November 23, 1982

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING 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., for the Nuclear Regulatory Commission Staff.

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

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PARTIAL INITIAL DECISION

OPINION

I. SCOPE OF DECISION

This Partial Initial Decision addresses environmental concerns raised in connection with the application of Philadelphia Electric Company ("Applicant") to the Nuclear Regulatory Commission ("NRC") to operate the Limerick Generating Station, Units 1 and 2, ("LGS") located on the Applicant's site on the Schuylkill River, near Pottstown, in Limerick Township, Montgomery County, Pennsylvania. To augment cooling water from the Schuylkill River, the Applicant proposes to provide supplemental cooling water for the LGS by diverting water from the Delaware River at Point Pleasant, Pennsylvania. This decision addresses environmental issues raised in contentions proposed by Intervenor Del-Aware and admitted by this Board in its Special Prehearing Conference Order of June 1, 1982, ("SPCO") as modified by our Order of July 14, 1982. The contentions concern changes in plans and circumstances relating to the operation of the Point Pleasant Diversion occurring since the LGS construction permit review. Del-Aware alleges that these changes in operation will cause environmental harm which could be mitigated only by appropriate changes in construction. We ordered an early hearing so that any mitigative measures found necessary might be ascertained before the start of construction. As a result of the hearing we have concluded that certain mitigative measures should be considered by the Applicant to assure that tones from transformers located outside the pump station, which is part of the Supplemental Cooling Water System ("SCWS"), are not

audible beyond the site boundary. These measures do not relate to the construction or design of the major components of the SCWS and do not require that the start of construction be delayed. In reaching our environmental determinations we have considered the actions taken by other federal and state agencies in their reviews of the SCWS.

II. BACKGROUND

On March 17, 1981, Philadelphia Electric Company filed an application with the NRC to operate the Limerick Generating Station Units 1 and 2. The application was docketed on July 27, 1981, and a "Notice of Receipt of Application for Facility Operating Licenses; Notice of Consideration of Issuance of Facility Operating Licenses; Notice of Availability of Applicant's Environmental Report; and Notice of Opportunity for Hearing" was published in the Federal Register on August 21, 1981.[1/]

On September 14, 1981, the Commission published in the Federal Register a notice entitled "Establishment of Atomic Safety and Licensing Board to Preside in Proceeding."[2/] A special prehearing conference was held in Norristown, Pennsylvania, January 6-8, 1982, following which we issued our SPCO. In our SPCO, we found that Del-Aware, the only petitioner proposing contentions concerning the supplemental cooling

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1/ 46 Fed. Reg. 42557.

2/ 46 Fed. Reg. 45715.

water system, had standing.[3] We also held that reports of the taking of shortnose sturgeon, an endangered species,[4] downstream of the proposed intake and an alleged change in intake location since the construction permit review raised the possibility that impacts sufficiently different from those previously considered and found acceptable justified our consideration such matters.[5] Further, we held that it was appropriate for us to consider environmental costs which were not considered at the construction permit stage because at that time the plan for the SCWS lacked concreteness.[6]

The Delaware River Basin Commission ("DRBC") has allocated water for the use of the LGS. Under the terms of the Delaware River Basin Compact, no federal government agency may make determinations which conflict with the DRBC's comprehensive plan if the federal member has concurred in the

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3/ SPCO, June 1, 1982, at 20.

4/ The Endangered Species Act, 16 U.S.C. § 1531 et seq. defines "endangered species" as "any species which is in danger of extinction throughout all or a significant portion of its range." 16 U.S.C. 1532(4). Section 1536 of that title requires federal agencies to take action necessary to insure that actions authorized, funded or carried out by them do not jeopardize the continued existence of endangered species or result in the distruction or modification of habitat of such species.

5/ SPCO, at 57.

6/ Id. at 61.

decision.[7] Therefore, we held in our SPCO that if the federal member had concurred in the decision, we were precluded from redetermining any impacts associated with that decision.[8] However, we did not agree with the suggestion that Section 15.1(s)1 would foreclose our consideration of whether changes since the CP might result in a need for us to require mitigative measures or might result in impacts significant enough to require us to examine alternative supplemental cooling methods. We concluded that while we could adopt the DRBC's underlying scientific data without independent inquiry, we should make an independent evaluation of the environmental impacts of the SCWS. We believed that this was consistent with

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7/ Section 15.1(s)1 of the Delaware River Basin Compact provides, in part:

> Nothing contained in this Act or in the Compact shall impair or affect the constitutional authority of the United States or any of its powers, rights, functions or jurisdictions under other existing or future legislation in and over the area or waters which are the subject of the Compact including projects of the Commission: provided, that whenever a comprehensive plan, or any part or revision thereof, has been adopted with the concurrence of the member appointed by the President on the United States, the exercise of any powers conferred by law on any officer, agency or instrumentality of the United States with regard to water and related land resources in the Delaware River Basin shall not substantially conflict with any such portion of such comprehensive plan....
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> Pub. L. No. 87-328, 75 Stat. 688 (1961) (emphasis added).

8/ We subsequently received the Affidavit of Gerald M. Hansler, Executive Director of the DRBC, which established that as a result of federal participation we are precluded by Section 15.1(s)1 of the Delaware River Basin Compact from reviewing impacts resulting from DRBC's allocation for the LGS. See, Memorandum and Order (Concerning Objections to June 1, 1982, Special Prehearing Conference Order) July 14, 1982, at 10.

determinations of the Atomic Safety and Licensing Appeal Board in ALAB-262.[9/]

Permits from the U.S. Army Corps of Engineers ("Corps") pursuant to Section 10 of the Rivers and Harbors Act of 1899, 33 U.S.C. § 403, and Section 404 of the Clean Water Act, ("CWA"), 33 U.S.C. § 1344, are required for the construction of portions of the SCWS. We held that we should treat the Corps' findings in the same manner that we treat those of the DRBC.[10/]

We acknowledged that jurisdiction over changed construction impacts rests with the NRC Staff. However, because we were concerned that significant operational impacts not anticipated due to changes in plans and circumstances since the construction permit stage might not be capable of mitigation except through changes in construction, we ordered an early hearing on four contentions to consider whether mitigative measures might be necessary and what form those measures should take. The parties to the hearing were the Applicant, the Staff and Del-Aware. The four Del-Aware contentions as redrafted and admitted are as follows:

> Contention V-14 - The esthetic impacts of the Point Pleasant pumping station, and associated hillside clearance and river-edge rip rap wall will adversely affect the peace and tranquility of the proposed Point Pleasant Historic District.
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> Contentions V-15 and V-16a (in part) - The intake will be relocated such that it will have significant adverse impact on American shad and short-nosed sturgeon. The relocation will adversely affect a major fish resource and boating and recreation area due to draw-down of the pool.

9/ Philadelphia Electric Company, (Limerick Generating Station, Units 1 and 2), ALAB-262, 1 NRC 163 (1975).

10/ SPCO at 12.

Contention V-16a - Noise effects and constant dredging maintenance connected with operations of the intake and its associated pump station will adversely affect the peace and tranquility of the Point Pleasant proposed historic district.

Contention V-16b - Seepage of water and toxics from Bradshaw Reservoir will cause a risk of groundwater contamination and hydraulic saturation.

In our Memorandum and Order Concerning Objections to the June 1, 1982, Special Prehearing Conference Order,[11] which addressed, among other things, the objections filed by the parties to this hearing, we determined that we would not consider Contention V-14, since its primary concern was with construction impacts and not operation. The Staff had objected to the timing of this hearing based on its belief that the Commission's regulations in 10 C.F.R. Part 51 do not contemplate that the Staff will present its position on environmental issues prior to the issuance of its Final Environmental Statement. In our view, our ability to make a meaningful NEPA determination depended on reaching a conclusion prior to the start of construction. We felt an early hearing was necessary because of the Applicant's representation that the Neshaminy Water Resources Authority ("NWRA")[12] planned to begin construction on

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11/ Issued July 14, 1982.

12/ NWRA is the Bucks County water authority with which the Applicant would share the use of the intake and pumping station at Point Pleasant.

December 15, 1982. Accordingly, we issued an Order on July 13, 1982, which among other things, scheduled hearings for October 4-8, 1982, with a view to reaching a decision prior to the scheduled construction commencement date. Hearings were held in Norristown, Pennsylvania, October 4-8, 1982, and continued in Bethesda, Maryland, October 18-26, 1982. During the course of the hearing, the parties reached a stipulation, which we approved, withdrawing Contention V-16b, relating to the environmental impacts of seepage from the Bradshaw Reservoir.[13/] Thus, the only contentions which remained for litigation were Contentions V-15 and V-16a (in part) and Contention V-16a.

III. LEGAL EFFECT OF ACTIONS BY OTHER AGENCIES

In our SPCO, we addressed at length the proceedings which were conducted by the Atomic Energy Commission on Philadelphia Electric's construction permit application and by the DRBC concerning the Point Pleasant Diversion prior to the operating license application. We do not repeat that discussion here. We abide by our earlier determinations with regard to the deference to be given by us to determinations reached in these prior proceedings.

Since our earlier Orders, several other governmental agencies having jurisdiction to consider matters related to the construction of the facilities associated with the intake and pumping station have taken action. We had previously ruled that since the only permit relevant to SCWS construction which is required to be issued prior to the authorization of an operating license is the § 401 certificate under the

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13/ Tr. 2371.

Clean Water Act ("CWA"),[14/] we need not wait for the other agencies to act.[15/] We continue to believe that our consideration of the environmental issues relating to alleged increased operating impacts due to changes since the CP did not need to await the action of other federal and state agencies. We now address the effect which the Commission must give to actions taken by those agencies.

On September 2, 1982, the Pennsylvania Department of Environmental Resources ("PADER") issued permits authorizing Philadelphia Electric Company to construct and operate the Bradshaw Reservoir, a component of the SWCS, and to undertake other construction unrelated to any issue before us. On the same day, PADER issued a § 401 certificate to NWRA. In a letter of that date to Mr. Robert Flowers, Executive Director of the NWRA, Mr. C. T. Beechwood, Regional Water Quality Manager, PADER, stated that Sections 301(b), 302, 306 and 307 of the Clean Water Act are not applicable to this project. By the terms of § 401 of the CWA (33 U.S.C. § 1341), where those sections are not applicable, the preclusive effect provided by CWA Section 511(c), 33 U.S.C. § 1371(c), does not apply to

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14/ 33 U.S.C. § 1341.

15/ Memorandum and Order of July 14, 1982 at 77.

state certifications.16/ Accordingly, the NRC is not precluded from reviewing pursuant to its NEPA responsibilities the requirements of the § 401 certificate issued by PADER for the foregoing activities. Issues raised by Contentions V-15 and V-16a (in part) do reach matters relating to this § 401 certificate. For example, Special Condition B of the § 401 certificate requires the permittee to comply with the terms and conditions of all applicable approvals and permits issued by the U.S Army Corps of Engineers. Similarly, Contention V-16a has the same subject matter as Special Condition AA of the § 401 certificate, which requires that any necessary maintenance dredging be performed between the beginning of November and the end of March of any given year. However, even though we have determined that PADER's issuance of a § 401 certificate has no preclusive effect on our consideration of related water quality issues, the conclusions which we have reached are not inconsistent with the terms and conditions of the § 401 certificate nor with the Special Conditions of that certificate.

16/ Section 401, 33 U.S.C. § 1341, states in pertinent part:

> (a)(1) Any applicant for a Federal license or permit to conduct any activity including, but not limited, to the construction or operation of facilities, which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification from the State in which the discharge originates or will originate, . . . , that any such discharge will comply with the applicable provisions of sections 1311, 1312, 1313, 1316, and 1317 of this title. In the case of any such activity of which there is not an applicable effluent limitation or other limitation under sections 1311(b) and 1312 of this title, and there is not an applicable standard under sections 1316 and 1317 of this title, the State shall so certify, except that any such certification shall not be deemed to satisfy section 1371(c) of this title.

On October 25, 1982, the U.S. Army Corps of Engineers issued permits pursuant to Section 10 of the Rivers and Harbors Act (33 U.S.C § 403) and Section 404 of the Clean Water Act (33 U.S.C. § 1344) authorizing NWRA to construct a water intake structure in the Delaware River and under the Pennsylvania Canal at Point Pleasant. Incorporated in and made a part of the permits were drawings E-1, E-2, and E-3 (1522-15, Delaware River - Neshaminy Water Resources Authority - No. 1), which depict the design and location of the intake structure.

We read Section 511(c) of the CWA to preclude us from reviewing pursuant to our NEPA responsibilities requirements established by the Corps pursuant to its responsibilities under § 404 of the CWA, 33 U.S.C. § 1344.[17/] Thus, to the extent that these drawings set forth requirements, we may not redetermine the location of the intake as represented in E-1 or the design, as shown in E-2 and E-3. However, since the conclusions that we have reached concerning the impacts of the design and location of the intake structure are not inconsistent with the Corps' permits, we need not and do not reach the question of whether we

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17/ CWA Section 511(c)(2)(a), 33 U.S.C. 1371(c)(2)(A), states:

> (2) Nothing in the National Environmental Policy Act of 1969 (83 Stat. 852) shall be deemed to-
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> (A) Authorize any Federal Agency authorized to license or permit the conduct of any activity which may result in the discharge of a pollutant into the navigable waters to review any effluent limitation or other requirement established pursuant to this chapter or the adequacy of any certification under section 1341 of this title.

would have been precluded by § 511(c) from requiring mitigative measures relating to the design and location of the intake structure.

IV. SUMMARY AND RATIONALE OF BOARD DECISION ON CONTENTIONS

A major component of the SCWS is the intake through which water will pass to provide supplemental cooling for the LGS. It is the design, location and operation of the intake which are the pivotal environmental issues with which we are concerned in this decision. The first issue with which we deal is set forth in Contentions V-15 and V-16a (in part).[18/] This issue involves the potential impact on American shad and shortnose sturgeon as a consequence of the relocation and design of the intake structure as well as its effect on fish resources and boating and recreation. The second issue considered is set forth in Contention V-16a[19/] and involves the impacts of operating noise and maintenance activities on the proposed Point Pleasant historic district.

This decision concerns contentions relating to the operation of the SCWS but does not authorize its operation, as the National Environmental Policy Act ("NEPA")[20/] and the Commission's regulations thereunder, 10 C.F.R. Part 51, require that the environmental costs associated with the SCWS be included in the balancing of the costs and benefits of the

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18/ See p. 6 supra.

19/ See p. 7 supra.

20/ 42 U.S.C. § 4321 et. seq.

LGS. The draft environmental statement, which will include that balance, has not yet been completed.

A. Contentions V-15 And V-16a (In Part)

1. Intake

The intake for supplemental cooling water system (SCWS) for the Limerick Generating Station (LGS) will be located approximately 245 feet from the shoreline at a distance of about 800 feet downstream from the mouth of the Tohickon Creek. It was NWRA's[21/] original intention to use vertical traveling screens at a shoreline location. Such screens are widely utilized by power plants, including several along the Delaware River. However, a new passive intake design, which affords greater protection to aquatic life, was developed. NWRA decided to construct an intake using the new passive wedgewire screens and to locate it approximately 200 feet from the shoreline. After discussions with the Pennsylvania Fish Commission and the U.S. Fish and Wildlife Service concerning the most effective placement of the intake, NWRA decided to move the intake an additional 45 feet into the river. It was believed that the increase in river bypass velocity that would be achieved by this move would provide additional protection for aquatic life. (FF 1-4)

The question of the significance of bypass velocity, i.e., the velocity of water flowing past the intake, as a factor in reducing mortality, was thoroughly explored during this hearing. While there is

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21/ NWRA holds the permits for the construction and operation of the intake and pumping station. Philadelphia Electric holds the permits for the Bradshaw Reservoir and associated facilities.

some evidence that a ratio of 2 to 1 between bypass velocity and intake velocity improves the effectiveness of the screens in protecting some life stages of certain species, we have concluded, after reviewing the entire record, that bypass velocity is of minor significance.[22/] Mr. Harmon and Dr. Masnik, the Applicant's and the Staff's witnesses, respectively, testified that while there is some benefit to be derived from a bypass velocity, there is substantial evidence that where bypass/intake velocity ratio is less than 2 to 1 (and even as low as 1 to 1, or, in one instance, in a lake application, 0-1), the screens operate in an effective manner. (FF 29-32)

Messrs. Miller, Kaufmann, McCoy and Emery, Del-Aware's witnesses, exhibited an excellent collective knowledge of the life stages and behavior of American shad. They had, however, only limited knowledge of the operation and characteristics of the wedgewire screen. These witnesses took the position, based solely on their personal opinions, that impingement and entrainment would be reduced if the intake were located in an area of higher bypass velocity; they provided no factual basis for concluding that such a result would follow. None of these

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22/ While there is some conflict in the testimony concerning the determinations of river velocity at various locations near the proposed intake, we have found that the bypass velocity during the periods of greatest concern for the American shad and shortnose sturgeon will be close to the 2-to 1 ratio deemed optimal by some of the witnesses. (FF 35-38)

witnesses had any expertise in hydraulics or river flow.[23/] (Tr. 1741) Both Mr. Kaufmann and Mr. Emery testified that they had not read the available literature dealing with passive wedgewire screens and their ability to reduce entrainment and impingement. (Tr. 1890) Specifically, Mr. Emery testified that none of the intake screens with which he is familiar are similar to the screens selected for the Point Pleasant site. While his familiarity with screens is limited to the shoreline vertical traveling screens (Tr. 2058), based on his limited knowledge, he would expect fewer fish to be impinged by the wedgewire screens. (Tr. 2059) (FF 15)

Mr. Miller, who is an employee of the U.S. Fish and Wildlife Service and knowledgeable concerning the habits and life cycle of the American shad, while not testifying directly with respect to the ratio of bypass velocity to intake velocity, did state that, in his opinion, a velocity past the intake of less than 1 foot per second (fps) would be detrimental to the American shad. (Tr. 3051, 3060) The basis for Mr. Miller's conclusions was that the lower velocities would increase the exposure time that the larval fish would be subject to the intake screens. However, Mr. Miller stated in his prepared testimony that if the intake velocity does not exceed 0.5 fps and the intake is located in the current the number of larval shad impinged would not be significant. (Miller testimony, 5; Miller, Tr. 3185-86) His testimony does not support a conclusion that a bypass velocity of 1 fps or greater is required. Mr. Miller acknowledged that he had no personal knowledge of

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23/ Mr. McCoy stated that a sanitary engineering course he took at South Dakota State University got into hydraulics, but not in detail. (Tr. 3139)

the efficacy of Johnson wedgewire screens except what he has learned from discussions with other employees of the Fish and Wildlife Service. (Tr. 3135) Mr. Miller's experience has been with vertical traveling screens and the studies in which he has participated utilized that type of system. (Tr. 3061-62) However, even with his limited knowledge of wedgewire screens, Mr. Miller was able to conclude that the Johnson screens are better than the vertical traveling screen. Similarly, Mr. McCoy, also an employee of the Fish and Wildlife Service, had never seen, studied or worked with wedgewire screens. (Tr. 3134) It appears that Mr. Miller's and Mr. McCoy's real concern is with the cumulative impact of this intake together with other losses along the river. (McCoy, Tr. 3368-69; Miller, Tr. 3369)

Thus, in considering all of the testimony on the significance of bypass velocity in relation to intake velocity, this Board is unable to conclude that a ratio of 2 to 1 is required. We do, however, acknowledge that during periods when the American shad or the shortnose sturgeon would likely be spawning in the vicinity of Point Pleasant, the bypass intake velocity ratio will be very close to 2to 1ne -- if not greater. (FF 26-32)

We also address an issue which was pursued by Del-Aware concerning whether the intake will be located in the eddy which sometimes forms below the bar downstream of the mouth of the Tohickon Creek. All of the witnesses who addressed the subject of the location of the intake have placed it in the main channel or main current and not in the eddy. (FF 5) As we have found that the intake is located in the main current or main channel, and not in the eddy, it is not necessary for us to

address the impact that the eddy may have on the protective features of the intake.

2. Hydrology

As discussed above, one of the factors that was initially believed to be necessary to make the protective features of the wedgewire screen most effective was a 2 to 1 ratio between bypass velocity and intake velocity. We treat the ratio and its importance in those sections of this opinion discussing the intake design and its impact on the species involved in this proceeding. However, because a question was raised concerning whether there was reasonable assurance that measurements establishing velocity were accurate and measured at the right location, we have reviewed the record and considered the conclusion of Mr. Wescott, the Staff's witness, concerning those measurements. Mr. Wescott's analysis is based on an assumption that the station measurements may have been in error by as much as 25 feet along the cross-section and that the flow of the river is at an angle to the centerline by as much as 30°. Using NWRA's curve for 3,000 cfs, he finds that the downstream velocity at a depth of 7 feet at Station 8+37 (station 8+62-25 ft) is 0.9 fps. Multiplying this number by cosine 30° gives 0.77 fps. This velocity is more than twice the average intake velocity of the screens (0.35 fps). Applying this same assumption to 2500 cfs results in a velocity of 0.64 fps, which is slightly less than twice the average intake velocity at maximum withdrawal. Accordingly, we are assured that even under these low flow conditions, the intake will operate with a bypass velocity which was believed necessary by some

witnesses to assure protection for the species of concern and for fish in general. (FF 35-39)

3. American Shad

Del-Aware alleged in Contention V-15 and 16a (in part) that the relocated intake would have a significant adverse impact on American Shad. This section of the opinion addresses that issue.

There is evidence that suitable habitat for the spawning of American shad exists at Point Pleasant and there have been reports of an expansion of the spawning grounds in the Delaware River toward the site. (FF 42, 67) However, there is no empirical evidence that spawning is in fact taking place at the site. The Applicant and the Staff presented testimony and evidence in response to this contention based on the assumption that spawning occurs in the vicinity of the site and were able to show that, even assuming spawning at the site, the intake would not have a significant detrimental impact on the American shad population in the Delaware River. (FF 39, 82, 86)

The maximum amount of water allocated by the DRBC for withdrawal from the Delaware River is a small percentage of the total amount of water passing the site. Pursuant to DRBC's allocation, NWRA and the Applicant are entitled to withdraw a total volume of up to 95 million gallons per day (mgd) or 147 cubic feet per second (cfs). If the intake were operating at the maximum allowed withdrawal and the river flow was at the lowest level anticipated by the DRBC of 2500 cfs (Hansler, Tr. 1261, 1273), the amount of water flowing into the intake would be approximately 5.9 percent of the total flow. Over the past 20 years, the return frequency of flows of 3000 cfs or less for the

months when shad spawn is less than 1 percent. (FF 80) Entrainment of 5.9 percent of the organisms in the water column would not have a significant impact on the American shad population. (FF 29, 80)

The design and location of the intake plus the biological characteristics and behavioral response of the American shad are factors which will reduce the losses expected from the volumetric calculation. (FF 16, 17, 79) The wedgewire screen, as discussed above, has been proved to provide protection for aquatic life which comes within its area of influence. Further, the size of shad eggs and their demersal characteristics would tend to protect them from entrainment through screens with slots 2 mm in width located two feet off the bottom. (FF 9, 10, 49-54, 57) The behavioral characteristics of American shad larvae have not been studied, but studies of larvae of a congeneric species suggest that American shad larvae small enough to be entrained would avoid the intake. (FF 58-63, 66, 71) All of the biological witnesses agreed that the intake would provide optimal, if not complete, protection to the later life stages of American shad. (FF 74, 90, 91)

One witness, Mr. Emery, believed that the intake might present a hazard to juvenile American shad and, in fact, could cause mortality due to descaling resulting from brushing against the screens. (Tr. 2115) However, we are unable, based on this testimony, to reach the conclusion that such an event is likely to occur. We can find no basis for concluding that the intake would differ significantly from other objects in the river that may be brushed against, including bridge abutments, rocks and other passive obstacles.

We also heard a great deal of testimony, some of which was conflicting, concerning the impact of bypass velocity as a factor of protection for the American shad. The witnesses expressed general agreement that there would be a reduction in entrainment and impingement with increases in bypass velocity up to a certain point which was not clearly identified. We would expect, therefore, that any bypass velocity would result in a measurable reduction in mortality, although we have concluded that this is an additional factor that further reduces the potential impact of an already acceptable intake. (FF 54, 74, 79)

Our examination of the record dealing with the impact of the relocated intake[22/] leads us to conclude that even if spawning were to occur in the vicinity of Point Pleasant the losses due to impingement and entrainment would not have a significant adverse impact on the American shad population in the Delaware River.

4. Shortnose Sturgeon

Del-Aware alleges that entrainment and impingement losses due to operation of the intake at Point Pleasant will adversely affect the shortnose sturgeon population in the Delaware River.

The shortnose sturgeon is listed as an endangered species and is protected by the provisions of the Endangered Species Act, 16 U.S.C. § 1531 et seq. However, no evidence was presented which indicates that shortnose sturgeon inhabit or spawn in the vicinity of Point Pleasant, although suitable habitat for spawning may be present. (FF 96-98, 100)

22/ There was general agreement that the potential for harm to American shad would be greater if the intake were a vertical traveling screen located on the shoreline. (FF 2-4, 11, 15)

The aralysis of the impact of the intake on this species was performed on the basis that shortnose sturgeon are present at the site. We heard extensive testimony on the physical and behavioral characteristics of shortnose sturgeon eggs and larvae and considered this information in connection with our review of the location and design of the intake. (FF 101-103, 105-107)

All of the witnesses who addressed the subject agree that due to the physical and behavioral characteristics of eggs and larvae, it is highly unlikely that they would be entrained. The spawning habits of shortnose sturgeon, the adhesiveness, density and size of the eggs and the size and intense bottom orientation of the larvae for the first 40 days of their lives preclude the likelihood of any contact of these life stages with the proposed intake. (FF 104, 108-110, 112) Larvae more than 40 days old are too large to be entrained and are strong enough swimmers to avoid impingement. We are convinced by all the evidence addressing the subject that healthy shortnose sturgeon adults will not be affected by the intake. (FF 110, 111)

Mr. Kaufmann testified for Del-Aware that the loss of a single specimen of an endangered species is significant. (Tr. 1991-92) The underlying concern of the Endangered Species Act (16 U.S.C. 1531 et seq) is for the protection of the species not the preservation of individual organisms. This concern for the species has been expressed by the National Marine Fisheries Service ("NMFS"), which has the responsibility under the Act for assuring the protection of shortnose sturgeon, in its "no jeopardy" letter and supporting Biological Opinion on shortnose

sturgeon. NMFS acknowledged that the potential loss of some individuals would not jeopardize the continued existence of the species. (FF 93-95)

We consider the opinion of NMFS to correctly represent the potential impacts of the SCWS on the shortnose sturgeon and we conclude that the proposed intake will not detrimentally impact the shortnose sturgeon in the Delaware River.

5. Recreation

The second sentence of Contentions V-15 and V-16a (in part) states:

> The relocation [of the intake] will adversely affect a major fish resource and boating and recreation area due to drawdown of the pool.

We initially thought this sentence referred to the adverse effects of drawdown on recreational fishing and on other recreational uses of the river. As testimony developed it became clear that the concern was not with drawdown, which was conceded to be less than an inch and, therefore, undetectable. Rather, the primary concern was with the location of the intake in the river and the effect it might have on the upstream migration path of adult shad by diverting them from the Pennsylvania side of the river, thereby reducing the access of Pennsylvania anglers. We found this testimony to be speculative and found no basis for concluding that fish would establish an avoidance pattern that would necessarily prejudice Pennsylvania anglers. (FF 113-116, 121-134, 126-132)

As a part of its allegation of recreational impacts, Del-Aware alleged that the intake structure would cause injury to persons rafting past the site and diving from rafts who might encounter fish hooks and

lures caught in the intake screens. Little evidence was presented to support this allegation and we found this testimony speculative. First of all, the intake screen is located approximately 245 feet from the shoreline and 2 feet off the bottom; the testimony reflects that shoreline fishermen cast their lines approximately 150 feet. (FF 133-138) It is therefore unlikely that hooks and lures cast from the shoreline will reach the intake. Secondly, wading fishermen attempting to catch American shad bounce their lures along the bottom and may lose their hooks in the rocks and rubble along the bottom as well as in the intake. Del-Aware did not introduce any evidence that would lead us to conclude that the hooks embedded in the intake would create any greater hazard to rafters and persons floating in innertubes than hooks caught on other objects along the bottom of the river.

We are, thus, unable to conclude that the intake would substantially increase risks to rafters and "tubers" in the vicinity of the intake, or that it would have any effect on recreational fishing.

B. Contention V-16a

Del-Aware contended that noise effects from the operation of the pumping station and from dredging maintenance of the intake would adversely affect the peace and tranquility of the proposed Point Pleasant historic district. The Staff presented evidence concerning the applicability of noise standards to districts designated as historic under the National Historic Preservation Act of 1966, 16 U.S.C. § 470. (FF 1-4; Tr. 139-142) Del-Aware presented evidence on the character of the district. In addition, the Board toured the site following the

hearings held in Norristown, Pennsylvania, and was thus able to relate the expert testimony to its own observations of the area.

1. Noise

In order to determine the potential impact of the operation of the pumping station on the peace and tranquility of Point Pleasant, a study was conducted in 1981 for NWRA to provide a basis for comparing the calculated noise from the pump motors with ambient levels at the site boundary. As a result of the comparison, it was concluded that noise from the pump motors within the pumphouse would not significantly increase the ambient level as measured at the site boundary. (FF 143-144) There was general agreement between the Applicant's expert witness, Mr. Moiseev, and the Staff's expert witness, Dr. Policastro, that the walls of the pumphouse structure would attenuate the noise of the pump motors so that there would be a very low level of noise outside the building. (FF 149-153)

Although some question was raised at the hearing concerning whether the plans for the pump station required doors meeting sound specifications and sound attenuators on air vents to the outside, there is no record evidence which would permit us to reach a conclusion regarding whether the plans include those sound-baffling measures. We cannot require that those measures be undertaken. We are assured that the Staff will factor the final design of the doors and vents into its Draft Environmental Statement. (FF 164)

Two quieted transformers will be installed along an outside wall of the pumphouse facing in the direction of the canal. At the time of the hearing, it had not yet been determined which of several models

would be selected. Even though these transformers are rated at 57 dB, the different models may vary in tone. Consequently it is not now known whether the noise from the transformers, which will be approximately 36 to 38 dBA at the site boundary, will be audible. (FF 153-159)

We do not know at this time the total environmental cost associated with the operation of the LGS. Therefore, we cannot say how the cost associated with any noise emanating from the pumphouse will affect the ultimate cost/benefit balance. We cannot therefore require that measures be taken to assure that tones emanating from the transformers not be audible at the site boundary. We do, however, suggest that, since the pump station has not yet been constructed, it would be prudent to plan construction to assure that noise from the operation of the station not be heard offsite. We think that the procedure described as follows will be adequate to assure that transformer tones are inaudible:

> Within a period of one month of installation of the transformers, the Applicant should carry out the following noise measurements and calculations. Measurements should be made between 12:00 a.m. and 4:00 a.m. at the site boundary at a point on the straight line between the transformers and Residence Number 4 (as shown on Policastro Exhibit 1). At that location:
>
> A. Measurements of the octave band sound pressure levels should be made. From those measurements, the masking level should be computed for transformer core tones at 120, 240, 360 and 480 Hz frequencies.
>
> B. Measurement at the 1/3 octave bands should be made for those four bands that contain the tones.
>
> The measurements should be obtained by observing the points of the sound level meter (set on fast response) by reading the lowest level which is repeated several times (mean minimum).

The results of these measurements and computations should be reported to the Staff.

If any of the four transformer tones is found to be audible,[23/] a barrier should be constructed sufficient to make that tone (those tones) inaudible. If such a barrier is found to be necessary, the study as described in the first paragraph should be repeated and the results reported to the Staff. In the event that modification of the barrier is necessary to assure inaudibility of tones, that construction should be undertaken.

We believe that the methodology detailed above will assure that tones from the transformers are inaudible at the site boundary.

2. Maintenance

Del-Aware alleged in Contention V-16a that constant dredging maintenance would adversely affect the peace and tranquility of Point Pleasant. The only testimony offered by Del-Aware on this aspect of the contention was that of Mr. McNutt, who testified that ice in the river might damage the intake. (Tr.) Del-Aware was not able to show that the repair of damage to the intake structure would involve dredging. The Applicant's witnesses provided testimony concerning the planned maintenance of the intake.

The intake will use an air backflush system for cleaning the screens of leaves and other material which might tend to clog the intake. It is anticipated that leaves will be the primary cause of any clogging and this problem will appear for a short period in the autumn. During the winter, if frazil ice, i.e., ice forming in water at various depths at 32° F., collects on the screens, the air backflush system can also be

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23/ Any core tone will be audible if the measured sound pressure level and the 1/3 octave band containing the core tone from B is greater than the masking level computed from A for that tone.

used to clear it. (FF 181-182) Any necessary repairs to the screens would be performed by divers from boats, and the steel framework, if damaged, would be repaired by underwater welding. (FF 172-173)

It is not anticipated that any of the maintenance comtemplated would result in obtrusive noise. Further, if dredging were ever required, it would be done as required by a U.S. Army Corps of Engineers' special condition between the beginning of November and the end of March, a time when heavy utilization of the proposed historic district by visitors would not be expected.

Finally, we think it unlikely that the intake would tend to collect debris, considering the presence of three 12-inch diameter steel posts at the head of the intake and the fact that ice floes would occur only at high river elevation during which the intake would be overtopped by many feet of water. (FF 165-167; FF 170-171)

We have concluded that there is no basis for Del-Aware's concern that dredging maintenance would tend to disrupt the quiet life style of the village.

V. FINDINGS OF FACT

A. Contentions V-15 and V-16a (In Part)

1. The Intake

1. The intake will be located in the Delaware River at river mile 157.2, approximately 245 feet from the Pennsylvania shoreline and approximately 800 feet from the mouth of the Tohickon Creek in about 10 feet of water. (Masnik testimony, 4; Applicant's testimony, 3)

2. It was formerly planned that the intake would be a shoreline vertical traveling screen. (Applicant's testimony, 2-3; Applicant Exhibit 2 at 1)

3. To reduce its biological impact the intake was initially moved to a location approximately 200 feet from the shoreline. (Applicant's testimony 2-3; Harmon, Tr. 2406-07; Applicant's Exhibit 2 at 1; Del-Aware Exhibit 1-C)

4. It was decided to move the intake 45 feet further out in the river in order to achieve a higher river flow velocity past the intake. (Applicant's testimony at 3; Bourquard, Tr. 2586, 2661; Brundage Tr. 3002; Applicant's Exhibit 2 at 2; Del-Aware Exhibit 9, Table 3)

5. The intake will be located in the main channel or main current and will not be in any eddy that may exist at Point Pleasant. (Plevyak, Tr. 1940; Bourquard, Tr. 1405, 2574; Harmon, Tr. 2573; Brundage, Tr. 2973; Phillipppe, Tr. 3756; Wescott, Tr. 3965).

6. If the intake were located in an eddy area, while the potential loss of eggs and larvae located in the eddy would be increased, the number of eggs entrained would not be different from the losses calculated from a simple volumetric ratio because: (1) a constant volume of water is withdrawn regardless of the location of the eddy, and (2) eggs do not actively seek out the eddy and there would be no higher concentration of eggs in the eddy. (Masnik testimony, 19)

7. Moving the intake to 245 feet from the shoreline was biologically efficacious and the benefit of moving the intake beyond 245 feet would be negligible. (Brundage, Tr. 2955-56, 2959)

8. The intake will be located in the river with its long axis oriented parallel to the flow of the river with a clear space of 7 feet between the two parallel rows. (Applicant's testimony, 4; Masnik testimony, 4)

9. At anticipated river flows, the top of the intake will be at least 4 feet below the river surface. (Applicant's testimony, 4; Masnik testimony, 4; Applicant's Exhibit 2, at 5)

10. The bottom of the intake screen will be slightly more than 2 feet above the existing river bed. (Applicant's testimony, 4; Masnik testimony, 4)

11. When the intake was moved 200 feet from the shoreline the design was changed to a passive wedgewire screen. (Applicant's Testimony 2-3; Harmon, Tr. 2406-07, Applicant's Exhibit 2 at 1; Del-Aware Exhibit 1-c)

12. The wedgewire screen array which will be utilized consists of two parallel rows of six 40-inch diameter by 10 feet 4 inch cylindrical screen sections which when placed end-to-end will be approximately 75 feet long. The leading and trailing screens (reference to river flow) will be protected by conical end pieces. (Applicant's testimony, 3; Masnik testimony, 4; Applicant's Exhibit 2, at 1) testimony, 4).

13. The screen openings will be 2 mm in width. (Applicant's testimony, 4; Masnik testimony, 5; Applicant's Exhibit 2 at 1)

14. The point of the wedgewire will face inward and the exterior screen surface will be smooth and flat. (Applicant's testimony, 4)

15. The wedgewire screen design to be used as a feature of the intake at the Point Pleasant site will provide more protection than the shoreline vertical traveling screen that was originally planned for the site. (Applicant's testimony, 3; Emery, Tr. 2058-59, 2071; Brundage, Tr. 2996-97; Miller, Tr. 3157; Brundage, Tr. 2996-97; Applicant's Exhibit 2 at 1)

16. The proposed intake design using the Johnson wedgewire screens is recognized as state-of-the-art technology and the best that could be used to minimize adverse biological effects. (Applicant's testimony, 12; Bourquard, Tr. 2429).

17. Each screen section will resemble a "T" or a "Y" with screening at each end and the combination support/outlet pipe in the middle. (Applicant's testimony, 4)

18. A stainless steel wire with a wedge shaped profile will be wound around a cylindrical frame creating a 360° clearance around all screens. (Applicant's testimony, 4; Masnik testimony, 4)

19. The screen is designed so that water will flow into the screens over their entire surface with a nearly uniform through-slot velocity. (Applicant's testimony, 4; Masnik testimony, 5)

20. The intake will be designed with an air backwashing system to clean the screens. (Applicant's testimony, 4; Bourquard, Tr. 2429)

21. The DRBC allocation of water from the Delaware for NWRA and LGS use has been established with a capacity limit of 95 million gallons per day (mgd) or 147 cfs. (Masnik testimony, 5)

22. At a maximum withdrawal rate (95 mgd or 147 cfs) the maximum intake velocity through the slot openings is 0.5 fps, with an

average velocity of 0.35 fps. (Applicant's testimony, 5; Masnik testimony 5; Applicant's Exhibit 2 at 1)

23. The low through-slot velocity relative to bypass velocity and the cylindrical design which allows water to be drawn in from all sides results in a rapid decrease in approach velocity as distance from the screen increases. (Masnik testimony 5)

24. The intake velocity is calculated to decrease from approximately 0.071 fps at a distance of one foot from the screen surface to 0.011 fps at five feet from the screen surface and to 0.0037 fps at 10 feet from the screen surface. (Applicant's testimony, 5; Masnik testimony, 5; Harmon, Tr. 2854-56; Dickinson, Tr. 2854-55)

25. At river flows of 3,000 cfs, a maximum of 4.9% of the flow will be withdrawn by the intake. At river flows of 2500 cfs, 5.9% of the flow will be withdrawn. (Masnik testimony, 15; Emery, Tr. 2063-64; Harmon, Tr. 2398; Masnik, Tr. 3557)

26. At a river flow of 3,000 cfs, the anticipated bypass velocity at the depth of the intake will be 1 fps. (Applicant's testimony, 5; Harmon, Tr. 2399; Bourquard, Tr. 2661-68; Applicant's Exhibit 1-A at 2-Question E240.27)

27. A river flow exceeding 3000 cfs will occur about 90% of the time. (Applicant's testimony, 5)

28. The 360 degree clearance around all screens will permit the unrestricted flow of water into the screens throughout their entire circumference and the flow of the river will pass along the screen helping to keep screens clear of debris and of silt. (Applicant's testimony, 4; Masnik testimony, 5; Emery, Tr. 1770)

29. The ratio of the bypass velocity to the intake velocity is one of the factors providing protection from entrainment and impingement for protection of aquatic life. (Harmon, Tr. 2519; Brundage, Tr. 2939, 2944, 2957; McCoy, Tr. 3302; Miller, Tr. 3311)

30. With a ratio of 1 to 1, a high level of protection has been afforded aquatic life though use of the wedgewire screen. (Harmon, Tr. 2357-59, 2394-96, 2826-27, 2851; Masnik, Tr. 4025)

31. Even when used in areas where there is no bypass velocity, wedgewire screens have been shown to provide substantial protection from impingement and entrainment. (Boyer, Tr. 1363; Harmon, Tr. 2582, Brundage, Tr. 2978, Masnik Tr. 3585-87)

32. When river velocity past the intake is 0.5 fps there is a 20 percent to 80 percent increase in protection over what would have been expected without the wedgewire screen. (Harmon, Tr. 2397-98, 2563)

33. The proposed orientation of the intake places the screens parallel to the river flow and the slots perpendicular. There were witnesses who believed that this is the most effective design for the protection of the aquatic life. (McCoy 3306; Brundage 2934, 2943, 2970)

34. Whether the screens are located in such a way that the river flow will pass perpendicular or parallel to the screen is of relatively minor importance as far as the screen's ability to provide protection to aquatic life goes. (Harmon, Tr. 2807, 2814; Brundage, Tr. 3001; Masnik, Tr. 3589, 3986) Virtually all fishes will be protected from impingement on this type of intake. (Harmon, Tr. 2396)

2. Hydrology

35. Velocity measurements made by the Applicant showing the velocity distributed across the river at the centerline of the intake at a flow of approximately 3,000 cfs can be considered reasonably accurate because bathymetry, the flow at Trenton and bottom roughness are consistent with those measurements. (Wescott, Tr. 3594-3600)

36. The cross-checks made by the Staff are reasonable. However, the velocity stationing could be in error by as much as 25 feet without being apparent in the checks. (Phillippe, Tr. 3833, 3837; Wescott, Tr. 3931-32)

37. The calculated bypass velocity along the centerline of the screen at a flow of 3000 cfs should be multiplied by the cosine of 30° (.86) to account for expansion downstream of the Tohickon Creek bar (Wescott, Tr. 3611)

38. Velocity measurements taken at low flows such as 3,000 cfs may be used to estimate velocities which may occur at very low flows such as 2500 cfs. Provided that there is no significant difference in water level the velocity distribution should be nearly identical, that is, the ratio of screen bypass velocity to average cross section velocity at 2500 cfs is the same as it is at 3,000 cfs (Wescott, Tr. 3609-3610)

3. American Shad

39. There is no evidence that shad spawn at Point Pleasant (rm 157). (Masnik testimony 12; Kaufmann, Tr. 1961; Harmon, Tr. 2404; Masnik, Tr. 3554; Harmon testimony, 7-8)

40. Point Pleasant was not the historical principal spawning grounds. (Masnik, Tr. 3554; Harmon, Tr. 2404)

41. Many hundreds of shad spawning grounds are located upstream of Point Pleasant. (Kaufmann, Tr. 1943-4)

42. Based on the availability of habitat at the site such as shallow flats with slight to moderate current and riffles and the anticipated improvement in water quality in the lower river, spawning at the site may occur in the future. (Masnik testimony, 12; Kaufmann testimony, 9; Kaufmann, Tr. 1901-05; Miller testimony, 3; Harmon testimony, 7-8)

43. The spawning location of American shad is determined by gonadal development which is thought to be temperature dependent. (Masnik, Tr. 3572-3; Miller testimony, 3)

44. Shad spawn in the Delaware River from mid-April through June with the peak in May in the reach between the Delaware Water Gap (rm 212) and Port Jervis (rm 252). (Masnik testimony 11, Tr. 3558; Harmon, Tr. 2420-2368; Kaufmann testimony, 6; Miller testimony, 3; Harmon testimony, 7)

45. Spawning in the lower river is not well documented. (Masnik, Tr. 3558)

46. Based on the earlier arrival of smaller sizes of juvenile shad caught at Byram near Point Pleasant, it is felt that some spawning may occur somewhere between Easton (rm 180) and Lambertville (rm 148). (Emery, Tr. 2002-4; Miller testimony, 3-4; Kaufmann, Tr. 1942-43)

47. The pool formed by the Lumberville Wing Dam is a nursery area for American shad. (Harmon testimony, 8)

48. Shad generally spawn in water depths of 2 to 6 feet. (Kaufmann, Tr. 1944)

49. Spawning culminates with the broadcasting of eggs throughout the water column. (Masnik testimony, 12)

50. After fertilization, water-hardened eggs are spherical and are 2.1-3.9 mm in diameter with a mean of 2.83 mm. (Masnik testimony, 12; Harmon testimony, 8)

51. Eggs are initially adhesive, adhering to suitable substrate, and later become non-adhesive, demersal, and tend to sink to the bottom within 5 to 35 meters from the point of spawning. (Masnik testimony, 12; Emery, Tr. 1761)

52. Shad eggs sink rapidly even in moderate current, and are swept under rocks and rubble (Masnik testimony, 16). Eggs would have little opportunity to interact with the intake even if spawned immediately upstream of the intake. (Harmon testimony, 8)

53. Only eggs spawned immediately upstream of Tohickon Creek which are carried past the intake would be vulnerable to entrainment or impingement. (Kaufmann, Tr. 1961)

54. Eggs which remain suspended in the water column have a low survival probability and entrainment of these eggs would not affect the shad population. (Masnik, Tr. 4006-07)

55. The incubation period for shad eggs is 2 to 17 days depending on the water temperature. (Masnik testimony, 12)

56. Shad eggs and larvae small enough to pass through the 2 mm slots could be entrained and ultimately lost from the Delaware fishery. (Masnik testimony, 14)

57. Factors influencing the number of eggs and larvae entrained include the withdrawal rate of the intake, the size of the eggs

and larvae relative to the 2 mm slots, the behavior of the larvae, and the flow regime in the vicinity of the intake. (Masnik testimony 14; Brundage Tr. 2941)

58. Newly hatched larvae are 5.7-10.0 mm total lengths (TL). (Masnik testimony, 13)

59. The larval size range is 9.0 to 27.0 mm TL with the larval phase lasting 21 to 28 days. (Masnik testimony, 13)

60. Larval shad would probably be susceptible to entrainment from the time of hatching until they attain 20 mm TL or for approximately 17 days after hatching. (Masnik testimony, 17; Miller testimony, 4)

61. The larval shad population in the vicinity of Point Pleasant, if it does exist, is very low. (Masnik, Tr. 3554)

62. Larval fish or eggs passing within two inches of the intake would be most susceptible to entrainment or impingement. (Kaufmann, Tr. 1887)

63. At distances greater than 1 foot from the intake, larvae would not be drawn toward the screen. (Harmon, Tr. 2855)

64. The cross sectional area of influence of the intake is minimal in comparison to the cross sectional area of the river in the vicinity of the intake. (Kaufmann, Tr. 1887)

65. Larval shad are to some extent at the mercy of the flow of the river; however, it is unlikely that they would be transported downstream at the same speed as the water. (Masnik, Tr. 3555-3556)

66. Eighteen day old shad (approximately 20mm TL) collect in groups, demonstrate a strong swimming ability, and begin to school, moving through the water column but generally staying in the same

location for at least another month. (Emery, Tr. 2110, Harmon, testimony, 9)

67. Shad are expanding their spawning range. (Miller testimony, 3; Masnik, Tr. 3577, 4013-15; Kaufmann, Tr. 1901-05; Kaufmann testimony, 9; Masnik testimony, 12)

68. The transformation from larval to juvenile phase occurs above 19.1 mm TL, generally between 25-28 mm TL. (Masnik testimony, 13; Harmon testimony, 9)

69. Entrainment would be limited to pre-juvenile shad. (Harmon, Tr. 2396; Harmon testimony, 9)

70. Based on an intake velocity of 0.5 fps and the location of the intake in the river current, there will be little impingement of shad larvae above 25 mm and the numbers of impinged shad will not be significant. (Miller testimony, 4-5; Emery Tr. 2066)

71. Juveniles move downriver in late summer and fall as the water temperature approaches 65°F with the population near Point Pleasant peaking in late September for 1980 and early September for 1981. (Masnik testimony, 13; Harmon, Tr. 2416; Kaufmann, Tr. 1950; Emery, Tr. 2112)

72. Juvenile shad moving downstream as the water temperature drops range in size from 55mm to 132mm (2 to 4 months old). (Emery, Tr. 2114)

73. Potential exists for descaling of juvenile shad between 24-40 mm which brush against the intake. (Emery, Tr. 1964, 2066; Harmon, Tr. 2416)

74. Given a maximum intake velocity of 0.5 fps and a current of 1.0 fps past the intake there would be little potential for impingement or injury of juveniles over 40 mm (approximately 6-8 weeks old). (Emery, Tr. 2067)

75. Although no data are available for shad, larvae of other members of the genus Alosa have shown a resistence to entrainment and impingement by wedgewire screens, when based on size alone, they might otherwise have been entrained. (Harmon testimony, 9)

76. Assuming the maximum withdrawal rate of the Point Pleasant Pumping Station is 95 mgd, the intake would remove 5.9 precent of the flow at 2500 cfs; 4.9 percent at 3000 cfs; less than 3.3 percent of the minimum mean monthly flow, and less than 2 percent of the mean monthly flow. (Masnik, Tr. 3557)

77. Removal of 147 cfs at 3,000 cfs would represent 4.9 percent of the river flow and a proportionate percentage of shad eggs and larvae drifting past the intake site. (Masnik testimony, 15; Emery, Tr. 2063-65)

78. The flow at the Trenton gage would have to drop to less than 2,100 cfs before a percentage greater than 4.9 percent of the flow would be removed under the reduced pumping scheme (i.e., NWRA withdrawal plus flow augmentation to the East Branch of Perkiomen Creek). (Masnik testimony, 15)

79. Estimates of losses based exclusively upon the amount of water withdrawn, assuming an even distribution of organisms in the water column, will be reduced by physical exclusion, behavioral exclusion and

bypass current factors. (Masnik, Tr. 1721; Brundage, Tr. 2941; Harmon, Tr. 2416-2426; Harmon testimony, 9; Emery, Tr. 2064)

80. Over the past 20 years the return frequency of flows of 3000 cfs or less for the months of April, May and June is less than 1 percent. (Brundage, Tr. 3003; Masnik Tr. 3558)

81. A loss of 5 percent to as much as 40 percent of the shad eggs and larvae population in the river would be difficult to detect (Emery, Tr. 2064; Masnik, Tr. 3551), and even a 50 percent reduction might not be detected. (Masnik, Tr. 4035)

82. A loss of 5 percent of shad eggs and larvae at the Point Pleasant intake would not have any significant impact (Masnik, Tr. 3993)

83. Shad larvae losses less than 5 to 10 percent of the total larval population in the Delaware River on a consistent basis would not be a significant biological concern. (Masnik, Tr. 3552-54)

84. A loss of 5,000 shad larvae in the Point Pleasant area would not cause any detectable change in the shad population in the Delaware River and would not constitute a significant loss. (Masnik, Tr. 3575-76)

85. The loss of a year crop of shad from a particular portion of the river would not present a problem because shad, unlike salmon, do not return to the same location each year to spawn.
(Masnik, Tr. 3577-78)

86. The impact of the Point Pleasant intake on shad in the Delaware River would probably not be measurable over a ten year period. (Kaufmann, Tr. 1952)

87. Adult shad tend to seek areas of higher water velocity in the Delaware; hence shad are routed to fishways by channeling flow to increase velocity. (Kaufmann, Tr. 1854-55)

88. In reference to the migration path of adult shad in the Delaware River and based on fishing experience, adult shad travel within a foot of the bottom and would not be affected by the intake structure. (Harmon testimony, 8; Kaufmann, Tr. 1862)

89. Adult shad are not likely to swim under the intake structure because they avoid dark areas and overhead structures. (Kaufmann, Tr. 1883-84)

90. Although increased velocity serves as an attractant to adult shad, an intake velocity of 0.5 fps will not impinge adult shad. (Kaufmann, Tr. 1855; Harmon testimony, 8)

91. Adult shad are very strong swimmers (mean speed 2 fps) and they could avoid the positive pull of the intake. Only sick or dying adults would ever be impinged. (Kaufmann and Emery, Tr. 1882-83; Masnik testimony, 22-23)

92. Juveniles of a species are more biologically important to the population than larvae, and it is more important to reduce impingement than entrainment. (Masnik, Tr. 3993-94)

4. Shortnose Sturgeon

93. The shortnose sturgeon is on the list of endangered species maintained by the Secretary of the Interior pursuant to the Endangered Species Act. 16 U.S.C. 1531 et seq.

94. The National Marine Fisheries Service (NMFS) which has statutory jurisdiction to implement the Endangered Species Act, possesses

the best available scientific and commercial data and the necessary expertise with respect to the shortnose sturgeon. NMFS has no information which would indicate that shortnose sturgeon are present at Point Pleasant. (Kaufmann, Tr. 1867; Masnik testimony, 6; Harmon, Tr. 2681; Brundage, Tr. 2928, 2990; Emery, Tr. 1797; Harmon testimony, 12)

95. On July 19, 1982, NMFS issued its Biological Opinion pursuant to Section 7(b) of the Endangered Species Act, 16 U.S.C. 1536, concerning the impacts of the Point Pleasant Diversion. NMFS concluded that, based on the best available data, the proposed state-of-the-art design of the water intake structure, and the projected schedule of withdrawals, the construction and operation of the Point Pleasant Pumping Station is not likely to jeopardize the continued existence of shortnose sturgeon in the Delaware River. (Masnik testimny, 6; Masnik testimony Attachment 4)

96. There is evidence that a very healthy population of shortnose sturgeon exists in the Delaware River between Trenton (rm 138) and Newbold Island (rm 124). (Emery, Tr. 1991; Brundage, Tr. 2979-2981) but no shortnose sturgeon have been recorded at or upstream of Point Pleasant.

97. Habitat suitable for shortnose sturgeon spawning may be present at Point Pleasant. (Masnik testimony, 7)

98. The most upstream recorded takings of shortnose sturgeon (2 in 1975 and 11 in 1981) were at Lambertville, New Jersey (rm 148), 14 river miles above Trenton and 8 miles downstream from Point Pleasant. (Masnik testimony, 7; Emery, Tr. 1797; Harmon testimony, 10)

99. Habitat and substrate considerations indicate that spawning may occur at Scudder Falls (rm 137). (Masnik testimony, 7; Harmon testimony, 10)

100. Spawning locations are inferred primarily from examination of adult fish and determination that these fish are in fact running ripe or very near to spawning condition. (Brundage, Tr. 2947)

101. Shortnose sturgeon eggs are demersal and adhesive and are usually spawned near the bottom over rubble, cobble or gravel substrates. (Masnik testimony, 7; Emery, Tr. 1798, 1814; Harmon testimony, 10-11)

102. Due to negative bouyancy, shortnose sturgeon eggs sink rapidly and would not be transported through the water column more than 20 meters from the point of spawning. (Masnik testimony, 7; Brundage, Tr. 2969-70; Emery, Tr. 1798-99)

103. Water hardened eggs are 3.0-3.2mm in diameter and would probably not be susceptible to entrainment though the 2mm slots of the wedgewire screen but would roll along the surface of the screen. (Masnik testimony, 7; Brundage Tr. 1800, 3028)

104. Given the lack of observed spawning of shortnose sturgeon in the vicinity of Point Pleasant, the spawning habits of the species, the demersal, adhesive, density and size characteristics of shortnose sturgeon eggs and the intake design, it is highly unlikely that shortnose sturgeon eggs will be entrained. (Masnik testimony, 7; Brundage, Tr. 2969-70)

105. From the time of hatching to 16 days of age (18mm TL) the larvae are exclusively bottom oriented and occupy the interstitial spaces in the substrate for up to 43 days of age. (Masnik testimony, 7-8;

Masnik, Tr. 3594; Kaufmann, Tr. 1869; Harmon, Tr 2515-17; Brundage, Tr. 2945; Harmon testimony, 11)

106. Experts have attempted to collect these larvae using the best techniques available and they have not met with much success. (Masnik, Tr. 3990-91)

107. The intense bottom orientation of shortnose sturgeon larvae is supported by the repeated failure to capture larvae in the Connecticut, Hudson and St. John's Rivers in surveys designed to determine the presence of shortnose sturgeon. (Masnik, Tr. 3593-94, 3990-91; Brundage, Tr. 2947)

108. Given their strong bottom orientation, there is little likelihood that shortnose sturgeon larvae would encounter the intake screens located 2 feet off the bottom. (Harmon, Tr. 2513; Masnik testimony, 8; Harmon testimony, 11, 12)

109. There is some evidence that newly hatched shortnose sturgeon larvae less than 20.5 mm TL (18.5 days old) may be susceptible to entrainment. (Masnik testimony, 7). However, entrainment of any shortnose sturgeon larvae is not likely. (Emery, Tr. 1870; Brundage, Tr. 2972)

110. By the time shortnose sturgeon larvae lose their strong benthic orientation (40-45 days), they are too large to be entrained and the likelihood of any impingement is so remote that it is difficult to quantify. (Harmon, Tr. 2517; Harmon testimony, 11-12; Masnik testimony, 8; Brundage, Tr. 2943; Emery, Tr. 1870, 1989-90)

111. Healthy shortnose sturgeon adults would not be impinged on the intake. (Emery, Tr. 1871-3; Masnik testimony, 9; Harmon testimony, 11-12, Brundage, Tr. 2960)

112. There will be no significant loss of shortnose sturgeon eggs, larvae, or adults due to operation of the intake. (Emery, Tr. 1989-90; Harmon testimony, 11-12; Brundage, Tr. 2972) The probability of impingement of shortnose sturgeon on the intake screen is extremely remote. (Brundage, Tr. 2960; Masnik testimony, 6-9; Masnik, Tr. 3981)

5. Recreation

113. Neither Del-Aware's witnesses nor the Pennsylvania Fish Commission has conducted any studies on the recreational shad fishery in the middle reach of the Delaware River. (Kaufmann, Tr. 1847)

114. The Pennsylvania Fish Commission presently is enumerating fishing access points on the Pennsylvania side of the Delaware River. (Kaufmann, Tr. 1847-48)

115. Point Pleasant is identified as one of a number of good locations for shore fishing for American shad. (Kaufmann, Tr. 1848-49)

116. The flow from the Tohickon Creek creates a "bar" which extends out into the river providing access from shore for wading fishermen. (Miller testimony, 4; Kaufmann, Tr. 1858; Plevyak, Tr. 1948; Emery, Tr. 1948), by shad fishermen during the spring and other fishermen during the summer and fall. (Miller testimony, 4)

117. There are more anglers fishing from boats than there are shore fishermen along the river despite the limited number of boating access areas on the Pennsylvania shore. (Kaufmann, Tr. 1787)

118. The number of shore fishermen in Pennsylvania is limited by the number of locations where anglers can park their cars and cross the Delaware Canal without trespassing on private property. (Kaufmann, Tr. 1788, 1790)

119. NWRA does not restrict access across its land for fishermen heading from parking areas at Point Pleasant to the river. (Kaufmann, Emery, Tr. 1856-57)

120. The importance of Point Pleasant to shore fishermen is due to the availability of parking, access to the river at several locations, the proximity of the river and the proximity of the migrating shad to the Pennsylvania shoreline. (Kaufmann, Tr. 1789, 1856-57)

121. American shad tend to be closer to the New Jersey shoreline than to the Pennsylvania shoreline in most areas between Trenton (rm 138) and Easton (rm 180). (Kaufmann, Tr. 2048)

122. Adult shad migrating upriver tend to travel in areas of high flow, where the main flow of the river is located, rather than in still areas where the flow is reduced. (Kaufmann, Tr. 1854)

123. Adult shad can be routed in fishways or fish ladders by creating an attraction velocity, a higher flow than surrounding water velocities. (Kaufmann, Tr. 1854-55)

124. At Point Pleasant, adult shad tend to run in the flow of the main channel beyond the Tohickon Creek bar. (Kaufmann, Tr. 1955, 1957-58)

125. Shad have been caught by Pennsylvania Fish Commission personnel in the eddy. (Plevyak, Tr. 1948-49)

126. Point Pleasant is believed to be the second most popular location in terms of angler success and utilization. (Kaufmann, Tr. 1790)

127. It is speculated that the adult shad migration path may veer away from the Pennsylvania shore, but the opposite effect is equally likely. (Kaufmann, Tr. 1792-93, 2130)

128. Under high flow conditions, which occur in the spring, it is likely that shad would be slightly closer to shore than other times of the year. (Kaufmann, Tr. 1858)

129. At Point Pleasant shad fishermen walk out on the Tohickon Creek bar -- in chest waders if the bar is inundated--to attempt to cast to the shad in the channel. (Kaufmann, Tr. 1858)

130. Fishermen cast a shad dart, a pointed lead-headed lure with a single hook, as far as they can, directly out into the river, generally across the river or slightly upstream. The lure is allowed to drift and either bounce along the bottom or kept just above the bottom, until it is immediately downstream and then it is reeled in and cast upstream again. (Kaufmann, Tr. 1858-59)

131. American shad probably travel within a foot of the bottom and quite often they rise a foot or so to the lure. (Kaufmann, Tr. 1862-63)

132. Fishermen can cast from 30 to 50 yards from the point at which they stand or wade out depending on the weight of the jig, the quality of the rod and the weight of the line. (Kaufmann, Tr. 1859-60; Emery, Tr. 1860)

133. Hooks and lures are lost in the attempt to keep the lure striking the bottom where the American shad are generally caught. (Kaufmann, Tr. 1859; Emery, Tr. 1816)

134. The intake is too far from shore for shorefishermen to lose their lures on the intake screens. (Emery, Tr. 1817)

135. Hooks and lures caught on the intake present no greater likelihood of becoming embedded in a rafter than those caught on other existing structures in the river. (Emery, Tr. 1816)

136. Twenty-five hundred innertubes are available for rental above the intake site; (Kaufmann, Tr. 1888; Emery, Tr. 1888), however, only four or five have been observed at Point Pleasant at one time. (Plevyak, Tr. 1966-67)

137. Persons "float" in innertubes through riffles and rapids where the depth of water varies from the smallest possible amount to a depth of possibly knee deep to thigh deep depending on the size of the rocks in the riffles. (Kaufmann, Tr. 1887; Plevyak, Tr. 2012)

138. There is no evidence of any injuries to rafters or "tubers" from diving off rafts or encounters with lost lures or hooks even though lures tend to get caught on anything in the river channel. (Emery testimony, 19; Emery, Tr. 1816-17; Kaufmann, Tr. 1887-88; Plevyak, Tr. 1967, 2013)

B. CONTENTION V-16a

1. Noise

139. The Point Pleasant Historic District has been recommended as being eligible for listing on the National Register of Historic Places. (Richter testimony, 2-3)

140. There are no noise standards or guidelines specifically applicable to historic areas. However, to the extent that increases in noise levels might cause a change in the historic or cultural attributes that qualify a particular site for inclusion on the National Register, such noises could constitute adverse effects which federal agencies must consider under the National Historic Preservation Act of 1966, 16 U.S.C. § 470. (Richter testimony, 3-4, Tr. 1140)

141. The U.S. Army Corps of Engineers has acted as lead agency in seeking the advice of the Advisory Council on Historic Preservation (ACHP) and the State Historic Preservation Officer (SHPO) as to the potential impacts of the Point Pleasant intake and pumping station upon the proposed Point Pleasant Historic District and upon the Delaware Division of the Pennsylvania Canal, a property already listed on the National Register of Historic Landmarks. The ACHP and SHPO have identified certain measures which Neshaminy Water Resources Authority (NWRA) should take (e.g., use landscaping to minimize visual impact of the pumping station, restore all areas within the District disturbed by construction as nearly as possible to their original appearance) to minimize the impacts of the construction and presence of the pumping station upon the proposed Historic District. (Richter testimony, 4-5)

142. The SHPO and ACHP, which are responsible for providing expert advice on the impacts of federal projects (including federally licensed projects) on historic sites, and the Corps as lead agency, have not identified noise impacts of operation of the pumphouse as an adverse impact of concern to the preservation of the proposed Point Pleasant Historic District. (Richter testimony, 5)

143. Measurements taken to establish ambient background noise level at the pumping station site boundary excluded transient noise sources and therefore would not vary significantly due to seasonal changes. (Moiseev, Tr. 1070)

144. Residual noise which constitutes background ambient at the pumping station site boundary is made up of river noise and distant sources not identifiable but probably traffic. (Moiseev, Tr. 1077)

145. It is critical to determine what the ambient noise level is at nighttime when people are trying to sleep. The standard procedure is to measure ambient noise level at nighttime between midnight and 4:00. This measurement was not made at the proposed pumping station site. (Policastro, Tr. 1145-1147)

146. Audibility of a noise that is at or below ambient depends on the character of the noise and the character of the ambient noise. (Moiseev, Tr. 1018)

147. The pumphouse structure will contain 4 vertical multistage centrifugal pumps driven by electrical motors. (Applicant's testimony, 14)

148. Each pump will have a sound level of 86 dB as measured by IEEE Standard 85. (Bourquard, Tr. 988.)

149. The walls of the pumphouse attenuate 50 to 60 dB. Consequently there will be a very low level of noise outside the building compared to ambient. (Policastro, Tr. 1124-1125)

150. The pumphouse structure appears to have sufficient attenuation to reduce pump and fan noises to insignificant levels. The

heating, ventilating and airconditioning outlets to the outside should be insignificant noise sources. (Policastro testimony, 3)

151. The equipment within the pumphouse will not transmit any significant noise through the pumphouse wall and the pumphouse will not, therefore, be a noise source to Point Pleasant residents. (Policastro testimony, 3)

152. Based on pump noise levels as specified, the expected transmission loss to the walls, and the distance attenuation, it is expected that there will be no noise impact from the pump motors at the pumping station property line or at the four nearest residences. (Moiseev, Tr. 983-984.)

153. Two "quieted" transformers will be installed outside the pumphouse facing the canal. Each will have a 57 dB rating. (Bourquard, Tr. 988; Moiseev, Tr. 989, 1031; Boyer, Tr. 989-90, 1030-31)

154. The transformers are 15 to 20 feet apart and are separated by a firewall. (Bourquard, Tr. 988; Boyer, Tr. 990-991)

155. Calculations show that the pump house noise is insignificant; the transformer noise is of primary concern and it may or may not be audible. (Moiseev, Tr. 1026)

156. The noise from the transformers will be approximately 36-38 dBA at the site boundary. (Moiseev, Tr. 1029)

157. "DBA" refers to "decibles A-weighted." "A weighted" refers to the use of a standard filter network on the sound level meter, which biases the meter to respond as an average human ear (less sensitive to high and low frequencies and more sensitive to mid frequencies). (Moissev, Tr. 1029; Applicant's testimony, 14)

158. In order to know whether transformer tones will be audible at the site boundary one needs to know the number of decibels in each of the tones for that particular transformer. (Policastro, Tr. 1126, 1131)

159. The quieted transformers have not yet been selected; it is not known, therefore, whether tones will be audible at the site boundary. (Policastro, Tr. 1126, 1131)

160. Calculations indicate that an enclosure may be required to assure that transformer sounds are not audible at the site boundary. (Policastro, Tr. 1152-1153)

161. Construction of sound barriers around the transformers to assure that tones emitted by the transformers are not audible at the property line is state-of-the-art. (Moiseev, Tr. 1046, 1055; Policastro Testimony, 5, 6, Tr. 1153, 1158-59)

162. It is feasible to measure the noise from the transformers at the site boundary once they are installed and to install barriers if they are determined to be necessary to assure that transformer tones are not audible at the site boundary. (Policastro. Tr. 1179; Boyer, Tr. 1049; Bourquard, Tr. 1047)

163. As operation of the pumphouse will not be a source of noise, it is not expected that the peace and tranquility of the proposed historic district will be affected by noise associated with operation of the pumphouse. (Findings 139-168)

164. The Staff will consider the potential impact of pumping station noise upon the proposed Historic District in the Draft and Final Environmental Statements (DES/FES) for the Limerick plant. The Staff will review whatever additional information is provided by the Applicant

on the specifications for the design of the transformers and any sound barriers which may be planned. The Staff's final analyses of whether there would be any noise impacts anticipated from the operation of transformers will be presented in the DES/FES. (Richter Testimony, 5-6, Tr. 1150-51)

2. Maintenance

165. A rock rip-rap blanket approximately 24 feet wide by 90 feet long will be placed under the intake. The purpose of the rock rip-rap under the intake is to keep the area swept clean. The rock rip-rap will present a relatively hard, unerodable surface to the flow during times of flood. It will keep the space between the bottom of the screens and the channel bottom clean. (Bourquard, Tr. 2553, 2562)

166. No maintenance dredging is anticipated because once construction is complete, the river bottom will be returned to its natural contours. (Applicant's testimony, 15; Bourquard, Tr. 2255)

167. Three ground posts constructed of 1/2 inch steel plate 12 inches in diameter embedded in the river bottom at the lead end of the intake will absorb the impact of anything flowing with any velocity downstream and thus prevent damage to the intake structure proper. (Boyer Tr. 2541)

168. Observations in the Susquehanna River confirm that water flows around ice dams and seeks a way downstream. Water flows underneath and through the ice dams. (Boyer, Tr. 2534, Dickinson, Tr. 2535)

169. Experience is that protrusions from the bottom of the river such as piers, bridge abutments and foundations presently existing

in the river do not attract ice. The intake structure is a similar protrusion; it will not attract ice. (Boyer, Tr. 2537)

170. During winter months the intake will be submerged by 5 or more feet of water. (Applicant's testimony, 16; Boyer, Tr. 2537; Bourquard, Tr. 2436)

171. Ice floes occur at high river elevations. It is not likely that ice floes would extend to the depth of the intake. (Boyer, Tr. 2537)

172. Should the screens be damaged, the flange section would be unbolted by divers and the screen and supporting framework would be removed for repair or replacement. (Boyer, Tr. 2539-40)

173. If the steel framework were damaged, it would be repaired by underwater welding. (Boyer, Tr. 2546-47)

174. In order to function properly, the screens need to be kept clean. Clogging of screens results in increased through-slot velocity. (Emery, Tr. 1773)

175. The screens are self-cleaning, but will also be cleaned when necessary by a backwash system utilizing an air compressor located in the pumphouse. Routine cleaning of the screens by backflushing will not require divers or boats and will not intrude upon any activities taking place in the proposed historic district. (Boyer, Tr. 2559)

176. The air backwash system will be operated by one person from a position on top of the gatewell. (Bourquard, Tr. 2557)

177. The Campbell plant on Lake Michigan has Johnson wedge-wire screens which are cleaned yearly by scuba divers. There is no backflushing equipment on the Campbell facility. (Masnik, Tr. 3985)

178. Leaf problems occur at power plant intakes in the area during the first marked increase in flow after the leaves have dropped off the trees in the fall. If a heavy rainfall occurs, the streams rise and wash down the leaves that have accumulated in the stream backwaters and carry them into the main channel. During that period, it may be necessary to operate the backwash two or three times a day. (Boyer, Tr. 2558-59)

179. Operating experience at a similar installation in Eden, North Carolina indicates that the backsurge from stopping the pumps cleans the screens and that there is very little need for backflushing. (Bourquard, Tr. 2560)

180. Should the intake require maintenance cleaning beyond that provided by the air backwash system, it will be done by divers working from boats. (Applicant's testimony at 16; Bourguard, Tr. 2440; Boyer, Tr. 2440)

181. Frazil ice forms in waters at various depths at 32 degrees F. Frazil ice moves with the current. Frazil ice occurs occasionally in the Delaware River (Boyer Tr. 2537-39)

182. Any frazil ice clogging the intake will be removed by the air backwash system. (Bourquard, Tr. 2436-37; Boyer, Tr. at 2437-38)

183. It is unlikely that dredging will be required. In the event that it is needed, it will be accomplished during the winter months, November through March, as required by a Special Condition imposed by the U.S. Corps of Engineers on the dredge and fill permits issued October 25, 1982. (Applicant's testimony, 15, Bourquard, Tr. 2255; Corps' permit, issued October 25, 1982)

184. These foregoing maintenance activities are unlikely to affect the peace and tranquility of the Point Pleasant proposed historic district. (Board findings, 26-45)

VI. CONCLUSIONS

185. Upon consideration of the record of the proceeding and in light of the foregoing finding and discussion, the Board concludes that the relocated intake will not have a significant adverse impact on American shad and shortnose sturgeon nor will it adversely affect a major fish resource and boating and recreational area due to drawdown of the pool.

186. We further conclude that noise effects and dredging maintenance will not have a significant adverse impact on the peace and tranquility of the proposed Point Pleasant Historic District.

VII. ORDER

187. Exceptions to this Partial Initial Decision may be filed within ten (10) days after its service. A brief in support of the exceptions shall be filed within thirty (30) days thereafter and forty (40) days in the case of the Staff. Within thirty (30) days of the

filing and service of the brief of the Appellant, and forty (40) days in the case of the Staff, any other party may file a brief in support of, or in the opposition to, the exceptions.

IT IS SO ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

Peter A. Morris
ADMINISTRATIVE JUDGE

Richard F. Cole
ADMINISTRATIVE JUDGE

Lawrence J. Brenner, Chairman
ADMINISTRATIVE JUDGE

Dated at Bethesda, Maryland
this 23rd day of November 1982

Respectfully submitted,

Ann P. Hodgdon

Ann P. Hodgdon
Counsel for NRC Staff

Elaine I. Chan

Elaine I. Chan
Counsel for NRC Staff

Joseph Rutberg
Assistant Chief Hearing
Counsel/Antitrust Counsel

APPENDIX A

1. Exhibits received into evidence:

Staff Exhibits

No.		Received	Identified
1	Drawing of American Shad, 21 mm. larva.		3223
2	Exhibit 4 from Applicant Exhibit 2, Point Pleasant Pumping Station, Delaware River Channel Section at Water Intake.		3487
3	Exhibit 5 from Applicant Exhibit 2, Point Pleasant Pumping Station Location and Layout Plan, General Profile, December 22, 1981, revised January 13, 1981.		3488
4	Exhibit 10 from Applicant Exhibit 2, Point Pleasant Pumping Station Intake Screen Assembly and Piping Details, September 1, 1981, revised January 13, 1982.		3488
5	Assessment of the impacts of the proposed Point Pleasant Pumping Station and intake structure on the shortnose sturgeon, by H. Brundage, 1982.		3501

Applicant Exhibits

No.		Received	Identified
1	Environmental Report Section (with index), including portions of Exhibits 1, 1A and 1B directly applicable to contentions.	949	937, 974
1A	September 3, 1982 Responses to Requests for Additional Information.	949	937
1B	September 17, 1982 Responses to Requests for Additional Information.	949	938
2	January 22, 1982 letter from E.H. Bourquard to Corps of Engineers with Table 1.	1328	1324
3	Applicant's list of Exhibits and other documents which the Licensing Board is requested to officially notice.		1334
4	Map of Point Pleasant showing location of intake.	2154	2152
5	Letter from P.L. Harmon to E.H. Bourquard (revision of Table 1 in November 1980 report), dated May 11, 1981.	2829	2829
6	Letter from R.L. Baldwin, Corps of Engineers to H.N. Larsen, U.S. Fish and Wildlife Service, dated September 24, 1982, concerning Notice of Intent to Issue a Department of Army Permit to NWRA.		3179

Del-Aware Exhibits

No.		Received	Identified
1-A	Issue #1 Response on water quality data at Point Pleasant.	1313	1299
1-B	Issue #2 Response on sea level elevation of Lumberville Dam.	1313	1300
1-C	Issue #4 Response on further assessments of intake location after 1980 Environmental Assessment.	1313	1301
1-D	Issue #6 Response on cross section data on Delaware River at Point Pleasant.	1313	1302
1-E	Issue #7 Response on status of Point Pleasant withdrawal in Recommendation 13.		1302
1-F	Issue #5 Response on current status of Merrill Creek project.		1302
2	Tabulation of available data and Delaware River Flow Velocities at Intake Site (3).		1376
3	Water Quality Analyses, Area-Specific Dilution Studies, Region III, January 1981.		1449
4	Water Quality Analyses, Ten Area-Specific Dilution Studies.		1460
5	Letter to Mr. Hansler from Mr. Torok dated March 12, 1980.		1465
6	Letter to Col. Baldwin from Mr. Pence dated March 17, 1982.	1494	1471
7	Development of Relationship Between Water Discharge and Water Surface Elevation, January 4, 1982.		1639
8	Draft - Background Report Concerning the Interstate Water Management Recommendations of the Parties to the U.S. Supreme Court Decree of 1954 to the DRBC (Without Appendices).		1660

No.		Received	Identified
9	Letter to E.H. Bourquard from P.L. Harmon dated July 28, 1981 and three Tables on Velocity Measurements.	2225	2211
10	The American Shad (Alosa sapidissima) in the Delaware River, by J.P. Miller, F.R. Griffiths and P.A. Thurston-Rogers.		2227
11	Rating Curve - Point Pleasant Intake Site.		2275
12	USGS Data Sheets for October 1980, May 1981 and July 1981.	2329	2320
13	Point Pleasant Pumping Station Preliminary Design, Sheets 1, 2 and 3 of 4.		2321
14	Letter to W.H. Dickinson from E.H. Bourquard dated August 10, 1982, including Tables.		2392
15	Memorandum from W.H. Dickinson, "Mechanical Engineering Division," dated May 14, 1982.		2460
16	Memorandum from D.L. Morad, "Making Water System Status Report," dated December 16, 1981.		2465
17	Memorandum of meeting of January 5, 1982 (2 pages) including Figures and Excerpts of Hansen paper, by E.H. Bourquard.		2570
18	Actual versus Measured Readings (Rangefinder) dated March 1981 (Tables) from handwritten note from Mr. Bourquard to Mr. Harmon dated March 10-11, 1981.		2758
19	Delaware Intake Points Below, Real and Actual Distance from Split-Image Measuring Devices, E.H. Bourquard, dated March 10, 1981.		2768
20	Letter from H.M. Brundage III to R.A. Flowers, dated July 27, 1982.		2966

No.		Received	Identified
21	Single page, marked "I3," excerpted from "Assessment of the impacts of the proposed Point Pleasant Pumping Station and intake structure on the shortnose sturgeon."		2975
22	Letter from H.M. Brundage III to E.H. Bourquard dated November 30, 1981.		3026
23	Letter from C. Culp, U.S. Fish and Wildlife Service to R. Baldwin, dated September 14, 1982.		3342
24	Photographs identified in McNutt testimony, including Cross-referenced Photo Numbers List.	3384	3384
25	Policastro 1 with J.T. Phillippe's markings.		3748
26	J.T. Phillippe's plotting of 17-18 points relating to Trenton.		3776
27	Excerpts from Ecological Studies of the Nanticoke River and Nearby Area, Volume II, dated December 1980.		3953

Board Exhibits

No.		Received	Identified
1	Page 15 of "Biological Evaluation of the Proposed Water Intake in the Delaware River at Point Pleasant, Pennsylvania for NWRA" by P.L. Harmon, dated November 1980.		2637
2	Cover letter from Mr. Richmond to Mr. Conner (index of contents); letter to Col. Baldwin from Pennsylvania Historic Museum Commission dated September 28, 1981; letter from Mr. Gordon of National Marine Fisheries Service to Mr. Sugarman dated September 30, 1982; letter from Mr. Hoffman of EPA to Mr. Cianfranni of Army Corps of Engineers dated August 5, 1982, signed by Col. Baldwin on October 14, 1982; Memorandum of Agreement between Corps of Engineers, the Advisory Council on Historic Preservation, and the State Historic Preservation Officer.		3955

2. Professional Qualifications of Witnesses:

Professional Qualifications	Transcript Page
Vincent S. Boyer	933
W. Haines Dickinson, Jr.	933
E.H. Bourquard	933
Neil Moiseev	933
Anthony J. Policastro	1118
Brian J. Richter	1118
Paul L. Harmon	1321
John E. Edinger	1321
George D. Pence	1439
Charles E. Emery, III	1736
Michael Lee Kaufman	1736
Stanley Plevyak	1930
Harold M. Brundage, III	2965
Richard Hunt McNutt	3382
Rex G. Wescott	3490
Michael T. Masnik	3504
Jonathan T. Phillippe	3658
Pierce F. Lewis	4036

For the Atomic Safety
and Licensing Board

_____
Lawrence Brenner, Chairman
Administrative Judge

Bethesda, Maryland
_____, _____

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
PHILADELPHIA ELECTRIC COMPANY	)	Docket Nos. 50-352
	)	50-353
(Limerick Generating Station, Units 1 and 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "PARTIAL INITIAL DECISION" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, or as indicated by an asterisk through deposit in the Nuclear Regulatory Commission's internal mail system, or as indicated by a double asterisk by express mail, or as indicated by a triple asterisk by hand delivery, this 23rd day of November 1982:

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