UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

'82 NOV :36

In the Matter of	)	
	)	
Philadelphia Electric Company	)	Docket No. 50-[illegible]-OL
	)	50-[illegible]-OL
(Limerick Generating Station, Unit 1 and 2)	)	

INTERVENOR DEL-AWARE'S PROPOSED FINDINGS OF FACT, CONCLUSIONS OF LAW, AND OPINION

Intervenor Del-AWARE Unlimited, Inc., by its counsel, submits its Proposed Findings of Fact, Conclusions of Law and Opinion, herewith, as directed by the Board.

Respectfully submitted,

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November 16, 1982

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LIC. NSING BOARD

Before Administrative Judges:

Lawrence Brenner, Esq, Chairman
Dr. Richard F. Cole, Member
Dr. Peter A. Morris, Member

In the Matter of	)	
	)	
Philadelphia Electric Company	)	Docket Nos. 50-352
	)	50-353
(Limerick Generating Station, Units 1 and 2)	)	

APPEARANCES

TROY B. CONNER, JR., Esq., MARK J. WETTERHAHN, Esq., ROBERT M. RADER, Esq., and INGRID M. OLSON, Esq., of Conner & Wetterhahn, P.C., Washington, D.C. for Philadelphia Electric Company.

JOSEPH RUTBERG, Esq., ANN P.HODGDON, Esq. and ELAINE I. CHAN, Esq., Office of the Executive Legal Director, U.S. Nuclear Regulatory Commission, Washington, D.C. for the NRC Staff.

ROBERT J. SUGARMAN, Esq., for Del-AWARE Unlimited, Inc.

SPECIAL HEARING DECISION

OPINION

BACKGROUND

The applicant Philadelphia Electric Company proposes to co-sponsor the creation of water diversion system from the Delaware River at Point Pleasant, Pennsylvania, to provide 46 mgd to supply make-up cooling water for the Limerick Generating Station. Due to the fact that the proposed diversion was technically under the sponsorship of the Neshaminy Water Resources Authority, the partner and co-contractor with Philadelphia Electric Company for the supply, and would have been built without PECo at that time, and was only conceptually planned when it was approved by the Delaware Basin Commission and then incorporated into the approval by this Commission in the CP Proceeding in 1975, the specific operating impacts of the intake and the diversion were not studied in detail at that time.

In addition, the design and plan, insofar as it had been determined, has been significantly changed since 1975, first being moved 200 feet into the River sometime in late 1980, after the DRBC completed its Negative Declaration on the project updating (August, 1980). In January, 1982, after acceptance of the OL application, submission of the Contentions, and the Special Pre-hearing Conference, it was further moved and revised plans were submitted to the Corps

of Engineers. No notice of this change was given to the Board until brought to the Board's attention by Del-AWARE after the Board issued its Special Pre-hearing Conference Order dated June 1, 1982, in which, inter alia, Del-AWARE was admitted as a party.

The area of the intake has been identified as a spawning and nursery area for many species of fish, and was considered a potentially significant spawning area for American Shad.By moving the intake location into the River, the applicant and NWRA sought to allay the opposition of U.S. Fish & Wildlife Service, the Pennsylvania Fish Commission and the Environmental Protection Agency, which were concerned about the impact of the intake on a pool known as the Point Pleasant Pool or Lower Black's Eddy, on the bank of which it was proposed to be located.

Also, after the issuance of the DRBC Negative Declaration, at the instance of Del-AWARE Unlimited, it was brought to the attention of the National Marine Fishery Service, the agency responsible for shortnose sturgeon under the Endangered Species Act, that shortnose sturgeon might be present in the area, and that the pool might be a spawning and nursing habitat for shortnose sturgeon.

The shifting of locations by the applicant and NWRA in 1980 and 1982 was motivated by a desire to find a location which could be successfully permitted, by neutralizing the

objections of the fish agencies, and was not a unconstrained selection of the optimal intake location on the Delaware River, either in the vicinity of Point Pleasant or otherwise. It was not supported by any systemic or reliable data addressing the question of optimal, (i.e. the best) location.

The reason for the location is that subsequent to 1970, when the NWRA first focused on the proposed location, and while the intake was still located on the shoreline, the NWRA had purchased not only the land for the pump station and the intake, but much of the land needed for the project as a whole, and therefore, to avoid the potentially difficult task of acquiring new land in other locations, sought to move the intake around to obtain the least objectionable scheme within the land already owned.

Both the applicant and NWRA were extremely concerned about crossing the New Jersey state line, although there is no known legal barrier to their crossing the line and obtaining necessary permits from the State of New Jersey.

Applicant moved the intake only as far it could without crossing the line, and thus the ultimate location was selected within that constraint, and does not represent the applicant's unconstrained optimal location for minimization of fish losses.

The intake comples is located in the historic Point Pleasant district and abuts the Pennsylvania Canal, a National Historic Landmark, which passes through the District. This Board has a responsibility, pursuant to §110(f) of the National Historic Preservation Act of 1966 as amended, 16 U.S.C. §470H-2, to engage in any planning and action possible to minimize harm on such landmark. While this Board's jurisdiction is confined to operating impacts, and the Board therefore determined that the effects of constructing the diversion, and the effects of the diversion as constructed, on the historic values would not be reviewed in this proceeding, the Board has evaluated the extent of impacts on operating the diversion on the Landmark and the historic district.

Prior to the time the applicant filed its application for operating license, the staff advised the applicant that it would conduct a comprehensive environmental review of the diversion, since such review had not occurred at the construction permit stage due to lack of details of the proposal.

In the EROL the applicant, however, provided little or no information with respect to the Point Pleasant aspects of the diversion, and instead conclusorily referred to the findings and determination of the DRBC with respect to

permitting the water withdrawal from the Delaware River. (EROL 2.3.3)

Although the staff reiterated its intention to review the diversion at the SPC, it took no action to obtain any data until after the Board issued its SPCO of June 1, 1982, and ordered special hearings. Questions were then asked in July, August, September, and October, continuing up to the eve of the special hearings.

The staff did not prepare and circulate a DEIS prior to the hearings, but did conduct a certain amount of research and study of the information within the time constraints.

The Board ordered the hearings to take place on an accelerated schedule and out of the time frame of the operating license proceedings, because of its concern that NEPA requires a timely review of potentially and environmentally damaging action, in time to prevent such damage as a realistic and practical matter. This is not a partial initial decision; such a decision can only commence after issuance of a DEIS.

The Board's review of these matters, both aquatic aspects and the historical aspects, has been severely constrained by the absence of systematic information concerning the intake, the ambient environment, the operating characteristics, and the details of the project and the environment, as well as the lack of an opportunity for public review of any such systematic studies. All

parties have been hampered by the need to produce and file information on an accelerated schedule.

As a citizen group with limited resources, intervenor Del-AWARE Unlimited, has been particularly prejudiced, especially given the fact that the applicant and the staff had substantially more resources, and the applicant, at least, had significant time in which to prepare its presentation, and to control, to some extent, the timing of the institution of the proceeding and the date of construction inception.

The Board is particularly concerned that the applicant and NWRA appear to have proposed an unnecessarily precipitous construction schedule, at least partly in order to foreclose full consideration of the project by local government, with the result at least, that the consideration by this Board has been constrained. Also, the applicant's decision not to institute proceedings in other agencies such as the DRBC, the Corps of Engineers, the Pennsylvania DER, the Advisory Council on Historic Preservation, and others, earlier than was done has prevented the full disclosure and circulation of relevant information in sufficient time and permit full consideration.

In these circumstances, the Board has commended all parties, and especially Del-AWARE for its efforts in bringing the matter as fully as possible before the Board in the time allowed. While the Board does not penalize the applicant for the difficulties which it caused to occur, the

Board must consider this aspect in determining the extent to which to be concerned about potential delays, where necessary in order to assure full consideration of environmental effects.

THE LEGAL STANDARD

This proceeding involves resolution of factual issues in the form of contentions raised by Del-AWARE which relate to environmental impacts of the LGS, or, more specifically, the supplemental cooling water system ("SCWS") for that facility. On the other hand, it involves compliance by the Commission with the requirements of the National Environmental Policy Act ("NEPA"), 42 U.S.C. §4321 et seq. by considering, in a timely fashion, the environmental impacts of its action, and the timely preparation of an environmental impact statement.[1/]

In its Special Pre-Hearing Conference Order ("SPCO") of June 1, 1982, and later in its Memorandum and Order of July 14, 1982 ("July Order"), this Board recognized that, due to the fact that the Point Pleasant Diversion was not considered to be part of Applicant's Limerick Generating Station at the time the EIS

1/ The regulations of the Commission at 10 C.F.R.§51.5(a) require the Commission to prepare an EIS prior to taking certain actions, including "(1) issuance of a full power or design capacity license to operate a nuclear power reactor." 10 C.F.R. §51.5(a)(1). Applicant's Limerick Generating Station is such a facility and, accordingly, an EIS must be prepared prior to issuance of the operating license sought by Applicant for this facility. Even if the Limerick Generating Station were not a facility of the type described in 10 C.F.R. §51.5(a)(1), an EIS would be required prior to issuance of an operating license for that facility for the reason that such action would be a "major Commission action significantly affecting the quality of the human environment." National Resources Defense Council v. Nuclear Regulatory Commission, 547 F.2d 633, 638 (D.C. Cir. 1976), rev'd on other grounds sub nom. Vermont Yankee Nuclear Power Corp. v. National Resources Defense Council, 435 U.S. 519 (1978).

for the construction permit was prepared, was not permitted, and had not been designed in detail at the CP stage, but has only come to be considered a part of that facility recently, the potential environmental impacts attributable to the Diversion have never been considered by the Commission. (SPCo at 57-58; 61-62; 68; 71; 75; July 14 Order, at 3.) It was noted that a number of such impacts -- which have been raised by the Del-AWARE in its contentions-- are attributable to operation of the Point Pleasant Diversion and that, consequently, this Board has jurisdiction to consider these impacts in this operating license proceeding. (SPCO at 83; July 14 Order, at 3). The Board also noted, however, that construction of the Point Pleasant Diversion was expected to begin shortly.[2/] This Board expressed its concern that, due to time constraints, some or all of the environmental issues raised in Del-AWARE's contentions might not receive adequate consideration prior to the time set for construction to begin, and that a decision prior to that date might not be feasible if this matter were to proceed in normal course. (SPCO at 82; July 14 Order, at 2-3.) The Board was particularly concerned about this possibility in view of the potential conflict with the requirements of NEPA. As the Board noted at the time, NEPA requires not only that environmental impacts be considered prior to issuance of the operating license, but also that consideration of such impacts take place at a "meaningful time". SPCo at 85,88; July Order at 3. In this regard, the well-recognized

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2/ On October 30, 1982, applicant submitted to the Board notice that construction on the Point Pleasant Diversion is scheduled to commence on December 15, 1982.

and oft-quoted opinion of the U.S. Court of Appeals for the District of Columbia Circuit in Calvert Cliffs Coordinating Committee v. U. S. Atomic Energy Commission, 449 F.2d 1109 (D.C. Cir. 1971) is instructive:

> NEPA requires that an agency must-- to the fullest extent possible under its other statutory obligations -- consider alternatives to its actions which would reduce environmental damage. That principle establishes that consideration of environmental matters must be more than a pro forma ritual. Clearly, it is pointless to "consider" environmental costs without also seriously considering action to avoid them. Such a full exercise of substantive discretion is required at every important, appropriate and nonduplicative stage of an agency's proceedings. (499 F.2d, at 1128) (Emphasis added.)

This Board's Orders, in effect, understand NEPA, in light of the teaching of Calvert Cliffs, to require us not merely to "consider" the environmental contentions raised by Del-AWARE, but to consider to the extent which would be required in an EIS any such contentions which present a substantial environmental issue. Furthermore, such consideration is to take place at a "meaningful" time: prior to the commencement of construction of the Point Pleasant Diversion. The reason for this must by now be obvious. If construction of the Point Pleasant Diversion were permitted to continue before the Board had had any opportunity to consider environmental impacts attributable to the Diversion, such consideration might be rendered meaningless, i.e. the cost of minimizing environmental harm may have become prohibitively expensive or not reasonably possible. Id. at 1128. Public Service Company of New Hampshire (Seabrook Station, Units 1 and 2), CLI-78-14, 7NRC852, 959-60 (1978); Consumers Power Company (Midland Plant, Units 1 and 2), ALAB-395, 5NRC772, 779

that impact prior to construction. Hiram Clarke Civic Club, Inc. v. Lynn, 476 F. 2d 421,425 (5th Cir. 1973); Save Our Ten Acres v. Kreger, 472 F.2d 463. 466-67 (5th Cir. 1973).

Pursuing the analogy, Del-AWARE met its burden when we accepted its contentions. Our review of the record, then, must determin whether PECo has satisfied its burden of showing that formal NE consideration via an EIS is not warranted by having carried its burden to show that no significant impact will occur. Absent such a finding, the Board must act to preclude a permit to operate LGS utilizing the facility.

attracts or induced effect, and any edge effect creating turbulence which might reduce the ability and tendency of organisms to bypass it.

Although the Board believes that the loss of any number of shad and sturgeon would have environmental significance, it is also important to consider the extent of such potential loss in relationship to the problems of shad and shortnose sturgeon in the river, as well as the circumstances of the proposed location, i.e., the extent of the difficulty, expense, and inconvenience in moving it, in weighing the relevant values involved. (Findings of Fact 1 to 6).

In making its findings or facts, which appear in the next section of this Opinion, the Board has had to consider the relative credibility of witnesses, their expertise, and the extent to which their testimony reveals a predisposition or bias, as well as the extent to which it is an apparent post hoc rationalization. For example, this latter factor is particularly relevant to the applicant's witnesses, inasmuch as they initially justified the intake location velocities on the basis that they were at least 1 fps, or alternatively, more than twice the velocity of the intake, at flows exceeding 3000 cfs, repeatedly representing this to be the low flow at which the intake would operate at maximum velocities. Only when clearly confronted with the fact that the intake would operate at maximum rates even when river flows would be substantially less than 3000 cfs, necessarily implying lower velocities, did the applicant's witnesses

begin to attempt to justify the intake location even th gh the velocities would conceivably fall substantially b ow 1.0 f . Naturally, the Board found it impossible to cr t testimony to this effect, particularly when the applica 's witness, its Senior Vice President for Nuclear Operati s, volunteered such justification in cross-examination, ha ng failed to disclose it during his deposition or to offer is opinion in pre-filed testimony, and preempting the prof ed witnesses on both hydraulics and biology, hen ot have done work prior to his deposition.

25 a to 25 c)

The Board notes particularly that a had many years in which to conduct the n which would have substantially eli ced t amount of uncertainty, but instead c ose to rely n d that can only be called scant or skimpy, t b c cer almost all of the variables identified ove. vi on these subjects compares dramatically the cu detail which in fact was furnished in nn Schuylkill River and Per omer Accordingly, the Board can ot r che d e on the applicant's conclusion might . (Findings of Fact 16 to 25)

With regard to the te ony of the ff witnc n the impact of fish, the Board similarly has problems h his testimony. First, committed himself verbally d intellectually to applicant's consultant, a former -

employee, prior to consulting with the federal and state agencies of expertise, and prior to conducting any substantial investigation. Second, his prepared testimony was based on the assumption that velocities would exceed 1 fps because the intake would not operate at maximum velocities when the flow was lower than 3000 cfs. Only when confronted with the necessity of considering lower flows did he then, in a similar post hoc rationalization, justify his previous testimony. The witness then relied on studies that showed results contrary to his conclusions. Finally, his standard for injury was significance of effect, i.e. deteitability, in relation to the population of the entire species, and while we certainly share and accept the supposition that danger to the entire species would be of concern, the Board also concludes that damage to significantly lesser quantities of shad and shortnose sturgeon are also of environmental significance, given their stressed and endangered status, respectively, and that, therefore, the destruction of any spawning and nursery area, or the substantial damage to such an area, represents a significant environmental effect, and therefore attaches little weight to the staff witness. (Findings of Fact 25e)

With this background, and based on the credible evidence, the Board has found that the Point Pleasant pool is a spawning and nursery area for American Shad, and is a

suitable spawning and nursery area for shortnose sturgeon, and may be used as such. (Findings of Fact 1 to 3).

The Board has further found that the shad and shortnose sturgeon eggs and larvae will be highly vulnerable to entrainment for at least the first two weeks after the eggs are dropped, and to impingement for at least three to four weeks, and this vulnerability period will extend into the months of late June and July, when river flows are commonly below 4500 cfs, and frequently below even 3000 cfs, and occasionally as low as 2000 cfs. (Findings of Fact 6i to 6K)

The Board has further found that the intake is so located with respect to the eddy-pool area that, although it is probably on what would be the edge of the main current at medium and higher flows, it is outside the main flow and would also probably attract eddy flow at flows lower than 6,000 cfs. (Findings of Fact 6e to 6g).

However, the Board concludes, with Del-Aware and with Westscott, that the vector of the flows, both from the main current and the eddy, will in some cases be at least be partially towards the intake. In addition, both the velocity and vector of the flows at lower depths in the water, may be significantly different than those near the surface, and may either not bypass, or present slower velocities at the intake. (Findings of Fact 7e).

The Board cannot determine, due to the paucity of data concerning velocity, both as to speed and direction, and as

to the extent of the spawning and nursing area at the present time, due to the lack of studies, and the inaccurate information concerning the directions and flows in the eddy, what the likely velocities and directions of flow and loss of species will be at different flows and velocities. However, it is clear that at these low flows the main current velocities would be slower than 1 fps, or double the maximum intake velocity, and given the vector of flow, would tend to direct organisms at least partially towards the intakes. While the Board has no direct evidence of speed of low at flows less than about 3,000, and does not accept the applicant's proposed rule curve or extropolation proposals as providing any reasonable basis for estimating speed of flow at any flows, it does accept the evidence that the speed of flows in the main channel near past the intake could be in the 1 fps or slightly higher flows of approximately 5000 feet or more current, and velocities would be significantly lower in the main current flow at lower flows. Main current flow or off the edge of the main channel at such levels will be still slower, dropping at times below .8 fs at the surfact. (Findings of Fact 6 to 7)

Moreover, at such lower flows, the Board has found that the eddy flows will circulate around towards the intake, and proceeding down the mouth of Hickory Creek Channel, probably encounter the intake repeatedly. This repeated exposure at adverse vectors and speeds will substantially destory the organisms in the eddy-pool. (Findings of Fact 7e).

The intake, itself, provides a much larger area o endangerment than any systems built or studies, other tha that at the Campbell Plant on Lake Michigan, which is a completely different type of intake facility, having slot openings of 9 millimeters or larger. Because of its location in the turbulent area where the eddy flows, the main channel flows, and the Tohican flows interact at different elevations and flows, the intake will be highly susceptible to debris and clogging, which will induce a higher through slot velocity in the remaining available surface. Furthermore, the intake will not be located parallel to the str flow, since it will be at a diversion from parallel f both the main channel and eddy flows. Moreover, since the intake slots will be perpendicular to flow, there will be an edging effect; turbulence will occur as the water pas.es over the slots, thereby tiring the larvae and reducing their ability to avoid the intakes. Finally, the smooth nose cone will tend to induce organisms to not avoid the intake, as they will feel safe, and the existence of two parallel rows of screens, 70 feet in length and 12 feet across, will further diminish the ability of organisms at larval stage to escape impingement. (Findings of Fact 8a to 8g)

In view of all these circumstances, the Board has found and must conclude that there will certainly be a substantial loss of shad and shortnose sturgeon eggs and larvae in operation of the proposed intake at its proposed location and the proposed design. (Findings of Fact 26 to 27)

In these circumstances, where considerable additional data could have been provided and should have been provided by the applicant, but it failed to do so, and where there is clear and convincing evidence of some substantial loss of significant fish, the Board must proceed to determine whether adequate justification exists for not investigating and selecting other intake locations.

Del-AWARE's witnesses, including public servants as well as independent experts, have provided information on the basis of which the Board has found that there are preferable locations available in the river at which a similar intake could be located and which would substantially obviate the loss of shad and sturgeon, which can be anticipated at the proposed intake location. These alternatives may include an extension of the conduit approximately 50 to 75 feet further into the main channel on the same alignment, in order to be parallel to the main flow, and to limit the area of interaction to the main channel, excluding the interaction with the eddy-pool flow. There are also downstream alternatives some downstream further into the Lumberville Pool, where there are more regular flows. Such alternatives would, as a side and not insignificant benefit, reduce the likelihood of substantial damage to the intake screens and the requirements for replacement, due to storms and debris coming down the river. While this impact, on the operation of the Limerick station itself, is not of primary relevance to this limited hearing, it is of concern to the

Board, as it relates to the operational reliability and economics of the overall facility. Finally, use of Philadelphia's Northeast treatment plant effluent should be considered. This alternative would enhance dissolved oxygen levels, and avoid the Perkiomen as well as the Point Pleasant intake and other impacts. (Findings of Fact 52 to 54)

It may be that the applicant can or will show in the future that there is good and sufficient reason for rejecting such alternatives, and that the proposed location and design is the only alternative that is viable, or is indeed the best of the potential alternatives. However, at the present time, no such comparative consideration of alternatives has been made by the applicant or by the staff, and in the circumstances of demonstrated likely significant harm, absence of adequate study of the proposed and other alternatives, this Board cannot simply accepting an alternative which is clearly based on the convenience of the applicant.

Finally, as the Board has stated previously, the fact and substantiality of the impact is clear; any uncertainty as to the extent of the impact and as to the relative weighing of alternative locations, the cost, and the potential delays associated therewith is a matter which is not the responsibility of the Board nor can it be charged to the intervenors; since the applicant selected the levels of studies and the timing of its application. Therefore, in the absence of an adequate environmental review leading to a

conclusion supporting the proposed intake, the Board concludes that it cannot appropriately proceed at this time because of the concrete environmental damage to be anticipated.

IMPACT OF OPERATIONS ON HISTORIC CHARACTER

The Board, in reversing itself and excluding contention V-14, confined itself to the consideration of the effects of operating the station on the historic character of the area, and excluded the effects of the creation of the pumping station, although the latter effects would extend past the construction stage. Having so decided, the Board has considered the question of operating effects, and concludes that the operation of the pumping station and the intake station will in fact adversely affect the historical quality of the area. While this is a concern standing by itself, had Congress not enacted Section 110(f) of the Historical Preservation Act of 1966, as amended on December 12, 1980, 16 USC §470h-2, the Board might not intervene on solely that basis in this proceeding. However, in order to indicate its conclusions in light of the action taken in the previous section, and in order to assist in the reconsideration of the cooling water supply, and since the Board has made findings which do reflect that there will be such an effect, some discussion is appropriate. (Findings of Fact, 33-34)

The Board has found that there will be an adverse effect from the transformer noise, and while it may be possible to obviate that effect through later construction, such construction in itself might have an adverse affect on the National Historic Landmark, the Pennsylvania Canal. The Canal's boundary is located less than 100 feet from the proposed transformers, and the Board has found an uncontroverted evidence that there will be an adverse noise effect on the Canal as a result of the construction. The construction of a 25 to 30 foot high wall on top of the fill of some 30 feet at that location will create in effect a 50 foot visual intrusion on the Canal, less than 100 feet from the Canal, in an area of pristine natural and compatible residential construction. Since the Landmark also extends into the area of the Mountainside Inn, it is clear that the area of the Canal to be affected is a considerable one. (Findings of Fact 35 to 36 42)

The Board has also found that the intrusion of frequent repair and other operations, through the use of cranes and substantial diving activity to replace the one ton screen assemblies in the river, which will occur frequently, and the near daily incursions down to the river on the transformed parcel for the gatewell, will have an adverse affect on the Point Pleasant Historic District. (Findings of Fact 37 to 41)

TIMING OF CONSTRUCTION

The Board has found that the construction of the proposed Point Pleasant Diversion Intake at its present location will significantly and adversely affect the environment, and has been inadequately justified. The final question to be resolved is the cost to the applicants and others of the delay necessary in conducting further studies and in relocating the intake.

The Board did not hear testimony concerning the availability of alternatives to Philadelphia Electric Company which avoid the necessity of having any supplemental water system from the Delaware River in place by 1985, when it expects to commence commercial operation at the Limerick Generating Station on Unit 1. However, the Board has received information in response to its request, in relationship to proposed contention V-24 relating to one unit, which shows that there is water available in the Schuylkill River which can be used by Philadelphia Electric to supplement its present proposed non-consumptive Schuylkill River use at times of low flow and high temperature in the Schuylkill River, when consumptive uses from the Schuylkill River would be barred under present permit terms. These include the availability of water from Blue Marsh Reservoir, owned and operated by the Delaware River Basin Commission, which has unclaimed capacity for sale, purchase from the City of Philadelphia, which has presently an entitlement to 258 mgd from the Schuylkill River, and which can make available the maximum 21 mgd needed by applicant for Unit 1,

and potential revision of the temperature restrictions on consumptive use at Schuylkill River intakes. (Findings of Fact 52 to 54)

Moreover, the Board has reviewed the construction schedule justification provided by the applicant in response to its direction, and finds that there is no need to commence construction of an intake facility at the present time, in any event, in order to meet an April, 1985 deadline. The applicant has completely failed to justify the need to construct in the river for two winters, which is the sole constraint which was offered as a basis for having to commence construction on December 15th. As the Board's findings indicate, the Board is completely unpersuaded, both because of the nature of the material, and its content, that such an inception date is necessary. Instead, the Board believe that no second winter is necessary, but in the highly and improbable event that a second winter, or portion thereof, in the river is necessary construction could very well take place in the winters of 1983-84, and 1984-85. (Findings of Fact 45 to 51)

Finally, as a matter of law, delay attributable to the changes in the proposed project, which were not provided to this Commission or to the staff, until specifically requested and in response to Delaware's proposed contentions, cannot be laid at the doorstep at anyone other than the applicant. It is apparent that the proposed intake location is not the result of a rational unconstrained planning

process, but rather one artificially constrained by the effort of the applicant to avoid necessity for making unconstrained decisions about matters as to which it had already had a sunk investment, which however, was not endorsed by this Commission or any other body.

Accordingly, the Board finds that there is no cognizable cost to the applicant from any time delay that may occur as a result of relocating the intake, or performing additional research to attempt to justify the present selection.

CONCLUSIONS

Based on the findings and facts, and the Board's opinion as stated above, the Board concludes that the proposed intake location is not appropriate and cannot be approved, based on the present record, and therefore finds and determines it shall be disapproved, and the applicant shall proceed to provide a new application, with appropriate basis, for supplying supplemental cooling water to the Limerick Generating Station. The Board further determines that no costs of the proposed diversion should be considered in any cost allowances, and that it will, if necessary, Order that the facility not be operated, if constructed.

I. Contention V-15: Impact Of The Location Of The Intake, As Changed, On The American Shad And Shortnose Sturgeon

1. The Point Pleasant Pool consists of the area roughly bounded by the main channel of the Delaware River on the east, the lower end of an eddy whose downstream end is approximately 1,000 yards downstream of the bar of the Tohickon Creek, the Pennsylvania shoreline, at the northern and upstream end, the bar of the Tohickon Creek. (McCoy, Tr. 3261-62; Phillipe Supp. Test. 3, Phillipe, Tr. 3734)

2. The Point Pleasant Pool is a likely future significant spawning and nursery area for American Shad. (Miller, Tr. 3049; Emery, Tr. 1763-64)

a. The dimensions of the Point Pleasant Pool, insofar as it is a spawning and nursery area for American Shad and Shortnose Sturgeon, are defined by the area of fast current on the channel side, the shoreline on the Pennsylvania side, the lower end of the eddy, which is located more or less opposite the Mountainside Inn, and the main downstream channel on the River side; its size and location range at different flows and flow trends.

b. While applicant's witness on biology indicated that, on behalf of applicant, he had collected egg samples in the Point Pleasant Pool during the spring of 1982, he also testified that he had not gotten around to analyzing them to determine their species; he did, however, observe that they look "suspicious" alluding to the size and similarity to Shad eggs. (Harmon, Tr. 2365) Rather than determine the species of the eggs, the witness, Harman, on

behalf of applicant, without demurrer from Boy[illegible] applicant's senior vice president, agreed that the Board could and should consider that the area is a spawning area for shad as a basis of its findings. (Harmon, Tr. 2408) Accordingly, it is unnecessary to resolve whether the Point Pleasant Pool is in or adjacent to a spawning area for American Shad which might be located just above the pool between the Tohickon Creek and the Byram Bridge. (Harmon Tr. 2365, 2408)

c. If, however, it is necessary to determine that the area is a spawning area for the American Shad, strong circumstantial evidence testimony leads clearly to the finding that the Point Pleasant Pool is a spawning area. Takings of larvae, at 20mm. or less, at the Point Pleasant cross section, on the New Jersey side at Byram, the taking of ripe shad at Lambertville, approximately 10 miles downstream, and the collecting of spawning shad and larvae at the Gilbert Power Station less than 20 miles upstream, all indicate the presence of shad spawning in the immediate vicinity of Point Pleasant, and the absence of reports on sampling undertaken during 1982 and other years by the applicant indicates that the applicant has reached no other conclusion. (Miller Testimony at 3; Miller, Tr. 3048-49, 3355-56; Emery, Tr. 2002)

d. Although the Point Pleasant area is not a prime spawning area for shad at the present time, this is due to the fact that shad cannot now pass through the lower Delaware River on their journey from the sea to spawn in the

river at times of river water temperatures high enough to induce them to spawn at locations in the lower river like Point Pleasant. (Kaufmann Testimony at 9, Tr. 2103; Miller Testimony 3-4)

e. With the present anticipated reduction in the dissolved oxygen block in the estuary, it is therefore the finding of the Board, based on uncontroverted testimony of the experts, that the Point Pleasant area and other suitable areas in the lower river will or should become prime spawning areas for American Shad in the future. (Kaufmann, Tr. 11901-02, 2104; Miller Testimony at 4; Miller, Tr. 3049, 3272)

f. Due to the vast reduction in the shad population in the Delaware River between 1900 and 1960 (Miller Testimony at 2), that population is and has been extremely stressed, and most important spawning grounds have been completely lost, and as a result, there is very little repeat spawning in the Delaware River, (Miller, Tr. 3286-87) and as a result, the continued health of the shad population in the Delaware River is extremely fragile, and considerably stressed at the present time. (McCoy Testimony at 4; Emery, Tr. 1779; Miller, Tr. 3196-3202, 3286-87, 3369).

g. In these circumstances, the healthy spawning of shad in the Delaware River is of extreme importance in each year in order to keep the population reproducing and to enable it to come back to healthy condition and to remain such. (Emery, Tr. 1782; Miller, Tr. 3064-65, 3196-3202)

h. To achieve this objective, the fish agencies of the states of New York, New Jersey, Delaware, Pennsylvania and the U.S. Fish and Wildlife Service have formed a cooperative program under the leadership of Joseph Miller, to manage the shad in the river so as to restore it to a healthy population. (Miller, Tr. 3186-87).

i. Ongoing studies by the Pennsylvania Fish Commission, the New Jersey Department of Environmental Protection, and other researchers have established the improvement in the shad population over the last few years, the restoration of spawning to the lower river for the first time in many years, and the hope for increase in the shad population. (Miller Testimony at 4; Emery, Tr. 1780-81; Kaufmann, Tr. 2122-23).

j. The shad has been determined to be a fish of vast economic importance to the Commonwealth of Pennsylvania, and the Commonwealth has designated all necessary measures to obtain its restoration in the Delaware River. (Kaufmann Testimony at 6). (30 P.C.S.A. §7301-02).

k. In these circumstances, although the loss of any single spawning and nursery area may not in itself destroy the shad population in the Delaware River, it is and would be significant in its effect on the program for restoration of the shad in the Delaware River, and especially for late spawners. (Miller 3061; 3272-74).

l. The Point Pleasant Pool is also a nursery area for American Shad, and substantial numbers of juveniles, as well

as a few larvae, have been found. The Point Pleasant Pool has not been systematically sampled for shad, but on the New Jersey side, the catch has been extremely significant. While applicant has conducted surveys and sampling in the area, the sampling has not been brought to the point of being analyzed, and no survey results have been reported since 1972. (Miller, Tr. 3246-48, 3254-57).

m. The concern over the lost of any habitat suitable for nursery and spawning of shad larvae is heightened by the fact that while the shad lay upwards 200,000 eggs, fewer than one thousand of those eggs progress to the larvae stage, and many fewer than that survive to adulthood; thus, any enhanced destruction of shad eggs is potentially significant in its effect on the repeat spawning and virgin spawning of shad, and therefore on the character of the population. (Miller, Tr. 3064; Emery, Tr. 1761).

n. Therefore, any loss of shad larvae in a given location, if significant in its relationship to the larva population in that area, although not numerically large in relationship to the shad population in the river, must be regarded as significant in the context of this stressed species in light of the limited survival of larval shad to adulthood. (Miller, Tr. 3061).

3. a. Shortnose Sturgeon is an endangered species, and that any agency proposing to take action in respect to such a species must determine that the proposed action will not affect critical habitat. (Kaurmann, Tr. 1991-92).

b. The Point Pleasant area is a suitable spawning and nursery area for Shortnose Sturgeon, but no one has sampled for Shortnose Sturgeon during its spawning season, so there is no knowledge as to whether Shortnose Sturgeon in fact does spawn in the Point Pleasant area, although they may very well do so; running ripe Shortnose Sturgeon have been taken in 1980-81 at Lambertville, only 12 miles downstream from Point Pleasant. (Kaufmann Testimony at 12-13; Kaufmann, Tr. 1797; Brundage, Tr. 2927-32).

c. The Shortnose Sturgeon is an extremely difficult fish to catch at any stage of its life, and exhaustive efforts to locate Shortnose Sturgeon larvae have proved almost entirely unsuccessful; (McCoy, Tr. 3068, Miller, Tr. 3071, Brundage Tr. 2924-25) the most systematic and exhaustive effort, on the Connecticut River, was able to catch Shortnose Sturgeon, after trying exhaustively with suction cup capturing the entire flow at the bottom, where the larvae were presumed to be, only after using nets which indiscriminately sampled both the bottom and the water columns (although they sample mostly the bottoms). (Maznik, Tr. 3593).

d. In these circumstances, as has other agencies, this Board must make the assumption that Shortnose Sturgeon spawn and nurse in or near the Point Pleasant Pool. (Brundage 2929-31).

e. There is no knowledge as to whether Point Pleasant Pool is a critical or unique habitat for Shortnose Sturgeon.

The loss of any Shortnose Sturgeon spawning and nursery habitat would be significant in that the Shortnose Sturgeon is an endangered species, and in the absence of the determination of any spawning and nursery areas, any potential spawning and nursery area must be regarded as potentially vital or unique, and therefore its loss significant. (Brundage; Masnik, Miller).

f. For the foregoing reasons, loss of any substantial number of shad or Shortnose Sturgeon would be of environmental significance.

B. The Susceptibility Of Shad And Shortnose Sturgeon To Entrainment, Impingement, And Other Damage By Water Intakes

3. Shad are susceptible to entrainment while in the egg and larvae stage. (Miller Tr. 3218-20).

a. When first released, shad eggs are smaller than 2mm. slot proposed at the intake location, therefore, to the extent present in the water column in the area of influence of the intake can be expected to be entrained during the operation of the intake. This period lasts only a short time, after which the shad are fertilized or lost as sterile. However, this period of time has not been precisely defined, and may last some time. (Miller Testimony at 4; Miller, Tr. 3205; Harmon, Tr. 2398-99).

b. After fertilization, while the shad eggs quickly become "water hardened", this does not actually mean that

they are hard, but that they absorb an amount of w[illegible] and become less soft. However, after this, while the[illegible]re bigger than the intake, they are extremely fragile, [illegible]n easily be extruded by an intake. (Miller, Tr. 30[illegible]52, 3253-55, 3206).

c. Therefore, it is apparent that all s[illegible]gs, after having been fertilized, are susceptible to entra[illegible]ent in an intake if they enter its area of influence, even at 2mm. (Miller, Tr. 3218-19).

d. The fish obtains a dimension in excess of the 2mm. width after approximately 16-18 days; prior to that time, he is entirely susceptible to entrainment. (Miller, Tr. 3207).

5. Shad are susceptible to impingement for their entire larvae period, up to 30 days. Approximately seven days after having been laid and fertilized the eggs sac opens and the larvae emerges. For the first 28-30 days of its existence, the shad is in the larval stage. For most or all of this stage, the shad does not have fully developed fins; as the fins develop, the shad obtains more control over his movements; however, during most of the larval stage, the shad is pretty much at the mercy of the currents. During this period, the shad has no backbone and has little stiffness, as a result of which he can be extruded or entrained into an intake of 2mm., even though his body may be wider than the 2mm. slot opening. (Miller, Tr. 3052, 3220-21; Emery, Tr. 2108-09; Harmon, Tr. 2424)

C. Relevant Hydraulic Characteristics Of The Point Pleasant Eddy-Pool, And Currents

6. The hydraulic determinant of the degree of loss of shad and shortnose sturgeon is the proportion of the water in the pool passing into the intake, and the velocity (speed and vector) at which the water is exposed to the intake.

a. The pool at Point Pleasant has previously been defined as the area bounded by the main channel of the Delaware River on the east, the bar of the Tohickon Creek on the north, the Pennsylvania shore on the west, and the lower end of the eddy area essentially opposite the Mountainside Inn on the South.

b. The Point Pleasant Pool is formed by the bar of the Tohickon Creek. (Phillipe Supp. Test., 3; Phillipe Tr. 3734) This bar extends east and southeast from the intersection of the channel of the Tohickon and what would be the western shore of the Delaware River, in the absence of the bar. (Phillippe Supp. Test. 3; Fig. 1) The Bar was formed by deposition from the Tohickon Creek, and protrudes from the shore from an upper elevation about 72 gradually dropping off until it merges with general river channel bottom at elevation 60 or 59 at the western edge of the main channel, approximately 275-350 feet from its beginning. (Phillipe Supp. Test. 3, Fig. 1)

c. The bar of the Tohickon Creek creates an area of low pressure and low energy by blocking the main flow of the Delaware River from that portion of the Delaware River

channel below the creek, (i.e., the Point Pleasant [illegible] at elevations below those which are sufficient to overtop the bar and override the friction involved in water crossing the bar. This condition of overtopping and overriding the friction occurs for all substantial purposes [illegible]ere between river flows of 5,500 and 6,00 cfs and highe[illegible]. At those higher flows, the eddy does not exist. (Phillippe Supp. Test. 3; Phillippe Tr. 3667; Boyer Tr.__)

d. At flows below 5,500 to 6,000 cfs, the low energy, low pressure zone shadowed by the Tohickon Creek bar eddies; as water spreads out from the main channel as it enters the area below the bar and assumes a vector of a westerly direction, while the main river flow is to the south and east. (Phillippe Supp. Test. 2-4) The eddy water first moves west towards the Pennsylvania shore, and then because of the still lower energy area back up towards the bar upstream, eddies upstream towards that bar. As the water reaches the bar, it is deflected by the bar back towards the channel, thus completing a clockwise circular motion by moving back towards the channel, at which time some of the water merges with the channel, but most is deflected from the main channel flow, with some vortices and turbulence, which in turns results, under steady state conditions, in its circulating back in the same clockwise motion. The river channel does not return to its general cross-sectional shape for several hundred feet below the proposed intake. (Phillippe Supp. Test. 2,3,5; Phillippe Tr. 3726)

e. This eddy, which has existed for hundreds of years, is known as Lower Black's Eddy, and has provided an attractive area for fish habitat. The movement of the water down from the bar toward the main channel is partially controlled by a scoured channel which is the outlet of Hickory Creek, (Phillippe Supp. Test. 4) a small stream consisting partly of Hickory Creek flow (from a small watershed) and partly of Delaware Canal Water. Hickory Creek enters the Delaware Canal as it comes down into a channel; there is then an overflow through which water, consisting of mixed Delaware Canal and Hickory Run water, continues down the Hickory Creek channel to the Delaware River in the pool. This composite channel has existed since the Delaware Canal was constructed. (Phillippe Tr. 3751-53).

f. In steady state conditions at flows below 5,550 to 6,000 cfs; the eddy water tends to recirculate repeatedly in the eddy. (Phillippe Supp. Test. 4).

g. As the flows increase in volume from the minimum flow, recorded as low as 1,100 cfs in 1935, and as low as 1,900 cfs in January, 1981, (McCoy Testimony at 11) the eddy becomes smaller and faster; it is largest and slowest at the lower end of the flow range. (Kaufman, Tr. 2117). The principal physical influence which changes size and velocity is the relationship of the eddy to the channel flow when the channel flow increases (rising stage) it "kicks" more water into the eddy, which increases the strength of the eddy.

(Phillipe Tr. 3734). When this occurs at higher flows, i.e., in the 5,000 to 6,000 range, the flows overtop the bar, but the bar still prevents flow in the lower part of the water column from reaching the eddy, as a result of which the eddy flow continues, but further downstream. (Phillipe Tr. 3734).

h. During the month of May, the period in which Shortnose Sturgeon spawn, the river is generally at flows in the 4,000 to 5,000 cfs range and higher. Thus, there are some years in which there would not be an eddy all the time, but only some number of days. (Phillippe Testimony at 4-5).

i. During June, the month in which American Shad spawn and during which Shortnose Sturgeon are still at the larvae stage, flows in the Point Pleasant area are frequently below 5500 cfs. A table of return frequency flows at Point Pleasant during the month of June: 2.9% flow 3050 cfs; 1.0% flow 2550 cfs; .5% flow 2000 cfs. (Phillippe Test. 4-5; Tr. 3683-88).

j. Changes in storage and other management measures will not likely substantially reduce frequency or extent of reduced flows. (McCoy Testimony, Phillipe Testimony at 4; Tr. 3683-88, 3784-89).

k. While Shortnose Sturgeon emerge past the larvae stage before the end of June, American Shad continue in the larvae stages until mid-July, with respect to the late spawning American Shad that could be expected to be spawning and larving in the Point Pleasant Pool. River flows during

July frequently fall below 3,000 cfs. A return frequency of flows below 3,000 cfs in July is as follows: 19.4% flows 3050 cfs; 10.2% flows 22550 cfs; 3.9% flows 2000 cfs. (Phillipe Test. 4-5; Miller, Tr. 3053-54).

l. When flows are lower in the river, velocities drop, both in the eddy, and with respect with the main channel velocities. (Harmon, Tr. 2399; Phillippe Tr. 2399).

m. The velocities of water movement include both the speed and the vector of the water movement. Water in the main channel, as it moves downstream above the pool, has a higher velocity than that of the eddy water. The water gains speed as it passes through a riffle above Point Pleasant, which riffle is located at just above of the main intersecting channel from the Tohickon Creek, just a few yards above the Point Pleasant Pool. (Phillipe Supp. Test. 2,4).

n. At the same time, the main channel water vector is impacted by the bars of the Tohickon Creek, and most relevantly, the lower bar, downstream of the main channel of the Tohickon. (Phillippe Tr. 3733-34). This bar blocks the main river channel water from proceeding in a southwesternly direction, in what would otherwise be a straight movement. (Phillipe Tr. 3734) This blockage is complete at flows under 5,500 cfs, and has limited impact at higher flows, where it blocks only the lower portions of the water column; the higher portions can overcome the blockage of the bar and continue straight ahead. (Phillippe Supp. Test. 3).

o. The most relevant flows for purposes of this case are flows below 5,500 cfs. At those flows, all of the main channel waters are deflected towards the New Jersey shore (the easterly shore) by the bar. At higher flows, the lower portions are still deflected. (Phillippe Supp. Test. 2; Phillippe Tr. 3726, 3874; Kaufman, Tr. 1982).

p. The bottom of the channel, which also has a principal control over the water, begins to move the water back towards the Pennsylvania shore as its passes by the downstream end of the bar. (Phillippe Tr. 3735). The angle at which the water returns toward the Pennsylvania shore depends on the flow quantity and trend and can get as high as 30% deviation from parallel to the sides of the bottom channel, towards the southwest, and thus towards the Pennsylvania shore. (Westcott Tr. 3918; Phillippe Tr. 3735). This angle and the force of the angle varies with the height in the water column, inasmuch as the toe of the bar extends downstream and towards the Jersey shore, at a lower depth as it drops off, and blocks the lower portions of the water column from moving towards Pennsylvania until a point further downstream. (Phillippe Tr. 3737-38; Phillippe Supp. Test. 3).

q. Velocity speed and vector is critical to determining the effect of an intake as shad and sturgeon eggs and larvae. (Harmon 2399-2400; Brundage 2932-42; Miller, Tr. 3350-51).

r. Knowledge of velocities is thus critical to predicting impacts. No adequate measurements of velocities at any given flow exist. (Phillippe Test. 2) Velocity readings taken in the Point Pleasant Pool and in the adjacent channel on November 7, 1980, by Applicant's consultants are not a valid basis for forming conclusions regarding relevant velocity for several reasons. First, they were not properly located. Velocity readings were taken only at 25 - meter intervals across in only one cross-section. (Harmon, Tr. 2253). Second, they were located by mean of a split-image range finder which was substantially in error, the error of which was internally inconsistent, and not monotomically variant, as a result of which correction can only be provided within a broad range of error in excess of 25 feet. (Phillippe Supp. Test. 10; Harmon 2750-60, EX. 18, 19; Westcott). Third, vectors were not provided, thus failing to disclose whether the eggs and fish in the water will be past the intake, or towards it. (Harmon, Tr. 2250-51).

s. Applicant's measurements of velocity taken on July 23 and 24, 1981, are reasonably reliable with respect to location, and there is no reason to believe that they are unreliable or significantly erroneous with respect to the meter readings. However, no vectors were provided; the vector of maximum velocity was recorded without regard to identifying the vectors, rendering them indeterminate. (Phillippe Supp. Test. 9, Tr. 3764, 3832-38).

t. Accordingly, neither of applicant's velocity measurements are an adequate basis for evaluating velocities at the flows which were provided; accordingly, they do not provide a valid basis for determining or estimating likely velocities at other flow conditions.

D. Relationship Of The Intake And The Currents, Anticipated Velocities And Directions

7. In fact, the Applicant has performed no studies which establish in any reliable fashion that the velocities will be past the intake or at a speed ratio of more than 2 to 1 past the intake at any of the relevant times; instead, such evidence does exist strongly suggest that both River flow (containing shad and sturegon eggs and larvae) and eddy flow (likewise containing eggs and larvae) will be directed toward the intake at frequently recurring flows, and will flow at speeds substantially less than a 2:1 ratio or 1 fs.. (Phillippe Supp. 4-5, Tr. 3792, Westcott Tr. 3942).

a. While the velocity measurements made on July 23, 1981 are sufficient to establish that the speed of the velocity will be more than 1 foot per second in the vicinity of the intake at 5500 cfs (Trenton), they do not establish that, even at such flows, the velocities will bypass the intake structure in a parallel vector. On the contrary, the measurements showed a turbulence, and while the velocity measured is the maximum velocity, the vector is quite uncertain, and in light of the bathymmetry and the Tohickon

bar and the trend toward the Pennsylvania shore, it appears that the velocity may intersect the intake at a vector as great as 20-25° off from parallel. Thus, the velocity, given the existence of the double row and the turbulence, will direct organisms in the main current directly towards the intake and increase mortality when compared with still water. (Phillippe Tr. 3735; Westcott, Tr. 3610-11, 3920).

b. The velocity measurement of November 7, 1980, since they may represent velocities as much as 25 feet or more further into the river, established that the 2800 to 3000 cfs flow rate level, velocity will fall below 1 foot per second in some area of the intake, at lower portion of the water column at least, at a site as much as 25 feet beyond the intake. (Westcott Tr. 3924-25, 3932).

c. In extending these velocities to lower flows, which frequently occur in late June and July, it is clear that velocities may be substantially less than 1 foot per second, may average .80 or less (assuming that the November 7th velocities are correctly established for the area of the intake), and may be as little as .3 feet per second at the lower end of the water column facing the intake, as suggested by one extrapolation downward from the recorded velocity on July 23, 1981. (Phillippe, Tr., Westcott Tr. 3610-11, 3958).

d. Intake velocities can be a maximum of .5 feet per second even with all screens open, and due to regular obstruction of some screen opening due to biofouling and

debris, could be even higher. (McCoy Testimony at 10; McCoy Tr. 3165).

e. Nor is it established that only the main channel will encounter the intake. On the contrary, due to the direction of the current in the eddy, and particularly its tendency to follow the Hickory Creek channel in the shadow of the bar, and given that the intake is partially shadowed by the bar, particularly at the lower portions of the water column (Phillippe Supp. Test. 3-4), it appears likely, if not certain, that the eddy water, particularly at times of falling stage and low flow conditions, both above and below 3000 cfs, will be moved toward the intake and encounter the intake, and will be taken in. (McCoy Testimony at 10) Since the water recirculates (Phillippe Supp. Test. 3-4), this means the aquatic organisms in the water will likewise be exposed to the intake repeatedly. This in turn will increase the likelihood of their being impinged or entrained, if one makes the conservative estimate that impingement and entrainment will be equivalent to the ratio of the withdrawn water to the relevant water body. (Miller Tr. 3054; Kaufmann Tr. 2069-70; Harmon Tr. 2361).

E. The Intake: Its Characteristics and Orientation in Relationship to River Hydraulics

8. The hydraulic characteristics, dimensions and placement of the intake will not reduce losses of shad and/or sturgeon

to the minimum reasonably attainable loss, and will allow significant impingement and entrainment losses.

a. The proposed intake assembly will consist of 12 identical pipes with screens mounted on them. The screens will filter all of the flows into the conduit, and when all screen surfaces are available, will function at an average velocity of .35 feet per second through the slots over an area some 75 feet from upstream to downstream, and some 12 feet from fore to aft. The assembly between those dimensions will consist of 12 screens, each forty inches (thus, more than 130 inches in circumference (40 x 3.14)) the length of each screen is 10 feet. ( )

b. Each screen will a have a thru slot opening of 2mm. in width and 23mm. in length. However, the width will expand as the distance from the face of the screen increases. (Miller, McNutt)

c. The types of screens to be utilized is called a Johnson Wedge Wire Screen, and is described as passive that it does not rotate or move. These screens are a new development in intake technology, and it is anticipated that they provide an advantage over the previously utilized traveling screen, with regard to entrainment and impingement of aquatic organisms. (McCoy, Tr. 3191) However, no systematic field studies are available; the only field data is a first year report from the Campbell Plant on Lake Michigan, which employs a 9mm. screen, and which entrained more than 3 million alewives in its first year of operation. (Masnik,

Tr. 3528-30) While no impingement was noted, impingement could hardly be anticipated with slot openings of 9mm., since the age of susceptibility of most species would coincide with width sizes less than 9mm., this permitting them to be entrained, so that they would not be impinged.

d. No laboratory or field studies have been performed to evaluate the effectiveness of the intake on American Shad or Shortnose Sturgeon, and each species has different characteristics relating to intake losses. (Miller 3235-37).

e. Laboratory studies of passive wedge wire screens have suggested that ambient current velocity parallel to the intake is an important variable in reducing impact through entrainment and impingement. (Brundage, Tr. 2941-42; Harmon, Tr. 2426).

f. Field studies and laboratory test that have been conducted have all been involved screens and screens assemblies substantially smaller than those proposed in this matter. Those test therefore, did not account for the loss of the ambient advantage to small fish (larvae) who have limited mobility, especially where the laboratory tests have shown that burst speed and swimming capability (behavioral reaction) are important in establishing the extent of effectiveness. The fish cannot substain their burst speed for more than a few feet, and if the intake is located such that the fish will be exposed to it over a period of time, or turbulence is created by the interaction of the current and the intake, or a combination of both, or the organisms

are exposed to the influence of the intake more than once during a short period of time through being circulated past it, whatever potential escape behavior they made exhibit will be increasingly obviated. (Miller, Tr. 3330-34; McCoy, Tr. 3055, 3225, 3305).

g. In addition to the orientation of the array with respect to the vector of the current, the intake can also be assembled such that the slots in the screens are orientated perpendicular to the trend of the current (or axially) or parallel to the direction of the current (radially). It is planned to located the proposed slot perpendicularly to the current. (McNutt, Miller).

h. The proposed creation of two rows of screens in the orientation of the screen assemblies in the river is unique; there is no recorded instance of any similar use, and thus no comparable experience and many problems can be expected. (Miller, Tr. 3190-3194; Phillippe Tr. 3676).

i. The orientation of the proposed slots will create a turbulence or edge effect at the down vector end of each slot. (Miller Tr. 3058, 3134, 3330-34).

j. The passage of current across the two rows of screens will cause a velocity change due to the intake of some of the flow, and thus a Venturi effect and thus turbulence in the area between the two rows of intakes. This turbulence will extend into the second row of the intakes. (Phillippe Tr. 3736; McCoy, Tr. 3055).

k. Such turbulence will reduce the ability of aquatic

organisms in the lower age groups to resist entrainment and impingement. It may also act to cause extrusion of some young organisms because of the rough tossing of such organisms in and around the intake structure. (McCoy, Tr. 3056; Miller, Tr. 3333).

l. It is planned to provide smooth nose cones at the upstream end of each of the two parallel arrays in order to attempt to deflect ice and debris coming downstream. However, these nose cones will provide a false security to organisms, who will be attracted along, and then caught in the turbulence as they encounter the perpendicular current slots. (Miller 3056).

m. Laboratory studies have shown, and an opinion has been expressed by many, including the project engineer and the biologist who performed the assessment on Shortnose Sturgeon, as well the Applicant's principal biological consultant, and is confirmed by the experience of fish biologist, that a velocity ratio of at least 2 to 1 that is, parallel to the velocity of the intake structure, is important in reducing entrainment and impingement. (Miller, Tr. 3051; Brundage, Tr. 2939; Harmon, Tr. 2565-66).

n. In representing the Johnson Wedge wire Screen Structure to various review bodies, including the Army Corp of Engineers, the Nuclear Regulatory Commission, the U.S. Fish and Wildlife Service, the Pennsylvania Fish Commission, and the Delaware River Basin Commission, the Applicant represented that the bypass velocity would be a minimum of 1

foot per second at the low flow at which the intake would be operated at its maximum, i.e., 3,000 cfs. (Brundage Tr. 2958, Del. Ex. 17)

o. As a result, the Applicant did not consider velocity that would exist at flows less than 3,000 cfs. (McCoy Tr. 10; Brundage Tr. 3009; Harmon Tr. 1649-50, 2357 Del. Exh. 77).

p. The Applicant similarly represented that the intake would be mounted parallel to the vector of the main current velocity. (Harmon, Testimony at 7).

q. The Applicant also represented first that its initial proposed location of 200 feet in the river, and later at the changed location 245 feet into the river, that the intake would not be located such as to be affected by or introduce flows from the Point Pleasant Pool, but that it was located in the main channel, and would draw water only from the main channel. (Harmon Testimony at __; Brundage 2958, 3539-41, Delaware Ex. 17; Masnik Testimony at 15).

INTERACTION OF THE INTAKE WITH AMBIENT FISH & WILDLIFE

9. The testimony and documentation on velocity, both as to speed and vector, by the applicant failed to establish in any reliable fashion, the absence of loss of significant quantities of fish with the intake at various flows and operating conditions. (Phillippe, 2-5).

10. The intake will have a maximum intake velocity, in operation, of at least one-half foot per second, and while the average velocity may be .35, has indicated by applicant, clogging by debris or biofogging will increase the velocities in the remaining open slot area to .5fs or higher under various conditions. (Miller Tr. 3291-93).

11. The individual velocity of screens, has been shown relevant in laboratory tests, but the limitation of velocity as indicated over a wide field such as that which will be created by the proposed array, consisting of 12 screens in two rows of six, covering 12 feet across the river and 70 feet along the river, precludes relying on the ability of the fish to avoid the intake, at larval stages, through behavior, since they will likely be cumulatively exposed to a series of screens, as they attempt to escape, or proceed with the current. (McCoy Tr. 3225; Masnik, 3507-08; Burndage 2960-61, Del. Ex. 22).

12. The intake will further deviate from the laboratory experiments in that the width edge slots mounted permindicturly to the flow, an edge effect will be presented, which will create turbulence, as will the parallel placement of rows of screens, thus subjecting the fish to more than simple .35 or .5 intake velocity utilized in the test for a single screen with rapidly-oriented slot openings. (Ibid.)

13. The intake will extend from a depth of a minimum of approximately 3 feet in the water, to a maximum depth of approximately 7 feet in the water. Fish moving from one elevation in the water, to another, will not necessarily be aided in escaping the intake. (Miller).

14. The vector of velocity with respect to the intake will vary according to flow conditions, including both the amount of flow in the river, and the trend of flow (rising or lowering stage), and will further vary at different depths in the water column. (Phillippe Supp. Test., 4).

(a) At rising stage, the main flow current will angle towards the Pennsylvania shore, and thus intersect the intake at an angle of up to 30 degrees from parallel. The water thus crossing the intake will proceed into the eddy, where it will, in many cases, recirculate into the intake. At lower depths in the water, the water will be moving towards the New Jersey shore, in the main current, allowing eddy flows to come down the Hickory Creek Scower Channel towards the intake, at an angle which has not been established, but which, if it proceeds to the intake, will do so at an angle substantially off from parallel. (Phillippe Tr. 3735-40).

(b) Flows circulating in the eddy will be likely exposed to the intake to the extent that such flows are circulated past and around the bar of the Tohickon Creek, and down the channel of the Hickory Creek. (Phillippe Supp.

Testimony, 2-4).

15. The speed of velocity of the flows will likewise vary with the amount of flow, the trend of flow (rising or falling), and the depth in the water column, as well as the cross section of the river. At lower depths in the water column, the velocities will be lower than at the upper levels most of the time, and therefore, velocities at the flows below 2800 to 3000cfs, at the intake, are likely to be adjusted downward to reflect first, the depth, secondly, the corrected distance towards shore, and thirdly, the lower flows. These velocities may be as low as .25 fs. (Phillippe Supp. Test. 6-9).

16. The applicant attempted, but failed to create a rule curve correlating flows at Point Pleasant and Trenton, and enabling an evaluation to be made as to velocity at various flows at Trenton, because the proposed rule curve did not take into account the effect of the Lumberville Wing Dam or the Delaware and Raritan Canal diversion. (Phillippe Supp. Test. at 6-7, Tr. 3700-05).

(a) The Lumberville Wing Dam is a partial constriction of the river located approximately one mile downstream from Point Pleasant. Because it has a slot opening, its impact is significantly different at flows which over top the side wings, from flows which do not, because the cross section available is substantially different. Thus,

any such relationship will not be a smooth curve, as was proposed by the applicant. (Phillippe Supp. 7-8, Tr. 3662).

(b) The Delaware and Raritan Canal diversions occur just downstream from Point Pleasant, and can amount to as much as 100cfs net loss to the river at various times, and are variable. Accordingly, changes in the DER Diversion can affect the relationship between Point Pleasant and Trenton flows by as much as 5% during low flow occurrences, and therefore without consideration and knowledge of what such flows were at the time of each attempted measurement, it is impossible to construct a rule curve. (Phillippe, Supp. 8).

(c) Therefore, the applicant's attempt to construct a rule curve was unsuccessful. This is further illustrated by the fact that the applicant proported to use 97% of the Trenton flow as the Point Pleasant flow in constructing his rule curve, but in doing so, failed to take into account differential travel times to Trenton at different flows, and different flow trends, and relied strictly on a 97% value, or made adjustments, and used figures which substantially deviated from the 97% value without explanation or justification, thus making the claimed confirming points on the rule curve invalid and non-confirming. A chart of the applicant's proposed rule curve was introduced as Exhibit 11, whereas the values which were actually recorded at Trenton are shown on Exhibits as and 26 and plainly do not provide a uniform or justified relationship

to Point Pleasant values, which would be necessary to them function as confirming points. (Phillipe Supp. 7-8, Tr. 3705).

17. The attempt to extrapolate anticipated speeds of flow by utilizing the two flow values and the speeds on November 8, 1980 and July 23-24, 1981, provide somewhat more aid. However, because of the extreme difficulty in attempting to use the November 8th data because of the failure of the applicant to provide a reliable location of the data, it is impossible to relate that data to the location of the intake. Furthermore, the proposed relationships do not account for what would then become anomolies in the data, i.e., lower readings further out into the river than closer to shore, unexplained movements in the peak velocities at different depths in the water column, and anomolies in apparent velocity readings. (Phillippe Supp. 3, 10-11, 3758, 3764).

18. As Harmon reported to Bourquard, he used the approximate maximum velocities measured, but did not record the vector of such maximum velocities, and therefore his readings do not represent a reliable estimate of downstream flow speeds. (Phillippe Supp. 9, Exhibit 9, Tr. 2211).

19. The main channel of the river commences at approximately station 9 plus 00, while the intake is located

at station 8 plus 62, with its further edge being 8 plus 72, and its closest edge to shore being 8 plus 52. Because the velocities of the main channel are moving towards Pennsylvania from New Jersey as they cross the intersection heading downstream, the upstream velocities are lower, and need to be measured along with the center line in downstream velocities; this has not been done except on the one occasion of July 23rd. (Phillippe Testimony 6, Supp. 2).

20. The applicant's attempt to extrapolate the flows from July 23rd and November 8th values is further rendered invalid by the fact that the applicant measured the flow on July 23-24 as 4500cfs, whereas the flows at Trenton on that day were 5900cfs, and on the following day 5000cfs, as a result of which the Board concludes that the flow at Trenton at the time of the velocity measurements was approximately 5500cfs. (Westcott).

21. The applicant failed in all of its studies, to recognize the control of the Lumberville Wing Dam, either for purposes of attempting to relate Trenton flow to Point Pleasant flow or for purposes of interpreting and understanding the hydraulic patterns within the eddy-pool. (Phillippe Testimony 6).

22. The applicant has completely failed to provide any systematic analysis of the hydrology and hydraulics of the

intake area, although it is a complex area which requires analysis, and although such an analysis could be done relatively simply with the available data using models developed by the Corps of Engineers. Such systematic study would aid significantly in achieving a complete predictive picture of the flows and velocities of the water that would encounter the intake. (Phillippee Testimony 6).

23. No witness provided by applicant had conducted a systematic or generalized study of the relationship of velocity to the fish.

24. The Board has not been presented with any study of the anticipated loss of fish into the intake either by impingement or by entrainment, of a nature normally available in connection with a project of this nature. (Masnik 3538).

25. (a) Contrary to its earlier claims, made repeatedly by the applicant, the water will be withdrawn at maximum rates even when flows in the river are below 3,000 cfs, as long as such flows are replaced by Merrill Creek releases.

(b) The Board disregards applicant's testimony on velocity measurements for the additional reason that the testimony is a post hoc rationalization which was prepared for this hearing by applicant's Vice President after he said

nothing at this deposition or in pre-filed testimony. He volunterred these opinions in response to a question which did not call for discursive answer, and then claimed he had performed the evaluations prior to his desposition and pre-filed testimony. The Board can not credit his claims, and must evaluate the remainder of his testimony in this light. (Boyer, Tr. 1350-54, 1611-21). Similarly, the applicant's engineer, confronted as to his repeated statements that the intake would not be operated at maximum rates when reiver flows were below 3,000 cfs (e.g. Applicant Exh. 2) repeatedly evaded admitting the truth, and thus eroded his credibility. (Bouquard, Tr. 1622-25).

(c) Similarly, the Board must discount the testimony of the staff biological witness, who admitted he expressed a tentative opinion to applicant's consultant, employed by his power employer, prior to making his investigation, and also prepared his testimony believing that the intake would not operate at maximum rates when flows were below 3,000 cfs, and that each fish would only exposed once and testified that he considered significant losses to be only those detectably affecting the population of the entire species in the River, and relied on the Nanticoke study, which in fact, admitted serious losses and the Campbell Plant, which had slot openings of 9mm, which involved a different species in a lake, to form his opinion regarding impacts of the Johnson service on shad, and ignored the ventor orientation, but admitted that bypass

velocity has an impact, though he ignored. (Masnik, Tr. 3508, 3591, 3512-14, 3528-29, 3540-44, 3551-53, 3557-58, 3586, 3587, 3984-85, 3986-88, 3997, 4000, 4005, 4025-28, 4033-34).

(d) Without a reliable study, the Board finds that it is inappropriate to draw a conclusion that there would not be a significant impact.

IMPACT OF THE INTAKE AND PROJECT ON FISH AT POINT PLEASANT

26. Combining the subsidiary facts, the Board finds that there is spawning of shad at Point Pleasant, and likely spawning of shortnose sturgeon. The Board finds that the shad and sturgeon use the Point Pleasant eddy-pool as a nursery area. The Board finds that the shad spawn in the pool above the riffle, which is above the eddy-pool at Point Pleasant, and the eggs and larva float down into the eddy-pool in which the intake is proposed to be located, and thereby are located in an area where they are present and vulnerable to impingement and entrainment. The Board further finds that the fish are substantially at the mercy of the current during most of their early month to two months of life, and both the main river current and the eddy current will expose them to the intake, on multiple occasions, because the current will carry them into the eddy, and the eddy will flow past the intake and expose the organisms to impingement and entrainment repeatedly.

Finally, the Board finds that the velocities past the intake either will not be parallel to the intake as represented, or will be at lower speeds than represented, and will not exceed the intake speeds by at least a factor of 2, and may even than intake speeds at low flows, and that low flows will occur frequently below 3000cfs during the period of vulnerability, thus, exposing the fish during the high period of vulnerability at velocities which do aid or assist them in escaping the intake, and on a contrary, expose them to the intake, and render them seriously vulnerable to entrainment and impingement. Finally, the Board finds that such entrainment and impingement will substantially and adversely destroy the intake pool area as a spawning and nursery area for American Shad and shortnose sturgeon, and further result in the substantial reduction of both species, in relationship to their number and taking into account, the stress on the shad population and the endangered status of the shortnose sturgeon.

27. The Johnson Wedgewire Screen Passive Intake System represents an effort to improve the methods for reducing entrainment and impingement impacts of water intakes, and the Board has no reason to believe that it is not a viable system as compared with others; however, the degree of its effectiveness has not been demonstrated with respect to shad and shortnose sturgeon, and its efficacy is sites specific. Therefore, the mere fact that the intake is "state of the

art design" says little about its efficacy as applied to the Point Pleasant eddy-pool location.

IMPACTS ON THE RECREATIONAL USES OF THE POINT PLEASANT EDDY-POOL

28. The Point Pleasant eddy-pool is part of an extremely and growing popular area for tubing and rafting and swimming in the Delaware River, and is a major recreational resource in the Philadelphia Area. (Plevyak Testimony 1-2).

29. The Point Pleasant eddy-pool is part of very important fishing area for American Shad, walleye, and many other species of fish, and because of its rare status as an area with access, the bar permitting fisherman's access to the main channel near the Jersey shore, and the eddy-pool itself, it is a very highly used fishing area. (Kaufmann, Emery 1948-49).

30. The operation of the Point Pleasant Diversion and intake system in the proposed location creates a substantial risk of adverse impact on the eddy-pool area for fishing, in that by changes the current patterns, may cause shad to move closer to the New Jersey shore, and out of reach of fishermen on the Pennsylvania side, the walleye and other fish may be deterred from using the pool, which they now use for spawning and all life stages, by reason of the disturbances

and turbulences created in the area. (Miller Tr. 2144-46; Kaufmann Testimony 13-14; Plevyak 1948-52).

31. The use of the Point Pleasant pool area for recreation may be adversely affected by the existence of the intake structure, which can cause problems for tubers and rafters. (Kaufmann & Emery, 1886-89; Plevyak 2010-14).

32. While Del-AWARE did not establish that there would be a substantial draw-down, now that the intake has been moved further out into the River, this Board, pursuant to regulation can take cognizance of serious environmental issues raised by testimony presented at the hearing, and the Board does so herein, in view of the testimony presented concerning the importance of the area for fishing, the importance of the area for recreation, and the likely effects through the means described above, and finds that there will be significant effect on the eddy-pool with respect to recreational utilization.

EFFECT ON THE HISTORIC DISTRICT

33. The Point Pleasant Historic District comprises of both the village, which has determined to be eligible for inclusion in the National Register, and the Pennsylvania Canal, a National Historic Landmark, which is located for present purposes, within the district, and includes not only

the Canal and tow path, but the Mountainside Inn property as well (Richter at 2-3 Exhibits 2-4).

34. The Point Pleasant Village Historic District is an eclectic assemblege of river and canal-oriented functions and structures, and retains a 19th early 20th century ambience, which is supported and sustained by its residents, and discouragement of their activities can cause the loss of the qualities of the District. (Lewis Testimony at 3-5; McNutt Testimony at 1).

35. The operation of the proposed system will entail frequent truck access to the River at the gatewell for operating the air compressor system to attempt to back-flush the screens, the insertion/operation of a transformer which will generate a noise that will extent beyond the boundaries of the Authority's property, and represent within the Authority's property, which is within the Historic District, an intrusive and incompatable activity, and the noise of the trucks coming and going, will all substantially and adversely affect the character and nature of the Historic District and the Landmark, which presently enjoy an extremely low noise level. (Moiser Testimony at 2-3; Poliocastro Tr. 1137-39).

36. Noise disturbance is composed not only of an increase in decibals, but an increase in perceived noise

level, which is actually represented by a background noise lower than the decimal level which is registered occasionally, and the proposed project would increase the perceived troublesome noise (masking level) by 5 decibals merely through the operation of the transformer, and assuming that the pump noise can be contained wholly within the pump house. (Poliocastro Ex 2). Such an assumption is premature because the evidence has not been provided. (Poliocastro 1122-23; Ex. 2, 1130-31, 1168-69). Applicant made no right time readings, nor did it report masking level values, both of which are necessary for evaluation. (Poliocastro 1144-42).

37. Additional noise intrusions will be attributable to the operation of a barge and/or crane system to replace intake screens lost to ice and other debris which will frequently come down the river and damage the intake screens. (McNutt 3446-47; Poliocastro Tr. 1120-21).

38. Ice and debris are frequently found in substantial amounts in the area of the intake, and debris and ice packs and ice dams of thicknesses of up to 4 feet more with force sufficient to cause destruction of the screens have frequently occurred. (McNutt Testimony at 5, 7-8, Tr. 3467-68, 3397-98, 3442-44; Phillippe 3794-96).

39. The material of which the screens will be formed is 304 stainless steel, which is only strong enough to withstand the force of 35,000 pound p.s.i., and the guard posts can handle 65-80,000 p.s.i., and a block of ice or ice dam of 100 feet by 100 feet by 3 feet will more than exceed the capacity of the screens and guard posts to withstand serious damage and will protrude downward to the river bottom. (McNutt Testimony, at 3, Tr. 3388-95, 3408-09, 3414-15, 3441-5; Phillippe Tr. 3673, 3794-96).

40. There will be frequent need to replace the screens, probably at least annually, and the activity involved, since each screen is almost one ton, will be substantial, and probably require use of cranes, and barges, as well as major transport equipment. (McNutt 3446-47).

41. This activity, taken as a whole, will substantially and adversely affect the character and condition of the Point Pleasant Historic District, including the National Historic Landmark, the Pennsylvania Canal. (Policastro 1139; Lewis Testimony 3).

42. Blocking of the transformer noise would require construction of 25' walls on top of the 30' fill, located less than 100' from the Landmark. (Policastro Tr. 1133). This might require further review for historical compliance. (Richter Tr. 1186).

43. Neither the staff nor the applicant made any effort to plan or take action to minimize the impact of the facility on the Historic Landmark. (Richter Testimony Tr. 1148 Moiseev Testimony).

44. There is no evidence that either the staff or the applicant has considered any alternatives to the project in light of the requirements of the National Historic Preservation Act of 1966, as amended in 1980, §110(f).

CONSTRUCTION SCHEDULE

45. Applicant's witnesses testified that no detailed studies have been prepared justifying its alleged need to commence construction on December 15, 1982, in order to complete construction by the summer of 1984. (Bourquard, Tr. 2481).

46. It appears affirmatively from applicant's schedules that applicant does not plan to utilize the proposed system until April, 1985. (Boyer, Tr. 2445-54).

47. The only justification offered for commencing construction by December 15, 1982, was the need to have the system in the summer of 1984, and the alleged need to be able to construct in the river during two winters, the DRBC

having limited construction to winter months. (Dickenson, Tr. 2466; Del. Exh. 16).

48. There is nothing in the bid proposals or contracts which requires the contractor to commence construction in the river on any schedule, or to construct more than normal hours, and there is no justification offered for believing that 5 months construction time in the river will not be sufficient.

49. The documents also disclose that the true reason for the haste to construct the system is not the need for completion, but rather an effort by the NWRA and applicant to avoid any further consideration of the project's desirability by the Bucks County Commissioners. Applicant provided no evidence to refute this explanation for the present proposed haste. (Boyer, Tr. 2463; Del. Exh. 15).

50. There is no reason to believe that reconsideration of the present proposed intake and other alternatives will entail any delay in the applicant's ability to operate the Limerick's generating station.

51. If there is any delay in operating the station due to the need to further develop intake locations and studies, it is attributable to the applicant, which failed to produce such studies at an earlier time, and failed to bring the

matter to the attention of the commission, or to provide necessary information to the staff or the Board, despite the fact that staff informed the applicant on January 5, 1981, that it intended to conduct a comprehensive environmental review of the diversion. (Tr. 3671-72).

ALTERNATIVES

52. Although neither the staff nor the applicant presented any evidence regarding alternatives, it is clear that viable and preferable alternatives to the present location exist. Phillippe identified viable alternative sites 500 feet and one-half mile downstream which would provide an opportunity to orient the intake assembly parallel to flow confidently get into the fast channel, and avoid ice and debris problems, while reducing and minimizing the substantial disruption to the Canal and Historic District. (Phillippe, Tr. 3668-69, 3842).

53. Relocating the intake 50 feet further into the river would avoid the eddy, increase bypass velocity and reduce the impact. (Phillippe Tr. 3844, 3863-65, 3870-73; Kauffmann Tr. 1909-19).

54. Other alternatives would aid in alternating the dissolved oxygen problem in the estuary. These include using the Philadelphia Northeast Sewage Treatment plant

effluent, which would avoid removing low B.O.D. water, and would remove high B.O.D., (B.O.D. causes low D.O.). Kauffmann, Tr. 1998-99. They also include taking the water from the Schuylkill River itself. (McCoy Tr. 3263-68, 3340-42, Del. Ex. 23). These alternatives would also avoid the effects on the Perkiomen, both flow and intake, which are substantial. (See ERDL Tables 5.1-6 to 5.1-9).

55. These alternatives have not been considered at all. The primary reason for the current location is that subsequent to 1970, when the NWRA first focused on the proposed location, and while the intake was still located on the shoreline, the NWRA had purchased not only the land for the pump station and the intake, but much of the land needed for the project as a whole, and therefore, to avoid the potentially difficult task of acquiring new land in other locations, sought to move the intake around to obtain the least objectionable scheme within the land already owned. (Westcott, Tr. 3966-67; Bourquard, 2732-33).

CONCLUSIONS OF LAW

1. The proposed Point Pleasant Diversion intake, in its operation, will have a significant adverse effect on the environment, in that it will cause substantial entrainment and impingement of American Shad and shortnose sturgeon. In as much as American Shad is a stressed species and shortnose

sturgeon is an endangered species, any significant losses of population are significant in relationship to the environment, and in view of the fragile nature of the shad and the endangered status of the sturgeon, the loss of the members and spawning and nursery area at Point Pleasant would be significant. The adverse effect on the fishing and recreational area is also significant, and the adverse effect on the Historic area is also of environmental significance. Combined and in the aggregate, these three adverse affects arising only from operation, and not taking into account other environmental effects which might arise from construction, represent a significant and environmental effect which requires an appropriate compliance with the National Environmental Policy Act procedures, including preparation of an Environmental Impact Statement and opportunity for comment, before this commission can approve them.

2. Applicant has not provided information in quantity or quality sufficient to formulate an environmental report and/or appropriate or sufficient for a satisfactory EROL, or sufficient to permit the staff to make an Environmental Impact Statement is sufficient to satisfy the requirements of NEPA and the Commission's regulations with respect to operating impacts.

3. The changes in the project, including the assumption by the Philadelphia Electric Company of the major

financial responsibility for the Point Pleasant Diversion, and the changes in the physical characters in the diversion, including the relocation of the intake, the development of details regarding the operation of the system and the elements of operations, including transformers, gatewells, back-flushing, in-river screens, and size and extent of screens, and the location thereof, represent project condition of a changed nature and changed circumstances which require, along with the absence of such information at the CP stage, full environmental compliance.

4. In these circumstances, the Board concludes that the National Environmental Policy Act requires that the Commission draft, complete, and file a final Environmental Impact Statement which includes full consideration and analysis of appropriate cooling water solutions, before permitting construction to commence and operations to commence.

5. Failure to require compliance prior to inception of construction will, in all probability lead to a situation in which damage will be done and progress and construction may advance to the point where, as a practical matter, the requirements of NEPA will be rendered annoulity and compliance impracticable.

6. In view of the facts and circumstances, there is no offsetting or conflicting considerations justifying permission to proceed.

_____
LAWRENCE BRENNER, ESQ.

_____
DR. PETER MORRIS

_____
DR. RICHARD COLE

DATED THIS _____ DAY OF _____, at Bethesda, Maryland.

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CERTIFICATE OF SERVICE

I hereby certify that I have this 17th day of November, 1982, served a copy of the foregoing INTERVENOR DEL-AWARE'S PROPOSED FINDINGS OF FACT, CONCLUSIONS OF LAW, AND OPINION on the following persons:

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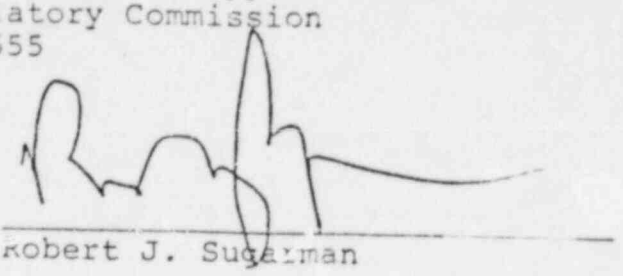

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