DUMP THE PUMP?:

AN ANALYSIS OF THE POINT PLEASANT WATER DIVERSION PROJECT, POINT PLEASANT, PENNSYLVANIA

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Introduction

The Point Pleasant Pump Station was proposed by the Neshaminy Water Resources Authority (NWRA) nearly two decades ago as a solution to the water supply problems of Bucks and Montgomery Counties. The Pump was to withdraw water from the Delaware River at Point Pleasant primarily to provide public water supply to the two counties. Secondarily, a small portion of the diverted water would be used to augment flows in the Neshaminy Creek.

Although Bucks and Montgomery lie in the Triassic Lowlands, a red shale geologic formation of poor water-retention quality, both counties depend almost exclusively on groudwater for their water supplies. Increased development has lowered the groundwater table, and the counties were included in a groundwater protected area designated by the Delaware River Basin Commission in 1980. All new or enlarged wells that withdraw more than 10,000 gallons of water per day must now obtain a permit from the DRBC, and existing wells of that size must be registered. The new regulations are designed to permit the Commission to monitor and regulate the use of groundwater. Thus the Pump Station is only one of several measures being taken to assure ample water supply in the Neshaminy River Basin.

Between 1966 and the start of construction in 1982, plans for the project were revised to include an additional diversion of water as a back-up coolant for the proposed Limerick Nuclear Generating Station on the Schuylkill River. In addition, the quantity of water required for consumption was reestimated due to lower projections of development and population growth.

Citizens' opposition to the project throughout its history has been vehement and effective. Dela-AWARE, the group most active in opposing the project, convinced the Bucks County Board of Elections to grant the right to a non-binding referendum on the Pump issue. Voters voted against the project, and the County Commissioners

withdrew Bucks County as a sponsor of the project probably due to election-year pressures. For the same reason, new NWRA members appointed that year were sympathetic to Del-AWARE's cause, and they succeeded in getting a court order to delay work due to faulty construction of the Pump's concrete foundations. This 90-day order is currently in effect.

This paper will discuss the need for and the environmental impacts of the project. Section I will provide a description of the entire water diversion project. Section II will discuss the environmental effects of the project. It will be divided into subsections covering each segment of the project. Section III will describe possible alternatives to the construction of the Pump. Finally, Section IV will discuss the values involved in selecting the Pump Station as the best alternative means of fulfilling water supply needs.

I. Description of the Project (see map)

The Pump Station at Point Pleasant on the western bank of the Delaware would withdraw 95 million gallons of water per day (mgd) from the river. The water would move through a 60-66" reinforced concrete pipe (the "Combined Transmission Main") to the Bradshaw Reservoir and Pump Station. The Reservoir, with a holding capacity of 70 million gallons, would control the flow of water between the Pump Station and the Perkiomen and Neshaminy Creeks. This first segment of the project would be developed and operated by the NWRA on behalf of it and the Philadelphia Electric Company (PECO), another sponsor of the project.

The second segment of the project would also be developed and operated by the NWRA. From Bradshaw, 49 mgd of the water would flow through another concrete pipe (the "North Branch Transmission Main") to the North Branch Neshaminy Creek and eventually through Lake Galena to the North Branch Treatment Plant at Chalfont. It is estimated that 40 mgd would eventually be picked up at Chalfont, with 4 mgd lost through evaporation and seepage and 5 mgd allowed to flow downstream to augment the flow of the Neshaminy Creek. Lake Galena is a man-made lake principally used for recreation. Water levels are varied seasonally in order to satisfy recreational users while providing flood control and water supply. The flow of water between the Delaware, Lake Galena, and the Chalfont Treatment Plant would be monitored in order to minimize both maximum daily withdrawals from the Delaware and flow variations in the North Branch Neshaminy Creek.

The third segment of the plan is to be developed and operated by PECO. A maximum of 46 mgd would be pumped from the Bradshaw Reservoir through the Perkiomen Transmission Main and to the East Branch Perkiomen Creek. The Creek would serve as a natural transmission main carrying water to another pump station (the "PECO Pump Station"). PECO's own Transmission Main would then carry the water to Limerick.

II. Environmental Impacts of the Diversion Project on Human and Natural Systems and Receptors.

A. Impacts of the Construction and Operation of the Point Pleasant Pump.

1. Pumphouse and Pipes. The segment of the Delaware River where the Pump would be located is a potential candidate for inclusion in both the Pennsylvania State Scenic Rivers System and the National Wild and Scenic Rivers System. But because of current development, the river would be eligible for inclusion only in the "recreation" or "modified recreation" categories. The Pump Station would be built to resemble a barn, and would thus blend in with existing development. It would not interfere with recreational uses along the river. Thus the project would not be objectionable should the river be included in either the state or federal scenic rivers systems within the above recreational categories.

Both the Delaware Canal bordering the river and the town of Point Pleasant are listed in the National Register of Historic Places. Interference with these sites would be minimized by conducting an archeological survey of the site prior to construction, by controlling blasting during construction, and by designing the structure to assure its compatability with surrounding architecture.

Because of the above precautions, the Environmental Assessment concludes that the impact of the Pump Station on the surrounding human environment is not significant. Del-AWARE does not agree. They believe that construction of the facility will "disrupt the lifestyle of a small village."[2] Noise levels during both construction and operation of the Pump have not been studied (although the structure will be sound insulated to mitigate noise.) Further, Del-AWARE is not convinced that the Delaware Canal can be protected from the blasting required beneath it. Nor do they believe an "archeological survey" is adequate acknowledgment of the value of the 5,000 year-old Indian village and blade factory buried in the path of projected pipelines.

2. Intake Structures. The pipeline would lead to the intake structure of the Pump consisting of 24 screens located 245' from the bank and submerged 4' during low flow. Each screen is 40" in diameter and water would flow through them at a maximum rate of .5 feet per second. They will rest on concrete foundations in 3 groups of 8, each to be connected with one of the 3 intake pipes.

Construction of this system is expected to create considerable turbidity, though the Assessment says turbidity will be limited to 1/3 the width of the river, allowing fish to swim through the area. The Assessment does not discuss other problems during construction, except to say it will be scheduled during the winter months in order to avoid disturbing aquatic life during the spawning season.

Once installed, the intake screens should not significantly disturb bottom sediments and should not cause scouring. The use of "innovative screens" should minimize the impacts on aquatic life. The small 2mm slots in the screens and the slow intake velocity should decrease the entrainment[3] and impingement[4] of organisms.

One study cited by the Assessment thus concluded "the small percentage of water and organisms likely to be withdrawn from the river through this intake will not result in biologically significant impacts to the fish community."[5] Another study was conducted to determine the impacts of the Pump on the shortnose sturgeon, an endangered species found in the Delaware. This study similarly concluded that effects of the Pump on the sturgeon population were negligible.[6]

Del-AWARE naturally objects to the conclusion that populations of aquatic organisms will not be affected by the Pump's intake structures. They point out that the Pump was purposefully located in a pool of virtually still water. an "extremely productive spawning and nursery habitat for 42 varieties of fish."[7] The river's velocity at Point Pleasant may be close to that of the 5 fps of the Pump's intake velocity. Thus the problem of entrainment and impingement may have been too readily dismissed in the Environmental Assessment. Further, damage to the intake structures by ice,

logs, debris or silt would greatly increase existing dangers to aquatic organisms.

B. Impact of the Loss of Water to the Delaware River. (see map)

The average daily flow of the Delaware just below Point Pleasant at Trenton is 7384 mgd. The maximum diversion of 95mgd is less than 1 1/2% of this quantity. Even at low flows, 95 mgd would be less than 5% of total flows.

During a drought, the DRBC's policy has been and will continue to be to maintain minimum flows at Trenton of 3000 mgd. If this level is approached, the water diverted to Limerick will be cut off, reducing the total diversion at Point Pleasant to 49 mgd, or 3% of total flows. Of this 49 mgd to be used for public water supply, 90% will eventually returned to the Delaware Basin "hydrologic system". Because public water supply is a non-consumptive use, only 10% of the water will be lost. Water will be returned to the system via the Neshaminy and Pennypack Creeks and the Schuylkill River, as well as through groundwater acquifers. Thus the Pump should have an immeasurable effect on the quantity of water entering the Delaware Estuary during a drought, and should therefore not contribute to the problem of saltwater intrusion into that supply of freshwater for the City of Philadelphia. All the water will be returned above river mile 90, and will thus aid in repelling saltwater intruding from the Delaware Bay. DER's Assessment emphasizes that the flow of the Delaware has been and will continue to be a managed system on which the Pump Station will have little impact.

Although Del-AWARE objects to this conclusion, they do not substantiate their claim that the Pump Station will increase salt water intrusion into the estuary.

C. Impact of the Construction and Operation of the Transmission Mains, and of the Bradshaw Reservoir and Pump Station.

The Combined Transmission Main will extend 2.4 miles between Point Pleasant and Bradshaw. Neither the Environmental Assessment nor Del-AWARE discuss the impacts of this or any of the other transmission mains. But it is probable that

construction of the mains will involve at least some disturbance to the surrounding vegetation, although such disturbances may be temporary.

The Bradshaw Reservoir will serve as a link between the Transmission Main and the Perkiomen and Neshaminy Creeks. Its surface area will be 810,000 ft^2 and it will hold 70 million gallons of water. The Assessment explains that "(t)he geology of the site and design are adequate to provide a suitable dam foundation."[7] Seepage from the reservoir into groundwaters will be minimized by installing a 2' thick layer of clays and fine silts. Mounding of groundwater should thus be minor, and the area immediately surrounding the reservoir is free of wells, septic tanks or significant springs which might be affected. The Assessment describes the quality of Delaware River water at Point Pleasant —insisting that even if seepage does occur, it will not pollute groundwater.

The DER classifies Bradshaw as a dam of "small size with significant hazard potential (C-2)."[7½] It is therefore equipped with an emergency spillway and freeboard. Both are intended to reduce the possibility of embankment overtopping, although it is unclear where water escaping through the spillway will go.

Water levels in the dam will be affected by rainfall over its surface and pumping from the Delaware. Pumping will normally be regulated by levels in the dam, but should this system fail alarms will sound and the pumps will be manually shut down. If this safety mechanism were somehow to fail, the emergency spillway would drain the reservoir and prevent overtopping. Finally, an emergency warning system and evacuation plan will be prepared. The DER has accepted these measures as adequate to assure the safe operation of the dam. In addition, PECO will be required to submit annual reports on the condition of the dam.

D. Impacts on the North Branch Neshaminy Creek.

A maximum of 49 mgd or 76 cubic feet/second would be added to the Creek,

a rate which is not considered erosive for the soil types found there. An energy dissipator and riprapped channel would be installed to decrease flow velocities as further protection against erosion and sedimentation. Adjustments in the quantity of water released into the Creek would be done gradually to reduce shocks on aquatic organisms.

The Assessment conludes that the "net effect of proposed project upon aquatic habitat and ecology in the North Branch Neshaminy Creek would be beneficial."[8] The Assessment explains that increased flows would decrease mortality due to seasonal dry-ups of the Creek. Increased flows would also increase the size of the entire river ecosystem, permitting greater productivity and survival.

This short description of benefits too quickly dismisses the effects of a project that would entirely change the whole ecosystem of the Creek. The median flow would be increased from 1.34 cubic feet/second (cfs) to 76.34 cfs. (see chart) Depth would increase from just over an inch to just over a foot. To decide that such a change is "beneficial" is to choose one type of ecosystem over another. The Assessment admits that: "with the increase of an additional 76 cfs, the character of the existing biota will be altered. Organisms favoring higher water conditions would be on the increase; those favoring low or slow-moving water would decrease."[9] This observation drastically understates the impact the increased flow will have on the Creek.

Because the impact of the Project on the East Branch Perkiomen Creek is similar, and because Del-AWARE is more concerned about that stream, these issues will be discussed more thoroughly in the next section.

E. Impact on the East Branch Perkiomen Creek.

The Assessment also concludes that impact of the Project on the East Branch Perkiomen Creek will be beneficial, because increased flows would increase the size of habitats and decrease seasonal mortality. Here also, aquatic organisms would be

protected against changing flows by an energy dissipator and riprap channel installed between the Transmission Main and the Creek.

PECO would be required to maintain a minimum flow during normal low flow periods,[10] even if no water is required for the operation of Limerick. Under normal operating conditions, the median flow of the Creek would be increased from 1.4 cfs to 66.4 cfs by the diversion. Once again, the entire character of the Creek ecosystem would be changed.

The Assessment emphasizes that this increase "does not place the stream in a mean annual flood condition."[11] When flows do reach potential flood levels, pumping into the creek will automatically be stopped. The Assesment concludes: "PECO is not anticipating pumping from the Delaware on a year-round bases. Pumping will cease when adequate flows exist in the "natural flows of the Schuylkill and Perkiomen to satisfy the operating conditions imposed by the DRBS."[12]

This "reassurance" only assures that the character of the waterway will be constantly in flux. It will not simply be increased from a creek of .15' to a stream of 1.30', but will constantly waver back and forth between the two states. It is difficult to see how any aquatic organisms will survive under such conditions.

This is the outcome the "Friends of the Branch Creek" are trying to prevent. They rightly claim that the project will "make a channel out of a creek."[13] The river bank will be eroded and scoured away and silt and sediment carried downstream. "More water will flush away fish and the little things fish eat..."[14] Drainage of the surrounding farmland will be affected.

The Group also claims that water quality will be decreased in both the Creek and groundwater as chemicals from the Delaware are introduced to the watershed. The Assessment addresses this arguement, concluding that water quality is actually better in the Delaware than in the Creek.

The "Friends of the Branch Creek" are also concerned with the direct effect

of increased flows on the human environment. The Creek may no longer be a safe place for children to play. Farmers currently cross the Creek on tractors to reach neighboring fields. Such crossings will become impossible with the drastic increase in depth and velocity of the Creek.

In substantiating its complaints, the group explains that the Limerick EIS stated the Creek would be "destroyed"[14½] if used to transport water to the plant. The environmental impacts on the Creek were described as second only to the effects of radiation in importance to the project. However, the Point Pleasant EIS, like the Environmental Assessment, maintains that impacts to the Creek would be beneficial. This discrepancy between the two impact statements was "resolved" by omitting the section on the impacts on the Creek from the Point Pleasant Impact Statement, referring readers to the Limerick EIS.

If the Limerick Nuclear Power Plant must use water from the Delaware as a back-up coolant, its only alternative would be to extend the transmission main all the way to the plant. At a cost of $700,000, this alternative would be economically unfeasible. PECO would probably opt to use another source of back-up coolant. (Alternative sources of back-up coolant for Limerick will be discussed later.)

Because the Group's conclusions are similar to those of the government agency who wrote the Limerick EIS, it is reasonable to conclude the Creek will in fact be wiped out by the Project. Nor can one say the creek ecosystem will be replaced by one more desirable, because flow in the creek will be constantly in flux according to water levels in the Delaware and the needs of Limerick. The loss of this riverine environment may be one of the most significant effects of the Project. It is curious that the Assessment so readily dismisses this issue, while it examines less deleterious effects in great detail.

F. Impacts of the Water Diversion Project on Land Use in the Region.[15]

The Assessment emphasizes that the Project is merely "a response to an existing water problem."[16] As demonstrated by the 1980-81 drought, the region is presently in need of water —regardless of projected increases in population and development:

> the Point Pleasant Project does not simply provide 40 mgd more water supply capacity to the NWRA service area, to be used in addition to current ground and surface water sources as the basis for attracting new development. The objective of the project is to relieve presently stressed supplies, while providing limited supplemental water for the "planned growth" contemplated by the Bucks and Montgomery County comprehensive plans.[17]

Thus the NWRA is responding primarily to existing needs and only secondarily to projected needs as predicted by the county planners. Water is only one of the many factors that determine patterns of growth in a region.The Authority itself does not have the power to determine development, either legally or practically.

Unfortunately, the County does not have much control over development either. Although Bucks has a "proficient"[18] planning staff, it is one without authority to implement its plans. The power to regulate land use lies with the County's 54 municipalities. The municipalities do not employ planners of their own, and have historically not followed the county planners' suggestions for development. Yet the County is not completely powerless to affect development within its boundaries. The County does have the power to approve or disapprove public works projects. By controlling the locations of roads, sewers, and water mains, Bucks can influence the location of development. Because Bucks can determine how water supplies from Chalfont are allocated, it can influence the impact the Pump will have on development.

Although the Assessment insists that impacts of the project on land use are minor, it also asserts that any such impacts will be beneficial.

The Project will contribute to water supply in the existing public system. Thus

development in presently populated areas will be encouraged. Both Bucks and Montgomery Counties favor this type of concentrated growth over "checker board-type development."[19] Thus the Pump is consistent with the local planners current preferences for growth.

The Assessment describes the negative environmental impacts of urban sprawl, implying the Pump will help save the region from the evils accompanying "a spreading checkerboard of subdivisions, industrial parks and malls."[20] Such sprawling development usually requires the construction of longer utility lines and more roads and other impervious surfaces. Natural vegetation is destroyed, and stormwater runoff is increased while groundwater infiltration is reduced. Increased travel distances contribute to air pollution.

The Pump will of course not prevent such a trend, but it will discourage it, as water is made more readily available in existing centers of population. Public water supply may be diverted elsewhere, but the DER may refuse to permit "subsidiary allocations" if they are not consistent with the County's plans for development. Thus the Pump will, says DER, encourage "more efficient and environmentally responsible land use development."[21]

Del-AWARE does not agree with this conclusion. Although they too favor the limitation of major new development to currently populated areas, they do not believe that water supply from the Pump will be used to promote this end. They maintain that water supply from the Pump will be used to promote development in Upper Bucks, presently an area of farmland and scattered historic homes:

> The resulting loss of farmland to rampant development reduces Central and Upper Bucks values. As new business centers are promoted, money, jobs, and people will flee Lower Bucks, weakening the tax base and resulting in reduced real estate values here as well.[22]

But this conclusion, that increased water supply would decrease real estate values throughout the County, seems very unlikely. If water would in fact supply Upper

Bucks, and allow development there, land values would surely increase. And regardless of what happens in Upper Bucks, Lower Bucks is not going to suffer from declining real estate values. This region is, for better or worse, one of the fastest growing in the state, as suburban Philadelphia continues to expand there. If expansion is permitted in Upper Bucks, it will not be at the expense of growth in Lower Bucks.

III. Alternatives to the Project.

A. No Action.

"(N)o action is no option"[23], according to the DER. 4,000 wells in the NWRA service area went dry in 1981, and water replacement costs were over $6.7 million. Where wells did not run completely dry, rationing programs were often required. The DER considers such programs unacceptable, though rationing reduced average consumption rates by only 10-15%, a reduction that was probably not too painful. Droughts of a similar magnitude as the 1980-81 event occurred several times during the 60's, and are expected to occur again.

B. Water Conservation.

The Environmental Assessment emphasizes that conservation will continue to be an important element of water allocation in the NWRA service area, although it includes little description of current conservation practices. It states that users of water diverted at Point Pleasant will be required to follow a program of conservation, but it is vague on the specifics of this program. It simply states that "basic changes in water-using appliances, processes and habits must be evolved."[24] The inclusion of specific details concerning how this end will be brought about would make DER's supposed dedication to conservation programs more credible.

The DER emphasizes that there are definite limits to what conservation can achieve. It asserts that current levels of consumption in the Basin are already relatively low (100-130 gpd), so there is not all that much room for improvement. Thus conservation is not a sufficient alternative to the Project.

C. Further Development of Groundwater.

The Assessment explains that the region is already over-dependent upon groundwater resources. Groundwater withdrawals continually exceed recharges in the region, and a continuation of this trend would lower water tables, decrease stream flows

(reducing their capacity to assimulate wastes), and make more private wells susceptible to dry-ups.

It has been suggested that existing groundwater can be used most effectively by locating new wells away from existing wells, thus reducing the incidence of groundwater mining. The DER rejects this scheme for two reasons. Firstly, there are few areas in the region where new wells would not interfere with existing wells. Secondly, the network of water mains necessary to transport the water from remote to populated areas would attract development in rural areas. Because the County opposes the development of rural areas, it objects to a plan which would encourage this type of development.

D. Utilization of Lake Galena.

Lake Galena could supply a maximum of 7 million gallons of water per day, and so the Assessment dismisses this resource as being of very limited potential. But the Pump Station itself is expected to initially increase water supply only 20 mgd. Lake Galena might be included as a significant part of a system of alternatives to the Pump Station.

E. Utilization of Lake Nockamixon.

The DER dismisses this man-made lake as a water source, primarily because the significant draw-downs that would be required would interfere with use of the lake as a popular recreational area. In addition, the lake is currently available for emergency water supplies, and use of the lake as a more regular water source would interfere with this function.

F. Withdrawal from the Schuylkill River.

Diversion from the Schuylkill River to supply Montgomery County has been suggested as a partial alternative to Point Pleasant. The Assessment explains that

the Schuylkill is already intensely used. Current withdrawals are five or six times low flows, so that water is used and reused several times. Additional diversions from the Schuylkill would exacerbate conflicts between users, as well as decrease water quality, as reuse increased the buildup of dissolved solids in the river's water.

G. Evansburg Reservoir.

The Evansburg Reservoir is currently planned for construction on the Skippack Creek in Montgomery County. Here again, the DER objects to using the reservoir for water supply primarily because it would interfere with the intended use of the facility as a recreational area. Secondly, this alternative would be more expensive than the Point Pleasant Project. Finally, says the Assessment, it would have a maximum capacity of only 20.2 mgd. This last point seems rather weak, since only 40 mgd will be made available by the Point Pleasant Project, and all of this capacity is not expected to be used until 2010. Thus the Evansburg Reservoir could probably provide all of Montgomery County's needs. Although pumping from the reservoir to Bucks would be impossible, says the DER, Evansburg might be part of a system of alternatives to Point Pleasant.

H. Diversion from the Susquehanna River.

This alternative is appropriately dismissed by the report. The Susquehanna is not even a part of the Delaware River Basin, it empties into the Chesapeake Bay. Such an interbasin transfer of water would have greater environmental impacts than the transfer of water within a watershed.

I. Independent Water Supply Projects.

Individual studies of the needs of Montgomery, Bucks, and Limerick conclude that a Pump Station at Point Pleasant is the most feasible source of water. If this is true, it is logical that the three projects be combined. A duplication of facilities would only increase construction, operation, and environmental costs of the project.

Multiple pump stations, intake structures, and pipelines would increase damage to the environment while escalating costs. The Assessment rightly dismisses this alternative.

Yet Del-AWARE believes there are other sources of back-up coolant for Limerick.[25] If this is so, it might be a reasonable alternative to use water diverted from the Delaware uniquely to fulfill public water supply needs. This would eliminate the necessity of using the East Branch Perkiomen Creek as a natural channel.

J. Using Philadelphia's Water Supply.

This is not a reasonable alternative primarily because Philadelphia's water supplies are themselves limited. And plans are being made to incorporate Camden into Philadelphia's water supply system, a plan which would put a further strain on existing supplies. In addition, water would have to be transported a long way from Philadelphia's Torresdale intake on the Delaware to Bucks and Montgomery Counties. Transportation of water from Philadelphia to Limerick would require the construction of an even longer pipeline through urban areas. The cost of providing water to Limerick alone would be higher than the total costs of the Point Pleasant Project.

IV. Evaluation of Impacts.

The water diversion project causes many impacts to the environment, most of which are difficult to quantify and assign monetary values. This section will describe a method which might simplify the process of weighing the Project's net environmental costs and benefits. Only the most significant impacts will be discussed, so that the general procedure will not be obscured.

Because many of the most important impacts of the Project would change property values, the property value surrogate market approach might be used to provide a common denominator for many different types of environmental effects.

All the negative impacts of the Pump Station itself (such as noise and the structure's physical appearance) would be reflected in lower land values. By comparing land values before and after the construction of a similar facility in a similar area it might be possible to make a prediction of the impact that the Pump will have on land values in Point Pleasant. Similarly, transmission mains and reservoirs similar to Bradshaw have surely been constructed elsewhere. Changes in land values caused by other projects could again be used to predict changes in land values that would occur in Bucks and Montgomery Counties. Projections of changing land values along the East Branch Perkiomen and the North Branch Neshaminy Creeks might also be derived using this method.

None of these estimates will be tremendously accurate, since land values reflect different factors in different locations. But the method would provide a useful approximation nonetheless.

The net decrease in property values would probably be far exceeded by the increasein property values resulting from the increased water supply. But there are many effects yet to be considered which would not be reflected in changing property values. Survey techniques might be used to determine the value citizens place on the Indian archeological site, the historic Delaware Canal, and the ecosystems of the two creeks that will be altered. Although many citizens might be willing to pay something to keep the two creeks from being destroyed, only a few people's preferences will ever be reflected in land values along the creeks. It is probably reasonable to limit such surveys to the NWRA service area. Since neither of the creeks is especially unique, it is doubtful that their preservation would be worth much to people outside the area. In contrast, the archeological site might be of greater significance, and people from across the country might conceivably be willing to pay for its preservation.

Measures of citizens' willingness to pay to preserve each of these areas could be added to obtain one value representing the net costs of those aspects of the project that, although significant, are not expected to change land values. This sum could then be added to the expected net decrease in property values to determine the costs of the Project. Costs could be finally be compared to the expected benefits of the Project, as measured by the anticipated increases in land values.

V. Conclusion.

I would expect that if the procedure described above were followed the net environmental impacts of the Project would be positive. Increased property values resulting from greater availability of water in developed areas would probably outweigh all the other impacts of the Project. The validity of this approach can of course be questioned. Increased property values do not necessarily mean the environment has been improved, they may simply reflect the land's increased value for development. However in this case the analysis is probably useful, given that the alternative to development in developed areas is the creation of suburban sprawl in currently rural areas.

When the Tocks Island Dam was rejected as a solution to water supply problems in the Delaware River Basin, it was agreed that the construction of several smaller projects would be a preferable means of providing water. The Point Pleasant Project is one such project. It would provide a small amount of water to an area currently in need of it. It would allow for development, but would encourage planned rather than haphazard growth.

The necessity of the segment of the Project that will provide back-up coolant for Limerick may be more debatable. PECO has decided to cancel construction of the second reactor at Limerick, reducing the total quantity of water required for a back-up coolant to 23 mgd (half the original estimate). It might be feasible to divert this relatively small quantity of water from the Schuylkill or one of the other sources closer to the plant than is the Delaware. The entire third segment of the Project could then be discontinued, thereby saving the East Branch Perkiomen Creek and eliminating the costs of constructing two long transmission mains

and an additional pump. Thus there is definitely room for discussion on the need for the thirdsegment of the Project. There may in fact be a better source of back-up coolant, although it is not described in the Assessment.

However the rest of the Project seems to be an entirely appropriate means of providing water where it is needed. Opposition to the Project will not succeed in stopping development, it will only succeed in bringing about less desirable patterns of growth.

NOTES

1. All figures in this section represent the ultimate capacity of the system. This capacity is not expected to be utilized until the year 20 10.

2. Del-AWARE fact sheet, page 3.

3. Entrainment occurs when small aquatic organisms such as fish eggs and larvae pass through slots in the intake screens.

4. Impingement occurs when larger organisms are captured on the screens.

5. Environmental Assessment, p. 31.

6. Ibid., p. 31.

7. Ibid., p. 85. 7½. Ibid., p. 86.

8. Ibid., p. 38.

9. Ibid., p. 36.

10. It would seem that dry periods in the Creek would coincide with droughts in the Delaware River. If this were the case, it would be impossible for PECO to fulfill both its requirement to maintain minimum flow in the Creek and its obligation to entirely cease its withdrawal from the Delaware at Point Pleasant. This discrepancy is not mentioned in the Assessment.

11. Ibid., p. 42.

12. Ibid., p. 42.

13. "Common Ground", p. 25.

14. Ibid., p. 25. Unfortunately, more detail on the biological effects of the project is not included in either the interview in "Common Ground", or in the Environmental Assessment.

14.5. "Common Ground", p. 27.

15. Much of this section will be limited to discussion of impacts on land use in Bucks County. I had little information on Montgomery County, though implications of the project there are probably similar.

16. Assessment, p. 63.

17. Ibid., p. 66.

18. The Delaware River Basin., p. 47.

19. Assessment., p. 64.

20. Ibid., p. 64.

21. Ibid., p. 65.

22. Citizens Voice, Volume 1, Issue 3, p. 4.

23. Assessment., p. 67.

24. Ibid., p. 68.

25. A member of Del-AWARE described the Blue Bell (?) Reservoir as one of several possible sources of back-up coolant. But none of these options is described either in Del-AWARE's literature or anywhere else.

26. The size of the Project is illustrated by comparing Point Pleasant with New York's current use of Delaware River water. The city now diverts up to 800 million gallons per day, while a maximum of 95 million gallons per day would be diverted at Point Pleasant. Half this latter quantity would be returned to the basin. In contrast, New York's diversion is considered an interbasin transfer of water —none is returned to the Delaware River Basin.

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Citizens Voice, Volume I, Issues 3,5,6,7,8,9,11,12,13,14,15,17,18, Volume II, Issues 1,2,3,4,5,6 (May 10, 1983-March 20, 1984).

The paper is published by Del-AWARE twice monthly as part of its efforts to mobilize citizens against the pumping station. The paper documents actions concerning the project, but its articles generally lack the detail necessary to subtantiate the groups' objections.

The New York Times, January 11, 12, 18, July 12, 13, 1983.

Delaware River Basin Commission Annual Reports, 1980, 1981, 1982.

The DRBC was formed in 1961 to control "water resources planning, development, coordination and protection" in the Delaware River Watershed. Its officers are appointed by the federal and state governments (of New York, Pennsylvania, New Jersey, and Delaware) and answer to changing administrations in those bodies.

The reports describe the major water resource problems in the Delaware River Basin and the Commission's efforts to solve them. Short reports on actions concerning the pumping station are included in each year. In addition, an article in 1980 describes the designation of the majority of Bucks and Montgomery Counties as groundwater protected areas; and an article in 1981 contains a report on groundwater shortages resulting from the 1980-81 drought.

Environmental Assessment Report and Findings Point Pleasant Water Supply Project, Commonwealth of Pennsylvania Department of Environmental Resources, August 1982.

The final EIS on the pumping station and diversion plan was prepared and submitted by the DRBC in 1973. The AEC submitted its EIS on Limerick in 1973, and the U.S. Department of Agriculture submitted an EIS on the Neshaminy Creek Watershed in 1976. Shortly after, the portion of water needed for public consumption was substantially reduced due to reestimates of projected population growth and development. Finally, the U.S. Army Corps of Engineers undertook its own environmental assesment of the project in 1981.

This Assessment prepared by the DER incorporates all these previous studies and considers the affects of the downgrading in the size of the project. It includes a description of the need for the project, as well as its environmental impacts and a discussion of its alternatives. The report concludes that the project is both necessary and safe.

The Citizens Voice objects to these conclusions, calling the report a "sham" and a "fraud" in its May 10, 1983 issue. It states that under oath during depositions taken on the assessment, two top DER officials who signed the report admitted that they had never read it, while another admitted that the DER had not considered some of the most up-to-date evidence on the need for the project and possible alternatives.

Neverthless the report discusses all the major considerations in the planning of the project.

Bissinger, Tom, "Drums Along the Delaware", Common Ground, Summer, 1983, p. 22-28.

The article contains several interviews with opponents of the pump, including one with the chairperson of an organization fighting to preserve the East Branch of the Perkiomen Creek. The effects to the creek were dismissed in DER's environmental assessment as beneficial, but the interview reveals why this is probably not the case.

Field, Donald R., James C. Barron, Burl F. Long, Water and Community Development: Social and Economic Perspectives, Ann Arbor: Ann Arbor Science Publishers, Inc., 1974.

Papers collected in this volume include two which describe the sociological reaction to water resource management projects. Gordon L. Bultena's article "Dynamics of Agency-Public Relations in Water Resource Planning", and Courtland L. Smith's "Self-Interest Groups and Human Emotion as Adaptive Mechanisms" are useful in considering Del-AWARE's vehement opposal of the project.

Howe, Charles W., and K. Williams Easter, Interbasin Transfers of Water: Economic Issues and Impacts, Baltimore: The Johns Hopkins Press, 1971.

This book discusses the general issues involved in large interbasin transfers of water and concentrates on the economic aspects of such transfers. Most of the examples discussed are of a scale much larger than the Point Pleasant project, but the issues are still comparable. Of particular relevance is a section on the huge diversion of water from the Delaware taken to supply New York City.

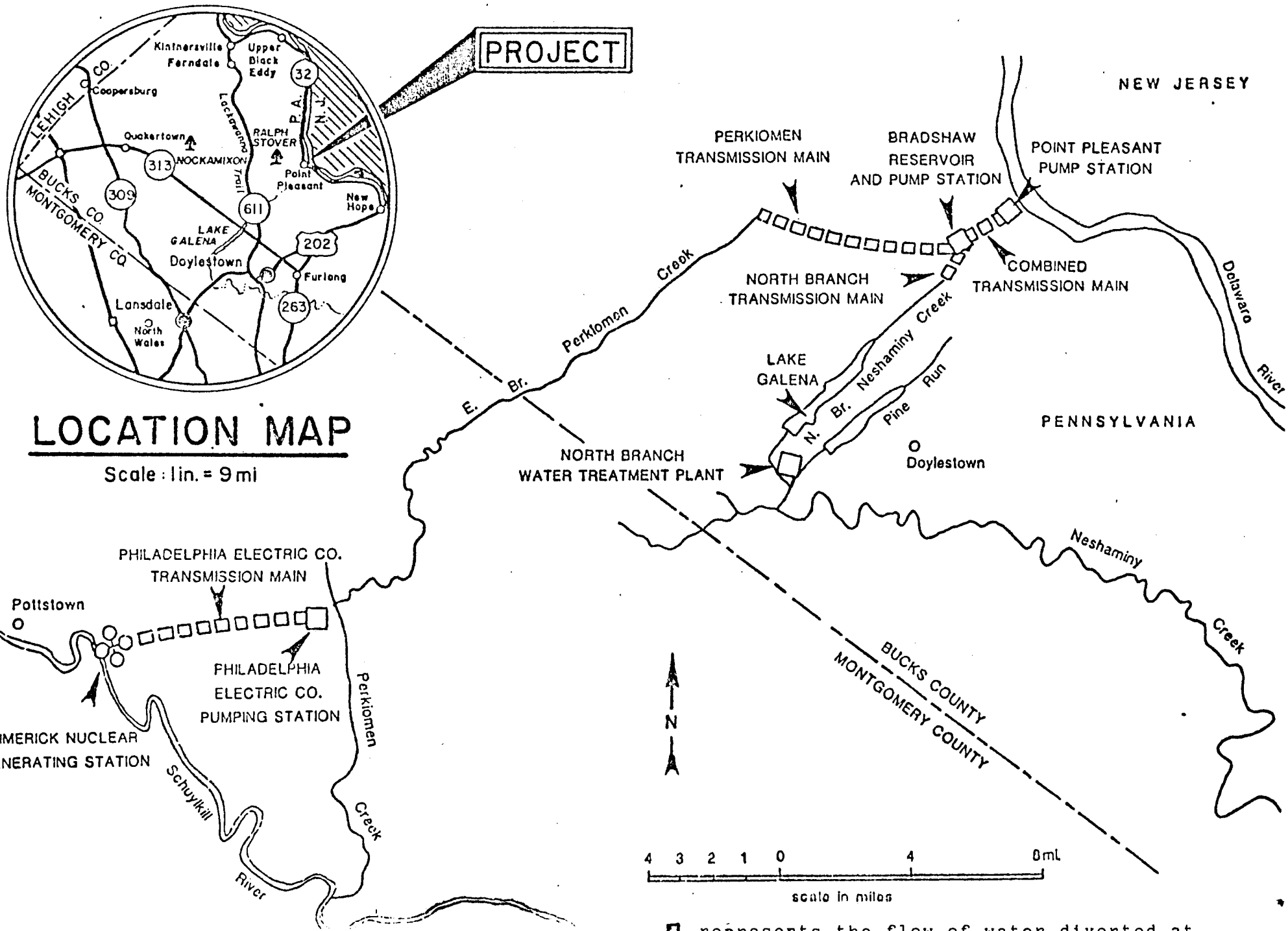
Kauffman, John M. Flow East, New York: McGraw-Hill Book Company, 1973.

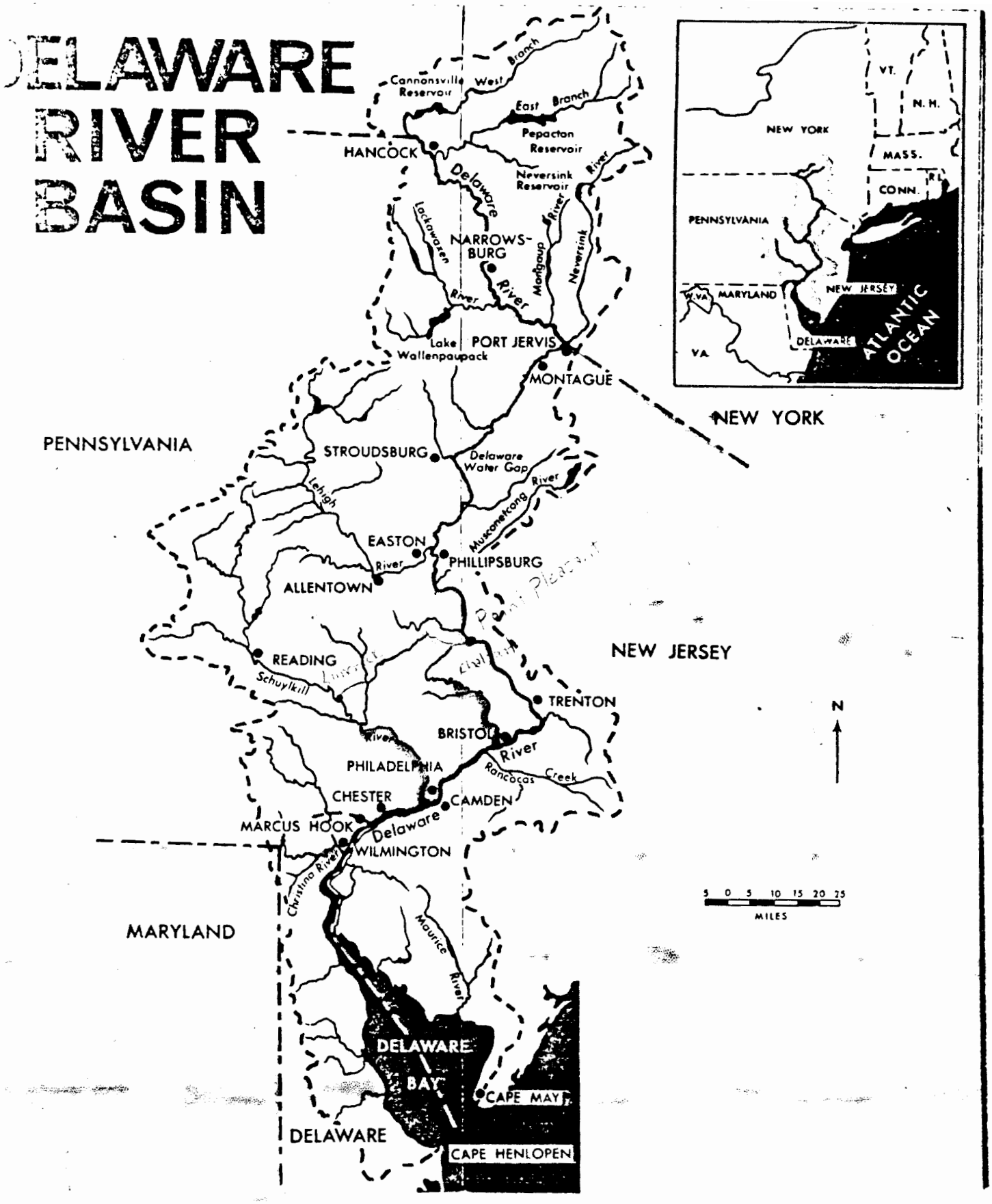
Palmer, Tim, Rivers of Pennsylvania, University Park: The Pennsylvania State University Press, 1980.

Both of the above were inspired by the author's love for the waterways they describe. Each describes the author's experiences along the rivers, along with occasional more detailed sections on the biology and the geology of the rivers. Both books include sections on the Delaware River and the issues of development in the watershed.

Various pamphlets from Del-AWARE and the Neshaminy Water Resources Authority were also helpful.

Council on Environmental Quality, The Delaware River Basin, August, 1975.


PROJECT
Klatnersville
Ferndale
Upper Black Eddy
32
LEHIGH CO.
Coopersburg
Lackawanna Trail
P.A.
N.J.
Quakertown
RALPH STOVER
313
NOCKAMIXON
Point Pleasant
BUCKS CO.
MONTGOMERY CO.
309
611
New Hope
LAKE GALENA
Doylestown
202
Furlong
Lansdale
North Wales
263
LOCATION MAP
Scale : 1 in. = 9 mi
NEW JERSEY
PERKIOMEN TRANSMISSION MAIN
BRADSHAW RESERVOIR AND PUMP STATION
POINT PLEASANT PUMP STATION
COMBINED TRANSMISSION MAIN
NORTH BRANCH TRANSMISSION MAIN
Perkiomen Creek
E. Br.
Neshaminy Creek
N. Br.
Pine Run
Delaware River
LAKE GALENA
PENNSYLVANIA
NORTH BRANCH WATER TREATMENT PLANT
Doylestown
PHILADELPHIA ELECTRIC CO. TRANSMISSION MAIN
Pottstown
PHILADELPHIA ELECTRIC CO. PUMPING STATION
Perkiomen Creek
LIMERICK NUCLEAR GENERATING STATION
Schuylkill River
Neshaminy Creek
BUCKS COUNTY
MONTGOMERY COUNTY
N
4 3 2 1 0 4 8mi
scale in miles
represents the flow of water diverted at Point Pleasant.



☐ shows those portions of the Schuylkill River and the Neshaminy Creek through which diverted water will be returned to the Delaware River. River mile 90 must be somewhere below where the Schuylkill empties into the Delaware.

Water flows in the "most upstream section" of the North Branch Neshaminy Creek, page 39, Environmental Assessment.

Table 3

	Q(cfs)	D(feet)	V(fps)
Median Flow	1.34	0.10	0.48
Median Flow + Point Pleasant Diversion	161.34	1.69	3.13
Mean Annual Flood	280.00	2.34	3.80
5-Year Flood	409.00	2.93	4.31
50-Year Flood	840.00	4.44	5.46
Median Flow + Point Pleasant Diversion under the Down-scaled Project[1]	77.34	?	? 3

[1]This chart projects the effects of the Project as it was planned in 1971. The revised figures were taken from the text accompanying the chart in the assessment.

Water flows in the East Branch Perkiomen Creek at the point of diversion, page 42, Environmental Assessment.

Table 4

	Q(cfs)	Depth (feet)	Velocity (fps)
Median Flow	1.4	0.15	0.61
Median Flow + Point Pleasant Diversion	66.4	1.30	3.02
Mean Annual Flood	320.0	2.6	5.1
5 - Year Flood	467.0	3.2	5.7
50 - Year Flood	960.0	4.1	6.6
Low Flow[2]	.05	.02	.17

[2]Figures for low flow were not included in the chart in the assessment, but were given in the text accompanying the chart.

Q = Flow in cubic feet per second
D = Depth of water in feet
V = Velocity of stream in feet per second