommended" heat rejection rate effluent limits in the draft Permit are, with a few exceptions, substantially lower than the "acceptable" thermal loading rates listed in Appendix D. We further recognize that the time of year when the heat load is released into the river may affect its impact on the aquatic biological community. Nevertheless, the data presented in Appendix D give rise to several concerns.

First, the recommended effluent limit of 91,870 MBTU/day for November 16-30 exceeds the modeled "acceptable" thermal loading rate of 52,768 MBTU/day by 39,102 MBTU/day, that is, by roughly 74 percent of the "acceptable" rate. By definition, it is unacceptable for the Plant's maximum heat rejection rate to exceed the "acceptable" thermal load rate.[2] Applying a factor of safety of ten percent, the Permit's effluent limit for November 1-16 should be no greater than 47,490 MBTU/day, which is less than half the rate proposed in the draft Permit.

Second, PADEP should, at a minimum, apply a similar, factor-of-safety approach to reduce the Permit's maximum heat rejection rate limits for the periods identified in the table immediately below. With the qualification that we believe the relevant heat rejection rate limits of the Permit should be even lower for the reasons explained in this Comment and Comments Nos. 1.B through 4, below, those limits certainly should be no higher than the "Factor of Safety Limits" listed in the table immediately below.

Period	**Draft Permit "Recommended" Limit (MBTU/day)**	**Factor of Safety Limit App. D "Acceptable" Rate Minus Ten Percent (MBTU/day)**
Jan 1-31	167,040	149,750
Feb 1-29	167,040	145,135
Apr 1-15	91,870	82,430
Apr 16-30	91,870	83,030
Aug 1-15	75,170	75,020
Nov 1-15	91,870	89,460
Nov 16-30	91,870	47,490
Dec 1-31	167,040	165,860

Third, and most important, although the Protection Report does not explain how PADEP got from the "acceptable" thermal loads to the generally lower "recommended" heat rejection rate effluent limits, to the extent that the "acceptable" loads are unacceptably high because they exceed the current actual thermal loads, the recommended effluent limits are likely to be unacceptably high as well. We provide further evidence that this is so in the next subsection of these comments.

[2] The recommended limit of 91,870 MBTU/day for April 1-15 also exceeds the acceptable rate of 91,588 MBTU.

When the current thermal load is causing appreciable harm and the modeled "acceptable" load is higher than the current load, something is wrong with the model. The problem may be with the model itself, with site-specific complications that confound its application at this particular location, or with one or more of the inputs (e.g., alternative instream criteria, mixing zone length, partial mix factors). But whatever the explanation, a comparison of the annual thermal loads that would result from the "acceptable" versus the actual heat rejection rates shows that the rates PADEP's temperature model would find "acceptable" have already been rejected by the river as too high to sustain a balanced and indigenous biological community.

B. The recommended heat rejection rate effluent limits would result in only an 8.3 percent reduction in the Brunner Island Plant's annual thermal load to the Susquehanna River.

For the three winter months of December through February, the draft permit would not require operation of the cooling towers, and would leave in place for those three months a heat rejection rate "limit"[3] that "was established at a level that theoretically PPL could never exceed." (Protection Report, p. 4) The Protection Report indicates that for the period of March through November, the recommended heat rejection rate effluent limitations in the draft Permit are from 45 percent to 55 percent below the existing permitted rate. (p. 5) But that comparison misleadingly overstates the true, practical impact of the new limits, because the existing permit limit was set at a theoretical maximum rate the Plant could not exceed. It is far more meaningful to know how much of a reduction in the Plant's actual thermal load would be required by the draft permit. The answers – 8.3 percent overall and 24.6 percent during the non-winter months – again cast considerable doubt on whether the Permit as drafted would alleviate the existing appreciable impairment of the river's aquatic community.

In the table at the top of the next page, we have added to the numbers drawn from the spreadsheet in Appendix D the fact that the permit recommends translating the current permitted maximum heat rejection rate of 6,960 MBTU/hr into a maximum rate of 167,040 MBTU/day during the winter months. The highlighted cells in the last column with negative required "reductions" show the periods during which the draft Permit's recommended heat rejection rates would allow increases from the current actual rate.

[3] The draft permit would change the expression of this existing limit from 6,960 MBTU per hour to 167,040 MBTU per day.

Period	Current Actual Thermal Load (MBTUs/day)	Current Permitted Thermal Load (MBTUs/day)	Recommended Heat Rejection Rate Limits (MMBTU/day	Percent Reduction Required vs. Current Limits	Percent Reduction Required vs. Actual Load
Jan 1-31	114,604	167,040	167,040	0.0	(-45.8)
Feb 1-29	143,420	167,040	167,040	0.0	(-16.5)
Mar 1-31	144,149	167,040	91,870	45.0	36.3
Apr 1-15	117,963	167,040	91,870	45.0	22.2
Apr 16-30	128,255	167,040	91,870	45.0	28.4
May 1-15	98,643	167,040	83,520	50.0	15.3
May 16-31	78,400	167,040	83,520	50.0	(-6.5)
Jun 1-15	111,575	167,040	75,170	55.0	32.6
Jun 16-30	112,084	167,040	75,170	55.0	32.9
Jul 1-31	130,441	167,040	75,170	55.0	42.4
Aug 1-15	133,811	167,040	75,170	55.0	43.8
Aug 16-31	132,925	167,040	75,170	55.0	43.4
Sep 1-15	76,262	167,040	75,170	55.0	1.4
Sep 16-30	64,540	167,040	75,170	55.0	(-16.5)
Oct 1-15	68,200	167,040	83,520	50.0	(-22.5)
Oct 16-31	68,529	167,040	83,520	50.0	(-21.9)
Nov 1-15	94,324	167,040	91,870	45.0	2.6
Nov 16-30	137,120	167,040	91,870	45.0	33.0
Dec 1-31	112,705	167,040	167,040	0.0	(-48.2)

Although the recommended heat rejection rate limits would laudably require substantial cuts in the current actual heat loads during the summer months of June through August, we are especially concerned about two aspects of the draft Permit revealed by the final column of this table. First, the month of May is an especially important period for the lower Susquehanna because smallmouth bass spawn primarily during May. The draft permit would require only a 15.3 percent reduction in the heat rejection rate during the first half of May, and would actually authorize a 6.5 percent increase in the thermal loading rate during the second half of the month. For both periods in May, the draft Permit should require reductions of at least 25 percent <u>from the current actual heat rejection rates</u>, which would result in limits of 73,980 MBTU/day for the first half of the month and 58,800 MBTU/day for the second half. Second, the critical, $Q_{7\text{-}10}$ low flow condition for this portion of the river occurs during September, but the draft permit would require only a tiny, 1.4 percent reduction in the actual thermal loading during the first half of September, and would allow an increase of 16.5 percent from the current rate during the second half of the month. For the low-flow month of September and the following month of October, the Permit should require reductions from the current actual heat rejection rates and certainly should not allow <u>increases</u>. We again recommend reductions of 25 percent <u>from the current actual heat rejection rates</u>, which would result in the following effluent limits: 1) September 1-15 – 57,200 MBTU/day; 2) September 16-30 – 48,400 MBTU/day; October 1-15 – 51,150 MBTU/day; 4) October 16-31 – 51,400 MBTU/day.

As in the preceding subsection, however, the more telling comparison is not between the heat rejection <u>rates</u> in MBTU/day (some of which apply to 15 or 16 days, some to 29, 30, or 31),

but rather between the annual heat load in MBTU those rates would authorize. Here we examine just two calculations.

First, multiplying the rates in Appendix D by the appropriate number of days, and using 167,040 MBTU/day as the recommended permit limit for the winter months, yields a maximum permitted heat load of 37,909,790 MBTU per year, which is just 3,427,550 MBTU (8.3 percent) lower than the current actual load of 41,337,340 MBTU per year. Thus, the recommended permit limits would require a reduction of only 8.3 percent in the thermal load the Brunner Island Plant currently adds to the Susquehanna River each year. Second, limiting the analysis to the non-winter months, if the Plant were to discharge at the maximum heat rejection rates allowed by the draft permit, the Plant's future (post-cooling tower construction) thermal load for the non-winter months would be 22,709,150 MBTU, or a reduction of 7,422,436 MBTU (about 24.6 percent) from the current actual thermal load 30,131,586 MBTU for that nine month period.[4]

Appreciable harm to nearly three miles of the Susquehanna River demands appreciable reductions in thermal loads. What counts are not the inflated percentage reductions from the Brunner Island Plant's theoretical maximum heat rejection rate, but rather the percentage reduction from the current actual heat load – the condition that has done the harm. Requiring a modest annual reduction of only 8.3 percent from the current annual thermal load, or even a reduction of 24.6 percent from the current loads during the nine non-winter months, seems insufficient to alleviate the appreciable harm PADEP's biologist have found in a segment of the river three miles long.

In the next two sections, we suggest changes to two of the temperature model inputs that should result in lower "acceptable" and recommended heat rejection rates.

2. A 5,000 foot-long mixing zone in the Susquehanna River below the confluence of the 2,000 foot-long discharge channel with river is excessive.

Pennsylvania's regulation governing the implementation of its water quality standards for "[h]eated wastewater discharges," 25 Pa. Code § 96.6, contains an ambient temperature change restriction in subsection (b) and a heat content restriction in subsection (c). Using language virtually identical to that found in the counterpart water quality standard in 25 Pa. Code § 93.7(a) (Table 3), Section 96.6(b) provides: "Heated wastewater discharges may not cause a change of surface water temperature of more than 2°F during any 1-hour period." 25 Pa. Code § 96.6(b). Section 96.6(c) provides that in addition to satisfying subsection (b)'s ambient temperature change restriction, "the allowable heat content of heated wastewater discharges shall

[4] This same difference of 7.4 million MBTU is obtained for a full-year calculation if one assumes that the Plant's actual thermal load during the winter months will continue at the current rates (i.e., that the Plant's heat rejection rate during those months will not increase to the higher rate of 167,040 MBTU/day allowed by the permit). Expanding this idea by assuming that the Plant's heat rejection rate will not increase from the current actual rate for any period (even where the draft Permit would allow such increases), the adjusted permitted thermal load would be about 33.2 million MBTU per year, or about 19.7 percent lower than the current annual thermal load.

be limited to" either: (1) an amount that will not raise the temperature of the receiving surface water above the applicable list of maximum instream temperature criteria in 25 Pa. Code § 93.7; or (2) some higher amount based on an evaluation conducted in accordance with Section 316(a) of the federal Clean Water Act, 33 U.S.C. § 1326(a). 25 Pa. Code § 96.6(c)(1), (2). This second option for implementing the heat content restriction is known as a "316(a) variance." Section 316(a) of the Clean Water Act authorizes the NPDES permitting authority to impose thermal effluent limitations "that will assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on [the receiving] body of water." 33 U.S.C. § 1326(a).

To translate either the temperature change restriction of 25 Pa. Code § 96.6(b) or the heat content restriction of 25 Pa. Code § 96.6(c) into NPDES permit effluent limitations, one must select the point of compliance. Unfortunately, the applicable provisions of law provide no guidance on this critical question. The two degree hourly change water quality criterion of 25 Pa. Code § 93.7(a) and the related implementation provision of 25 Pa. Code § 96.6(b) do not specify the point in the receiving water at which compliance should be measured. Similarly, neither Section 316(a) of the Clean Water Act nor the Pennsylvania regulation authorizing effluent limitations to be based on a Section 316(a) evaluation, 25 Pa. Code § 96.6(c)(2), specifies where in the receiving water body the "balanced, indigenous" population must exist, or conversely, from what portion (if any) of the receiving water body a discharge of heated wastewater may impair, or create an imbalance in, the aquatic community. More generally, Pennsylvania has not heeded the Environmental Protection Agency's "recommend[ations] that States have a definitive statement in their [water quality] standards on whether or not mixing zones are allowed," and that "State water quality standards should describe the State's methodology for determining the location, size, shape, outfall design and in-zone quality of mixing zones," EPA, Water Quality Standards Handbook, p. 5-2 (2d ed. 1994).[5] Pennsylvania's Chapter 93 water quality standards and Chapter 96 implementation provisions contain no definitive statement about mixing zones and do not describe how to determine the point for measuring compliance with ambient water quality standards, and thus the point to be used in modeling effluent limitations for achieving those standards.

Part C.IV on page 26 of the draft NPDES permit states: "The Department has approved a variance from meeting state water quality standards to the permittee under Section 316(a) of the Clean Water Act under the assumption that the Final Heat Rejection Rate limitations for Outfall 001 will result in a balanced, indigenous aquatic life community in and on the body of water at a distance of 5,000 feet downstream of the discharge channel." (emphasis added) That is to say, as Appendix D to the Protection Report confirms,[6] PADEP used a mixing zone of 5,000 feet when calculating the draft NPDES Permit's heat rejection rate effluent limitations. The same is true with respect to the draft permit's hourly heat rejection rate change limitation of 2,210 MBTU/hr, the calculation of which uses a partial mix factor that is based on the width of the thermal plume at the one mile mixing zone boundary. (Protection Report, App. D, E). In other

[5] For an example of a state mixing zone regulation with specific provisions governing thermal mixing zones, see Ohio Admin. Code § 3745-2-08(M).

[6] Footnote 8 to the spreadsheet in Appendix D states that the "[a]ccepatble thermal loads [are] based on meeting criteria at [the] 1-mile mixing zone point."

words, these effluent limitations are designed to produce compliance with the two degree hourly change criterion, and with the alternative, 316(a) variance-based instream temperature criteria used in the calculations,[7] only at points at least 5,000 feet downriver from the confluence of the 2,000 foot-long discharge channel with the Susquehanna River. In the nearly mile-long area between that confluence and the compliance points downriver, the Brunner Island Plant's discharge may cause the river's temperature to: a) change by more than two degrees (F) in one hour, b) exceed even the augmented, 316(a) variance instream temperatures used in determining the draft heat rejection rate limits; and c) cause appreciable harm to the river's aquatic community.

As described in EPA's Water Quality Standards Handbook (2d ed. 1994), a mixing zone is "a limited area or volume of water where initial dilution of a discharge takes place." (p. 5-1) "The area or volume of an individual [mixing] zone or group of zones must be limited to an area or volume as small as practicable that will not interfere with the designated uses or with the established community of aquatic life in the segment for which the uses are designated." (p. 5-3) In Part C.I.F. of the current Permit, which took effect March 1, 2002, PADEP required PPL-BI to perform temperature monitoring in the river at the end of a 650 foot-long mixing zone below the confluence of the Plant's discharge channel with the river, which was thought to represent an average 15-minute travel time. Both "antibacksliding" and administrative finality may preclude the adoption of a different thermal mixing zone in this renewal of the Permit. Moreover, in light of this recent (and uncontested) judgment that a 650-foot mixing zone is appropriate for implementing the two degree hourly change criterion, PADEP bears a heavy burden to justify a thermal mixing zone in this version of the Permit that is nearly eight times that length. Far from carrying that burden, the available documents offer no justification for dramatically expanding the mixing zone in this renewal of the Permit.

Even if the current Permit did not contain a much shorter mixing zone, however, a thorough justification for a nearly mile-long mixing zone would be demanded by the combination of: 1) EPA's guidance to keep mixing zones "as small as practicable;" 2) the importance of the mixing zone's length to PADEP's temperature modeling,; and 3) the fact that a mixing zone establishes, without express regulatory authority or standards, what amounts to an exception to regulatory criteria of general applicability. But neither the Protection Report nor any other document we reviewed explains why a 5,000 foot-long mixing zone is warranted in this situation, or how PADEP and PPL came up with that length.

The Protection Report states that "[m]ixing was considered at a distance of approximately 5,000 feet (about 1 mile) downstream of Outfall 001. Below this location, the Department's biologists have determined that critical aquatic life habitat must be protected." (p. 4) The reference to "critical aquatic life habitat" suggests that the line was drawn in part based on judgments about the quality and perhaps quantity of the habitat. But reaches of streams with comparatively deficient aquatic life habitat nevertheless deserve protection of their existing and designated aquatic life uses. Where Pennsylvania law recognizes exceptions to the protection of the aquatic life use, it does so explicitly. See 25 Pa. Code § 95.5 (modifying treatment

[7] These 316(a) variance criteria, which are listed in the "Allowable Temperatures" column in the Protection Report's Appendix D spreadsheet, are discussed in Comment No. 3.

requirements where "aquatic communities are essentially excluded" from receiving waters by acid mine drainage).

One consideration not mentioned in the Protection Report is that the mixing zone at issue is public property. The bed and banks of the Susquehanna River up to the mean ordinary low water mark are owned by the Commonwealth of Pennsylvania and held in trust by it for the benefit of all the people.[8] See R. T. Weston, Public Rights in Pennsylvania Waters, 49 Temple L. Q. 515, 539 & n. 153 (1976); Pa. Const., art. I, Sec. 27. We are concerned about the size of the area within the public "commons" that the draft permit would authorize one private company, PPL-BI, to impair. In addition, though it might be unreasonable to expect a discharge of this volume to result in attainment of water quality criteria at the "end of pipe," here the condenser cooling water discharged by the Brunner Island Plant already has traveled 2,000 feet through the Plant's discharge channel (itself part of the "waters of the United States," 40 C.F.R. § 122.2, and the "waters of the commonwealth," 35 P.S. § 691.1), before it reaches the Susquehanna River.

If the mixing zone were shortened, the modeled "acceptable" heat rejection rates in Appendix D to the Protection Report would be lower, which should, in turn, result in lower "recommended" heat rejection rate limits. In light of the public ownership of the section of the river at issue and the demonstration in Comment No. 1 that the heat rejection rate limits in the draft Permit would require only modest reductions in the Plant's actual thermal load, we recommend that PADEP continue to use the 650-foot thermal mixing zone it used in the current version of the Permit, and that it repeat its modeling and determination of the temperature effluent limitations using that distance. In making this recommendation, we emphasize that we do not necessarily regard a 650 foot-long mixing zone as appropriate either at the Brunner Island Plant or elsewhere, but we recognize that the 650-foot zone has the imprimatur of recent practice and administrative finality in this particular situation.

3. The "316(a) variance" instream criteria are not justified by the draft Permit's supporting documents.

The Protection Report states that "[t]he Heat Rejection Rate maximum daily limits . . . were agreed upon with PPL" and "are generally consistent with a 316(a) variance that provides a 4°F increase above [the 25 Pa. Code § 93.7(a) (Table 3)] WWF criteria during April and a 2°F increase above WWF Criteria during March and May through November, as shown in Attachment D." (p. 5) Footnote 2 in Attachment D further indicates that the allowable instream temperatures used in modeling the "acceptable" loads listed in its spreadsheet were set at eight degrees (F) above the Chapter 93 criteria for the three winter months.

Putting aside the issue of the size of the mixing zone, the Protection Report provides no explanation or reason, beyond the agreement with PPL, for selecting those particular margins above the Chapter 93 temperature criteria. The very order in which the quoted sentence

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[8] Additional public rights extend landward to the ordinary high water mark. See Weston, Public Rights, 49 Temple L. Q. at 540.

discusses the effluent limits and the 316(a) variance criteria suggests that instead of first deciding upon the appropriate instream criteria and then running the temperature model to see what "acceptable" thermal loads would satisfy those criteria, PADEP and PPL first reached agreement on the heat rejection rate effluent limits and then worked backward to the selection of supporting instream criteria.

Further support for this conclusion comes from two additional facts. First, in no other iteration of the many modeling runs available in PADEP's file did it use the odd combination of instream temperature criteria used in Appendix D – 8°F above the Chapter 93 WWF criteria during the winter, 4°F above the Chapter 93 criteria in April, and 2°F above the Chapter 93 numbers for the rest of the year. There are some with no 316(a) variance at all, some with a "full 58-degree winter variance" (58°F instream criterion for November 16 through April 15, and Chapter 93 criteria for the remainder of the year), and some with a "5-degree winter variance" or "3-degree winter variance" (Chapter 93 criteria plus 5 (or 3) degrees for November 16 through April 15, and Chapter 93 criteria for the remainder of the year), but not one with the odd assortment used in the final modeling.

Second, the fact that the allowable temperatures for April under the 316(a) variance are an extra two degrees above the Chapter 93 criteria means that the modeled "acceptable" thermal load rate for both halves of April almost precisely match the recommended heat rejection rate effluent limits for those periods. Without that extra two degree boost, the agreed-upon heat rejection rates for April would be called into question by the fact that they would noticeably exceed the modeled "acceptable" thermal loading rates. The Protection Report does not allay these suspicions by providing a justification for applying an extra two degree margin above the standard Chapter 93 criteria exclusively to April among the non-winter months.[9]

Regardless of those suspicions, however, we would be particularly concerned that the greatest margins above the standard WWF temperature criteria are in April, when smallmouth bass begin their movement upstream in preparation for spawning that usually begins in May. Smallmouth bass typically begin spawning at a temperature of 60 degrees (F) or lower. By allowing the river temperature to rise to 56 degrees during the first half of April and to 62 degrees during the second half of the month, the draft permit's heat rejection rate limits carry the risk of inducing smallmouth bass (and perhaps other species) to spawn prematurely. In turn, such early spawning could result in lower survival rates for the baby smallmouth (for example, when (paradoxically) heavy rains expose them to lower water temperatures than would be expected during the normal spawning period). Given recent trends in the Susquehanna's smallmouth bass population, this result obviously is one to be avoided.

The only instream monitoring data available that includes the month of April is PPL-BI's monitoring from 2003, which is included in Attachment C to the Protection Report. One of the monitoring locations, Station T-7, was approximately one mile downriver from the Brunner Island Plant's discharge channel. PADEP has concluded that the aquatic biological community

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[9] Other than Appendix D, all of the modeling spreadsheets we reviewed in PADEP's files used the Chapter 93 WWF criterion of 58 degrees (F) as the "allowable temperature" for the second half of April.

is impaired at that location, and for roughly an additional two miles downriver. (Protection Report, p. 4) For the first half of April, the Chapter 93 WWF temperature criterion is an average daily maximum temperature of 52 degrees. For three days during the first half of April 2003, the average daily temperature at Station T-7 exceeded 52 degrees, with the highest daily average being 56.1 degrees. Over the whole 15 day period, the average daily temperature was 48.5 degrees. Because the draft permit's heat rejection rate is designed to achieve an average daily maximum instream temperature of 56 degrees rather than the usual 52 degrees, the permit would essentially allow the 2003 pattern to continue. To the extent the 2003 pattern contributed to the observed impairment at Station T-7, that result obviously would be inappropriate.

For the second half of April, the Chapter 93 criterion is an average daily maximum temperature of 58 degrees. For thirteen days during the second half of April 2003, the average daily temperature at Station T-7 exceeded 58 degrees, with the highest daily average being 77 degrees. Over the whole 15 day period, the average daily temperature was 65.7 degrees, or almost eight degrees above the Chapter 93 daily maximum criterion. Although achieving an instream daily maximum of 62 degrees during the second half of April obviously would be an improvement over those 2003 conditions, it is impossible to say, from the data presented, whether that improvement would be sufficient to alleviate the appreciable harm to the aquatic communities PADEP has found at Station T-7 and for an additional two miles downriver.

This same observation applies generally to the list of 316(a) variance "allowable temperatures" in Appendix D to the Protection Report, and to the final heat rejection rate limits that are based on them. What is the basis for believing that if the instream temperatures at the end of the 5,000 foot mixing zone only exceed the standard maximum temperature criteria by 8°F during winter, 4°F during April, and 2°F during the other eight non-winter months, a balanced, indigenous aquatic community will exist at that point and downriver? Identifying locations below the Plant with a healthy, balanced, indigenous aquatic biological community where these 316(a) variance "allowable temperatures" have prevailed is important to support PADEP's use of those temperatures in its modeling in place of the presumptively applicable and presumptively valid Chapter 93 criteria. PADEP has not made such a showing.

The Double Whammy

PADEP's use of an elongated, 5,000-foot mixing zone together with its granting of a 316(a) variance from the Chapter 93 temperature criteria is a "double whammy." Their combined effect, as shown in Comment No. 1, is a set of heat rejection effluent limits that fail to guarantee substantial reductions in the Brunner Island Plant's current thermal load.

If PADEP is going to grant a discharger the generous benefit of a 5,000 foot mixing zone below a 2,000 foot discharge channel, it should at least insist that the discharge meet the standard Chapter 93 instream criteria at the mixing zone boundary. As between the two factors, however, provided that there is a demonstration that higher-than-Chapter 93 instream criteria will sustain a balanced, indigenous aquatic community in this reach of the river, we would prefer to see the mixing zone reduced to the 650 foot length used in the last renewal of the Permit, with corresponding downward adjustments to the modeled "acceptable" thermal loads and the heat rejection rate effluent limits.

4. The Permit's approach to the three winter months should be more cautious than initially allowing a shutdown of the cooling towers during that period.

The draft Permit would require PPL-BI to run the full volume of the condenser cooling water through the new mechanical cooling structures during the period March 1 through November 30. (Part A, Footnote 13) It would leave in place, as the final heat rejection limit for the months of December, January, and February, the existing theoretical maximum heat rejection rate of 6,960 MBTU/hour (translated in the draft permit to 167,040 MBTU/day), which PPL-BI never has violated. As a result, "PPL will be allowed to turn off the cooling system during the winter months (December 1 – February 29)." (Protection Report, p. 5) The Protection Report goes on to explain that "PPL desired this due to the costs it will incur for operating the system, concerns over freezing, and because it did not feel that existing winter temperatures were causing a biological concern. The Department's biologists believe that this may be acceptable, subject to further biological surveys to confirm that the lack of winter cooling is not causing appreciable harm to aquatic life." (p. 5)

As late as mid-February 2006, PADEP was proposing a year-round maximum heat rejection rate of 2,213 MBTU/hr or 53,124 MBTU/day in order to satisfy the applicable instream temperature criteria. The careful wording of the Protection Report – "believe that this may be acceptable" – along with the need for further biological surveys, shows that PADEP has not concluded that the lack of winter cooling is not contributing to the impairment of the river's biological community. It is precisely because PADEP lacks the data necessary to draw a firm conclusion that it is requiring PPL to perform additional biological studies and to demonstrate that the lack of winter cooling is not causing harm.

But the firm conclusion and the studies necessary to support it must come first. The "precautionary principle" instructs environmental regulators to err on the side of protecting, rather than risking harm to, public health and natural resources. When it comes to the winter months, the draft Permit fails to take such a cautious, conservative approach. Given the number of potentially confounding variables, nobody can say today, with the requisite degree of scientific certainty, that the failure to cool the Brunner Island Plant's discharge during the winter months has not contributed to the appreciable harm to the downstream aquatic community found by PADEP. But instead of testing its theory gradually by allowing incremental cutbacks in winter cooling and assessing their impacts, the draft permit would take the unreasonably risky approach of authorizing a complete shutdown of the cooling system and allowing the current permit limit – the theoretical maximum heat rejection rate – to remain in effect for the winter months.

We recommend that instead of initially allowing a complete shutdown of the cooling structures during the winter months, PADEP test its theory about the effect of the winter temperatures gradually by initially requiring that all cooling water be run through the cooling structures during the winter months, with an express exception for periods during which icing or other identified conditions would allow PPL-BI to shut down the cooling structures. We further recommend initially setting a maximum heat rejection rate limit of no more than 96,050 MBTU/day for the three winter months, which is roughly a 42.5% reduction from the current limit, again subject to an exception for shutdowns. The Permit could include a provision

allowing PADEP to relax this winter limit in the event the biological monitoring demonstrates that the current impairment of the river has been alleviated and higher winter temperatures will not cause appreciable harm to the river's biological community.[10] This change would require the deletion the last sentence of Part C.III.C of the draft Permit and the related phrase "or April 1, 2010 if physical construction is completed in the winter" from Part A, Footnote 1.

5. PADEP's calculation of the maximum hourly change in heat rejection rate is incorrect because it uses an inapplicable statistical procedure. The maximum heat rejection rate change effluent limit should be no higher than 1,354 MBTU per hour.

In Comment 6, below, we recommend that PADEP avoid the complication of calculating a maximum hourly heat rejection rate change effluent limitation by replacing that limitation with one that establishes a maximum hourly change in the temperature of the Susquehanna River at the compliance point, or with a limit establishing a maximum hourly change in the temperature of the cooling water at Outfall 001. In this comment, we explain why PADEP's calculation of the maximum hourly heat rejection rate limit, and, along the way, its determination of the appropriate maximum hourly temperature change in the discharge channel at Outfall 001, were incorrect. The heat rejection change limit PADEP calculated at 2,210 MBTU per hour should be no greater than 1,354 MBTU per hour.

A. The statistical concept of a confidence interval is inapplicable to the calculation at issue.

In order to implement the two degree hourly change instream temperature criterion, the draft permit includes an effluent limitation restricting the change in the Plant's heat rejection rate to 2,210 MBTU per hour. PADEP came up with that rate by first calculating the hourly temperature change at the end of the discharge channel that would be expected to result in a two degree (F) change in the river temperature at the end of a 5,000 foot mixing zone during September, the month with the lowest river flow. That calculated temperature is 5.41 degrees (F). In an attempt to apply a statistical confidence interval, PADEP then multiplied that temperature by a confidence interval factor of 1.65, resulting in a temperature of 8.9 degrees (F). After applying a ten percent factor of safety to reduce that value to 8.0 degrees, PADEP plugged the 8.0 degree change value into a mass balance equation to come up with the rate of 2,210 MBTU/hr.

We note initially that PADEP's determination of the 2,210 MBTU/hr limit is dependent on the 5,000-foot mixing zone to which we have objected above. Though we continue that objection, the remainder of this discussion and our calculations will assume a 5,000-foot mixing zone is applicable.

The fatal flaw in PADEP's calculation comes in the second step of multiplying the calculated value of 5.41 degrees by a statistical "z-score" of 1.65. There is absolutely no basis

[10] Relaxing the winter limit based on such future monitoring results would appear to fall within either or both of antibacksliding exceptions at 33 U.S.C. § 1342(*o*)(B)(i), (D).

for using a z-score in the calculation at issue, and even if there were, the way PADEP used it is incorrect.

The fundamental error here is the application *vel non* of a confidence interval. A confidence interval is something that is applied to the measure of central tendency (usually a mean or median) for a sample drawn from a larger population. The farther away a particular value is from the sample mean or median, the less likely it is that the value is the "true" mean or median of the overall population.

The concept of the confidence interval simply has nothing to do with the end-of-discharge-channel temperature change value PADEP calculated here (5.41°F/hr). That calculated value is not the result of random samples drawn from a larger population, and therefore has no statistical confidence interval. Moreover, because PADEP has no sampling data from which to determine a mean or standard deviation, it has no basis for determining a confidence interval. In short, PADEP's attempt to create a confidence interval around the calculated value of a change of 5.41 degrees (F) per hour at the end of the Plant's discharge channel is statistical nonsense. PADEP therefore should have applied its 10 percent factor of safety directly to the calculated value of 5.41°F/hr and then plugged the resulting temperature change of 4.9°F/hr into its mass balance equation. The result is 1,354 MBTU/hr. With the caveat that we believe the value should be lower because of the excessive length of the mixing zone, we recommend that PADEP replace the draft effluent limit of a maximum change of 2,210 MBTU per hour with a value no greater than 1,354 MBTU per hour.

B. If a confidence interval somehow is applicable, PADEP has not determined it correctly.

The preceding subsection is all that is needed to correct the maximum heat rejection rate effluent limit. In the event PADEP nevertheless believes that it must apply a confidence interval, we show in this section additional errors in PADEP's application of the concept.

"Z-scores" apply to populations that are normally distributed for which the standard deviation is known. A different set of values, known as "t-statistics" or "Student's t-statistics," are used for small sample sizes where the standard deviation is unknown (and must be calculated from the sample data). As the sample size increases, the t distribution approaches the normal, and the t-statistic cutoff values for various levels of confidence approach the z-score values.

Given that the sample size here (one) is small and the standard deviation of the population is not known, it is improper to use the z-score. It also is impossible to use a t-statistic. Because the "sample" has no degrees of freedom, there <u>is</u> no t-statistic, and because the sample has no variation, one cannot calculate a standard deviation to which the t-statistic might be applied. If we were dealing with value obtained by averaging a sample of "n" members, one could calculate a standard deviation and determine the appropriate t-statistic using n-1 degrees of freedom.

If one had sampling data enabling one to perform such calculations, however, the appropriate confidence interval limit to use in this situation would be the <u>lower</u> limit, not the

upper limit. For the mean or median of a given random sample, there are equal, 50 percent likelihoods that the "true" average value in the population (here, the true average hourly temperature figure that will cause a two degree (F) change across the river at the end of the 5,000 foot mixing zone) is higher than or lower than the sample mean or median. If the value selected for use in the mass balance equation is too high, the limit will not satisfy the standard of ensuring compliance with the instream criterion at the compliance point.

Two policy questions presented in that situation are on which side does the regulator err, and by how much? That is, should the regulator use the boundary of the upper or lower confidence interval, and what level of confidence should the regulator select? Here, no matter what level of confidence is selected, the precautionary principle dictates that the lower confidence interval boundary be chosen. Assume that a 95% confidence level is chosen. When your concern is preventing temperature changes of a certain magnitude, selecting the higher-than-the-mean temperature change confidence interval boundary obviously is a very risky course, because there is only a five percent chance that the true value is that high. In contrast, the boundary of the lower confidence interval is the precautionary or conservative choice, giving the regulator 95% confidence that the result to be avoided – river temperature swings of more than two degrees within an hour at the end of the mixing zone – will, in fact, be avoided. So, if PADEP were to use a confidence interval value, it should take the precautionary approach of using the boundary of the lower one-tailed confidence interval.

Finally, PADEP's multiplication of the calculated end-of-channel temperature by the z-score is incorrect. The proper way to determine the boundary of a one-tailed confidence interval is to select the appropriate t-statistic based on the chosen confidence level and the number of degrees of freedom, multiply the t-statistic by the calculated standard deviation divided by the square root of the number of samples, and then subtract that number (for the lower one-tailed limit) or add that number (for the upper, one-tailed limit) to the sample mean or median.[11] If PADEP can find a way to properly calculate a standard deviation and determine a confidence interval here, however, we will be surprised and enlightened to see it.

6. PADEP should replace the maximum hourly heat rejection rate change effluent limitation with an effluent limitation setting a maximum hourly change of 2°F measured at the compliance point in the river. Alternatively, the limit should be expressed as a maximum hourly change of 4.9°F/hr in the temperature of the water in the Plant's discharge channel. If PADEP retains the exception to the maximum heat rejection rate change effluent limitation in Part A, Footnote 7 of the draft Permit, it must change the values of 2,210 MBTU/hr. and 8°F in that exception to 1,354 MBTU/hr. and 4.9°F, respectively.

The last paragraph of Part A, footnote 7 on page 10 of the draft Permit includes the following exception to the draft heat rejection rate change effluent limitation: "If the hourly

[11] For large samples, the calculation of a confidence interval boundary using a z-score similarly uses the product of the z-score times the standard deviation divided by the square root of the sample size.

Heat Rejection Rate Change exceeds the limitation specified in Part A I and II, the permittee shall not be considered in violation of the limitation if the permittee can document that the effluent temperature over the same period of time did not change by more than 8 °F." The Protection Report explains that "PPL has noted that there may be events where the Heat Rejection Rate Change may exceed 2,210 MBTUs/hour due to changes in discharge flows, and requested that it not be considered in violation if the temperature change does not exceed 8 °F in the channel, to which the Department agreed." (p. 8)

First, for the reasons explained in the preceding comment, if PADEP decides to retain the exception in the quoted provision of Part A, Footnote 7, the value of 2,210 MBTU/hr in the exception must be changed to 1,354 MBTU/hr, and the value of 8°F must be changed to 4.9°F. Both of the higher figures that appear in the current draft of the exception were improperly inflated by PADEP's incorrect application of a confidence interval and a z-score.

Second, the Protection Report does not rule out the possibility that the temperature in the discharge channel may change by more than 8°F per hour, and thus may result in an hourly change of more than two degrees (F) in the river temperature at the end of the mixing zone, during some periods in which the heat rejection rate does not change by more than 2,210 MBTU. It therefore does not justify the one-sided, ratchet-like operation of Footnote 7's exception. As drafted, an in-channel temperature change of less than 8°F/hr (which should be 4.9°F/hr), trumps and excuses an exceedance of the heat rejection rate change limit of 2,210 MBTUs/hr (which should be 1,354 MBTU/hr), but the permit does not symmetrically provide that an in-channel temperature change of more than 8°F/hr trumps a heat rejection rate change below the limit of 2,210 MBTUs/hr and results in a violation of the permit. If PADEP decides to implement the two degree change criterion through a maximum heat rejection change effluent limitation, we recommend that PADEP make the Footnote 7 exception symmetrical, and that it replace the values of 8°F/hr and 2,210 MBTU/hr with the correct values of 4.9°F/hr and no more than 1,354 MBTU/hr.

We believe that instead of trying to calculate a maximum hourly change in heat rejection rate, the obvious and best way for PADEP to implement the two degree hourly change criterion is to require PPL-BI to monitor the temperature in the river at the point of compliance (which should be 650 feet below the confluence of the Plant's discharge channel with the river), and to determine directly whether that ambient temperature has fluctuated by more than two degrees (F) in an hour. An earlier, unreleased version of the draft Permit in PADEP's files would have taken this approach while giving PPL-BI the opportunity to discontinue the instream monitoring if it could establish a statistical correlation between changes in the discharge channel temperature and the changes in the river temperature at the point of compliance. The draft Permit's approach unnecessarily adds two layers of uncertainty: 1) the relationship between the hourly change in temperature in the Plant's discharge channel and the hourly change in the river's temperature at the point of compliance; and 2) the relationship between the hourly change in the Plant's heat rejection rate and the hourly change in the temperature in the Plant's discharge channel. There is every reason to avoid those two potential confounding factors when the fact to be determined – the change in the river's temperature – can be monitored directly, as past monitoring proves. We therefore recommend that the Permit require PPL-BI to monitor the river temperature at the point of compliance and perform the necessary comparisons to determine whether the river

temperature has changed by more than two degrees (F), and to use a surrogate (direct monitoring of the temperature change in the discharge channel) if and only if conditions prevent the direct monitoring of the river temperature. In addition to simplifying the implementation of the two degree hourly change criterion, the river temperature data generated by this requirement would be useful in determining whether the target (316(a) variance) instream temperature criteria are being satisfied.

A second alternative that is not as good as direct, in-river monitoring but has the virtue of eliminating one of the two complicating factors would be to replace the maximum hourly heat rejection rate limit with a limit defined in terms of the change in the discharge channel temperature at Outfall 001. The regular monitoring of the discharge channel temperature would make it simple to determine whether the Plant is in compliance with an effluent limitation defined as a maximum hourly change in that monitored temperature. The draft Permit's approach unnecessarily requires an extra step that both injects uncertainty and adds administrative burdens on PPL to calculate changes in the heat rejection rate and on PADEP to check those calculations.

In sum, we recommend that PADEP replace the maximum hourly change in heat rejection rate limit with a limit allowing the discharge to cause no more than a two degree (F) change in the river temperature at the point of compliance in a one-hour period, along with a requirement to perform the instream temperature monitoring necessary to determine compliance with that limit. In the alternative, we recommend that PADEP express the effluent limitation as a maximum hourly change in the cooling water discharge channel temperature of 4.9°F/hr.

7. The 110°F instantaneous maximum effluent limitation for Outfall 001 should take effect immediately.

Dozens of Pennsylvania NPDES permits contain an instantaneous maximum temperature effluent limitation of 110 degrees (F). PADEP Technical Guidance Document No. 391-2000-017, "Implementation Guidance for Temperature Criteria" (December 18, 2003), provides that "[i]f the maximum temperature of the unregulated discharge reported in the application or reported on past DMRs exceeds 110°F, the permit should . . . [i]f the heated discharge is accessible to the general public, [require the permittee to] post a warning sign and require a maximum allowable discharge temperature of 110°F as a public safety measure." (pp. 15-16) Relying on this guidance, DEP's initial draft of NPDES Permit No. PA0008281 in 2001 included an instantaneous maximum temperature limit of 110°F at Outfall 001. 31 Pa. Bull. 3777 (July 14, 2001). After PPL-BI objected, DEP deleted the 110°F limit. 31 Pa. Bull. 6467 (November 24, 2001). Because anglers frequent the Brunner Island Plant's discharge channel, the 2006 draft Permit once again includes an instantaneous maximum effluent limit of 110°F, but only as a <u>final</u> limit that would "take effect upon completion of the cooling system." (Protection Report, p.6)

We support the addition of this instantaneous maximum limit to the Permit, but in light of the temperatures recorded in the discharge channel and downriver from it during 2005, we believe that PADEP must follow its technical guidance document and have the limit take effect immediately upon issuance of the modified Permit. On September 18, 2005, the temperature at

monitoring point T11B in the Plant's discharge channel reached a maximum of 123.1°F, and the average of the 288 temperature readings for that day at point T11B was 110.88°F. In the Susquehanna River, the highest temperature recorded during 2005 at monitoring point T3 immediately upriver from the Brunner Island plant was 89.82°F on August 14. That same day, the river temperature reached a high of 119.13°F at monitoring point T4C roughly 650 feet downriver from the end of the Plant's discharge channel, and 114.52°F at monitoring point T8 across from the downriver tip of the Plant's Ash Basin No. 6.

These monitoring results show that during summertime periods of low river flows and high energy demand, the Plant's cooling water discharge poses a threat to public health and safety not only to those who might enter the Plant's discharge channel, but also to (perhaps unsuspecting) anglers, boaters, canoeists, or swimmers who might enter the river downstream from the discharge channel. We recommend that PADEP make the draft Permit's instantaneous maximum effluent limit of 110°F for Outfall 001 both an interim and final limit, and that it modify Footnote 5 of Part A in a manner consistent with having this limitation take effect immediately upon issuance of the revised Permit.

8. The maximum hourly heat rejection rate change limit, the 110°F maximum temperature limit, and the total residual chlorine concentration limit must be enforceable by the public.

Part A, Footnote 2 of the draft Permit states: "The Instantaneous Maximum discharge limitations are for compliance use by DEP only. Do not report instantaneous maximum values on Discharge Monitoring Reports (DMRs) or Supplemental DMRs unless specifically required on those forms to do so." PADEP should revise Footnote 2 to make clear that its first sentence does not apply to the maximum hourly heat rejection rate change limit, the 110°F instantaneous maximum discharge temperature limit, or the total residual chlorine concentration limit of 0.2 mg/l in Part A of the Permit, and that all three of those limits are enforceable by the public.[12]

The maximum heat rejection rate change limitation is not an instantaneous maximum limitation at all, but instead is an hourly change limit that requires two separate instantaneous measurements (and a calculation) in order to measure compliance. It has been placed in the "Inst. Maximum" column only because that is the closest match. Thus, by the terms of its text, Footnote 2 does not apply to this limit. But because the numerical reference to Footnote 2 in the "Inst. Maximum" column of the Part A tables confuses the issue, PADEP should add a sentence

[12] We question whether PADEP has the authority to limit the enforcement of an NPDES permit effluent limitation pursuant to the citizen suit provisions of either the Clean Water Act, cf. 33 U.S.C. § 1265(a)(1), (f)(2), (f)(6), or the Clean Streams Law, cf. 35 P.S. § 691.601(c) (authorizing action to compel compliance with any permit issued pursuant to act). But putting aside that question of authority, PADEP may not automatically include Footnote 2 in every permit or automatically apply it to every instantaneous maximum limit. E.g., Department of Environmental Resources v. Rushton Mining Co., 591 A.2d 1168 (Pa. Cmwlth.), allocatur denied, 600 A.2d 541 (Pa. 1991). Here, for the reasons explained in the text, PADEP should decide not to make the three limits in question subject to Footnote 2.

to Footnote 2 making it clear that the maximum heat rejection rate change limitation (or the maximum discharge channel temperature change limitation we recommend as a replacement for it) is not considered an instantaneous maximum limit and therefore is not subject to Footnote 2 of Part A.

PADEP imposes the 110°F instantaneous maximum discharge temperature limit "as a public safety measure." (TGD No. 391-2000-017, p. 16) There would appear to be no valid reason to prevent the public from enforcing a permit limit established for its protection. Moreover, unlike most other NPDES permit effluent limits, this one may easily be monitored by anyone with a thermometer. As a result, this particular instantaneous maximum limit should not be subject to the usual restriction found in Footnote 2, and PADEP should amend Footnote 2 accordingly.

The draft Permit's instantaneous maximum concentration limit of 0.2 mg/l for total residual chlorine (TRC) is a technology-based limit mandated by the similar "maximum concentration" limit in the Environmental Protection Agency's effluent limitations guidelines (ELGs) at 40 C.F.R. § 423.13(b)(1). Under 40 C.F.R. § 125.3, PADEP is required to include this maximum concentration limit in the draft Permit. Neither 40 C.F.R. § 125.3 nor 40 C.F.R. § 423.13 limits the enforcement of the TRC limit required by the ELGs to the EPA or the state NPDES permitting authority. As a result, PADEP may not deviate from the ELGs by adding an enforcement restriction not found in the ELGs. PADEP must revise the draft Permit to make clear that PPL-BI must report the results of its monitoring for this parameter, and that the maximum TRC concentration limit is not subject to Footnote 2 of Part A and is fully enforceable by the public.

9. The Permit should expressly require PPL-BI to implement the plan for preventing heat shock fish kill incidents as approved by PADEP.

Part C.I.I. on pages 22-23 of the draft Permit requires PPL-BI to "submit a report to the Department that describes operating procedures that will be followed under worst-case river conditions, in terms of turbidity, debris and other materials that cause or threaten to cause damage to intake pumps or other equipment, to eliminate future "heat shock" fish kill incidents." The condition also reserves the right for PADEP to require additional measures in the event those in the "report" do not prevent additional fish kill incidents.

The reference to "worst-case river conditions" in the quoted sentence is confusing, and we recommend simplifying it by eliminating everything from "under worst-case" through "or other equipment" from that sentence. In addition, what this permit condition is requiring PPL-BI to submit is accurately described as a "plan" for preventing heat shock fish kills, and the permit condition should both call it a "plan" rather than a "report" and expressly require PPL to implement the plan as approved by the PADEP (something it now does only by implication).

10. The Permit should require Whole Effluent Toxicity testing for the cooling water discharge at Outfall 001.

The Protection Report states that in conducting a Whole Effluent Toxicity (WET) test of the Brunner Island Plant's cooling water discharge in 2002, "it does not appear that PPL followed the writer's instructions to not dechlorinate samples prior to testing (since disinfection residuals are in this case the concern), and PPL did not provide usage rates to determine whether the chemical usage rates are protective." (p. 14) The Protection Report goes on to note that PPL-BI's application proposes the use of new chemical additives and to increase the application rates for certain chemical additives. After concluding that "it can be reasonably expect that Bromine (and Chlorine) concentrations will be well below 0.1 mg/l, which may be protective of aquatic life," the Protection Report recommends that "future consideration be given to periodic WET testing." (p. 14)

Given that PPL-BI apparently did not do the WET testing as specified during the last permit cycle, and now is proposing to increase the number and amount of chemical additives in its cooling water (in part because of the introduction of the cooling structures), the Permit should include a condition requiring that PPL-BI conduct WET testing in accordance with PADEP's instructions. The condition should require that the WET testing take place during the new permit term, but sometime after the startup of the mechanical cooling structures.

11. The Permit should include additional monitoring parameters for Outfalls 002 and 004.

Outfall 004 at the Brunner Island Plant is the discharge from the Ash Basin No. 6 Polishing Pond. The analytical results for the river water sample collected by PADEP below Outfall 004 on September 30, 2005 are startling. The sample detected exeedances of the Chapter 16 acute instream criteria for five toxic substances: copper, aluminum, cadmium, lead, and zinc. For three additional toxics (nickel, chromium and arsenic), the concentrations detected exceeded the Chapter 16 chronic criteria. In addition, the total iron concentration of 85.6 mg/l, which is more than twelve times the instantaneous maximum concentration of 7 mg/l in a discharge of coal mine drainage, see 25 Pa. Code §§ 87.102(a), 88.92(a), was more than 50 times higher than the Chapter 93 thirty-day average instream criterion of 1.5 mg/l. (Protection Report, p. 21) The permit writer states in the Protection Report (pp. 21-22) that he believes that fine solids in the discharge from Outfall 004 are passing through the glass fiber filters specified in the standard testing method for total suspended solids (TSS).

The Protection Report notes that the waste streams for Outfalls 002 and 004 "are generally similar." (p. 17) For both outfalls, the permit application fails to include current data for toxic parameters, so Part A, Footnote 15 of the draft Permit would require PPL-BI to collect at least three composite samples for each outfall and analyze them for the parameters required by specified NPDES application modules, and reserves to PADEP the right to reopen the Permit's effluent limits and monitoring requirements based on those results. For both outfalls, the draft Permit would require quarterly grab samples for three toxics: total lead, total mercury, and total zinc.

With respect to the toxic parameters, the final Permit should make clear that because the permit renewal application does not include the standard information required by PADEP's application modules, the Permit does not provide a shield against liability under Section 402(k) of the Clean Water Act with respect to any of those parameters. We further recommend that for both outfall 002 and 004, the quarterly monitoring for toxics required by the Permit include all of the toxic parameters detected at levels above the acute or chronic instream criteria in PADEP's September 30, 2005 river water sample downstream from Outfall 004. That is, copper, aluminum, cadmium, nickel, chromium, and arsenic should be added to the existing list of parameters. In addition, the monitoring of metals should include the fly ash indicator parameters boron and molybdenum, which are routinely included by the Waste Management Program in permits involving beneficial use of coal combustion ash or mixtures that include coal combustion ash. Finally, for both outfalls, in light of the extremely elevated iron concentration in PADEP's September 2005 instream sample, the monitoring for both Outfall 002 and 004 should include total iron. (We note that the draft permit would require monitoring for both total copper and total iron at Outfall 006, the spring discharge or seep to Hartman Run addressed in the next comment.)

For Outfall 004, the draft Permit would add a new set of "best professional judgment" effluent limits for TSS that would take effect one year after the effective date of the renewal of the Permit, and also would require weekly, 24-hour composite samples for TSS. The Protection Report notes that after PPL determines the particle size and thus the appropriate mesh/pore size to be used in filtration system to be installed in Ash Basin No. 6 pursuant to Part C.I.J of the draft Permit, "it may be necessary to specify a different type of filter for the TSS test to accurately characterize the discharge." (p. 22) In light of the similarity of the waste streams at Outfalls 002 and 004, we recommend that if PADEP specifies a different filtration method or type of filter for the TSS monitoring at Outfall 004, that change also apply to the TSS monitoring at Outfall 002.

12. The Permit should include additional monitoring parameters for Outfall 006.

According to the Protection Report (p. 24), Outfall 006 is a spring discharge or seep to Hartman Run that appears to originate in the area of retired Ash Basins Nos. 1 and 3. Given the proximity of this discharge to coal combustion ash repositories, the monitoring parameters should include two additional coal ash indicator parameters used by PADEP's Waste Management Program, (total) boron and molybdenum.

13. The Permit must include a schedule of compliance for rectifying the unpermitted discharge of contaminated water that is not composed entirely of stormwater through stormwater outfalls.

Part C.VI.A.1 of the draft Permit provides that except as allowed by Part C.VI.A.2, "all discharges to storm water outfalls, shall be composed entirely of storm water." The narrow exception in Part C.VI.A.2 applies only to certain "non-polluting water discharges" that would not be expected to mobilize iron. As stated in the Protection Report (p. 24), however, "[s]torm

water samples in some cases show very high iron concentrations" that indicate they are not composed entirely of stormwater, and thus violate Part C.VI.A.1. The only DMR containing stormwater monitoring data that was made available to PennFuture was for the period March 1, 2003 through February 29, 2004. For that period, the maximum iron concentration in the bi-annual samples at Outfall SW-8 into Conewago Creek was 6.52 mg/l, and the maximum concentration at Outfall SW-18 into the Susquehanna River, adjacent to Ash Basin No. 6, was 3.16 mg/l. Notwithstanding those extraordinarily high iron concentrations for samples diluted by stormwater flows, the Protection Report recommends that these discharges "should be given further consideration in the future." (p. 24)

The discharges from Outfalls SW-8 and SW-18 are not composed entirely of stormwater and therefore are not authorized by the Permit. Because those discharges are unauthorized by a NPDES permit and therefore unlawful under Section 301(a) of the Clean Water Act, 33 U.S.C. § 1311(a) and Sections 301, 307(a), and 611 of The Clean Streams Law, 35 P.S. §§ 691.301, 691.307(a), 691.611, the consideration of those unlawful discharges may not be deferred. Instead, under 25 Pa. Code § 92.55(a), the Permit must include a schedule of compliance for rectifying the ongoing, unlawful discharge of non-stormwater from the permitted stormwater outfalls.

We thank you for your consideration of these comments. Please feel free to contact me at 717-214-7925 if you have any questions.

Sincerely,

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