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May 13, 1986



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Mr. Samuel J. Chilk  
Secretary  
U.S. Nuclear Regulatory  
Commission  
Washington, D. C. 20555

In the Matter of  
Philadelphia Electric Company  
(Limerick Generating Station, Unit 1)  
Docket No. 50-352 *OC*

Dear Mr. Chilk:

For the Commission's information, I am enclosing a copy of two docket decisions entered by the Delaware River Basin Commission as Docket Nos. D-69-210 CP (Final) (Rev. Nos. 5 and 6) (April 29, 1986). The decisions are temporary docket revisions which during 1986 again permit substitution of dissolve oxygen limitations for existing temperature constraints and substitution of existing consumptive use allocations of Titus Generating Station, Units 1, 2 and 3 and Cromby Generating Station Unit 2 to Limerick Generating Station, and which permit obtaining water from two Borough of Tamaqua reservoirs under prescribed conditions.

Sincerely,

*Troy B. Conner, Jr.*  
Troy B. Conner, Jr.  
Counsel for Licensee

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cc: Service List

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DOCKET NO. D-69-210 CP (Final)(Revision No. 5)

DELAWARE RIVER BASIN COMMISSION

Philadelphia Electric Company  
Limerick Electric Generating Station  
Limerick Township, Montgomery County, Pennsylvania



PROCEEDINGS

The Philadelphia Electric Company (PECO) applied, on December 16, 1985, for a temporary modification of Docket No. D-69-210 CP (Final). The application was amended with a submission of supplemental information on January 22, 1986.

The application was reviewed for temporary revision of the project in the Comprehensive Plan and approval of these temporary changes under Section 3.8 of the Delaware River Basin Compact. A public hearing on this application by PECO was held by the DRBC on January 22, 1986. The hearing record remained open until 5:00 p.m. February 14, 1986. Twenty comments were received and entered into the hearing record on this application.

DESCRIPTION

Purpose.--The purpose of this application is to obtain temporary relief, through December 31, 1986, from two existing docket limitations and thereby increase the frequency that water may be withdrawn from the Schuylkill River for evaporation at Limerick Unit 1. The two existing limitations are: (1) PECO may not withdraw water from the Schuylkill River for evaporative use at their Limerick Station when the temperature rises above 59° F and (2) water for evaporative use may not be withdrawn from the Schuylkill River when the flow at Pottstown gage (not augmented by releases from Commission sponsored reservoir storage) falls below 530 cfs for one Limerick unit in operation. They requested temporary substitution of dissolved oxygen (DO) monitoring in place of temperature restriction in the original docket and they also requested the option of transferring the existing consumptive use of Schuylkill Basin waters from currently operating generating units on the Schuylkill River to the Limerick Unit 1 generating unit. This would allow the operation of the nuclear fueled unit in lieu of existing fossil fueled units when existing docket limitations would otherwise preclude consumptive use of the Schuylkill River water for the Limerick Generating Unit 1.

Location.--Existing intake facilities are located as follows:

<u>Intake</u>	<u>River Mile</u>
Titus	92.47 - 71.15
Limerick	92.47 - 48.22
Cromby	92.47 - 39.1

Dissolved oxygen monitors have been installed approximately 200 feet upstream of each of six dams and at the Limerick site.

The six dams are located as follows:

Fairmount Dam	92.47 - 8.49
Flat Rock Dam	92.47 - 15.6
Plymouth Dam	92.47 - 20.7
Norristown Dam	92.47 - 23.95
Black Rock Dam	92.47 - 36.6
Vincent Dam	92.47 - 44.7

Physical features

a. Design criteria.--The applicant proposes substitution of dissolved oxygen limitations of a daily average of 5.1 mg/l and 4.2 mg/l instantaneous in lieu of the current temperature limitation (59° F) in order to reduce the number of days that PECO would be required to replace evaporative losses or cut back the operation of the Limerick Unit 1. PECO has requested approval to withdraw water from the Schuylkill River for consumptive use at Limerick whenever flow conditions are met and DO values at five of the six designated stations exceed the 5.1 mg/l minimum daily average and the 4.2 mg/l minimum instantaneous values.

The applicant also proposes that when existing Schuylkill River flow constraints [Ref. DRBC Docket No. "D-69-210 CP (Final)"] or the above requested DO constraints restrict the consumptive use for Limerick Unit 1, operation of Units 1, 2 and 3 at the Titus Generating Station of the Metropolitan Edison Company and Unit 2 at the Cromby Generating Station of the Philadelphia Electric Company be curtailed as necessary to allow the equivalent consumptive use at the Limerick Generating Station.

Docket No. D-74-32 (Revised), approved on October 8, 1980, acknowledged that the addition of a cooling tower at the Titus Station would result in a maximum consumptive use of 3.5 mgd.

The Cromby Generating Station was operating prior to the formation of the DRBC and the water use has not subsequently been substantially altered. Accordingly, there are no docket decisions establishing the consumptive use at that station. However, in 1976, the DRBC issued a Certificate of Entitlement to PECO establishing the quantities of water that could be used at the Cromby Station and not be subject to DRBC water use charges. The entitlement established a quantity of 88.401 mg/month (2.9 mgd) for the Cromby Station. Proportioning the total consumptive use between Unit 1 (150 mw) and Unit 2 (201 mw) indicates that up to 50.628 mg/month (1.7 mgd) is the maximum consumptive use for Unit 2.

Transferring the 3.5 mgd from Titus Units 1, 2 and 3 and 1.7 mgd from Cromby Unit 2 would provide up to 5.2 mgd for consumptive use at Limerick. This 5.2 mgd, if used for operation of Limerick Unit 1, would enable the Unit to generate power at levels up to approximately 25 percent of full power.

b. Facilities.--All existing facilities of the Limerick Electric Generating Project remain as approved by Dockets Nos. D-69-210 CP (Final) and D-69-210 CP (Final)(Revised). No new facilities are required at the existing Titus or Cromby generating stations. The DO monitors were installed as described in DRBC Docket No. D 69-210 CP (Final)(Revised), which was approved on May 29, 1985 and expired on December 31, 1985.

Cost.--There are no construction costs associated with the implementation of this project.

Relationship to the Comprehensive Plan.--The applicant is requesting revision of the Limerick Generating Station Project as included in the Comprehensive Plan by Docket No. D-69-210 CP (Final).

#### FINDINGS

The Limerick Generating Station was included in the Comprehensive Plan by Docket decision No. D-69-210 CP (Final) on November 5, 1975, which also incorporated the project description and docket decision D-69-210 CP dated March 29, 1973. Docket No. D-69-210 CP (5/29/73) includes a section headed "FINDINGS" subheading "Source of Water Supply 1. Schuylkill River" which reads as follows:

"Schuylkill River water at the plant site may be used for nonconsumptive use whenever the effluent discharged back to the river meets all applicable water quality standards.

"Schuylkill River water at the plant may be used for consumptive use when flow (not including future augmentations of flow from Commission-sponsored projects) as measured at the Pottstown gage is in excess of 530 cfs (342 mgd) with one unit in operation and 560 cfs (362 mgd) with two units in operation with the following exceptions:

"(a) There shall be no withdrawals when river water temperatures below the Limerick station are above 15° C except during April, May and June when the flow as measured at the Pottstown gage is in excess of 1791 cfs (1158 mgd).

"(b) Use of the Schuylkill River will be limited to a withdrawal that will result in an effluent that meets all applicable water quality standards.

"The constraints on nonconsumptive use of Schuylkill River water are necessary to prevent violation of total dissolved solids, stream quality objectives and effluent quality requirements of the Commission's water quality regulations. The constraint on consumptive use of Schuylkill River water is to protect water quantity and water quality below the Limerick Station. Both sets of constraints would be suspended in the event of any operational emergency requiring a shutdown of the plant."

As part of the docket decision No. D-69-210 CP (Final)(Revised) paragraph (a) above was revised for the period ending December 31, 1985, to read as follows:

"(a) No withdrawals for consumptive use shall be made from the Schuylkill River or the natural flow of any of its tributaries whenever dissolved oxygen in the Schuylkill River at or below Limerick as measured at any one or more of the monitoring locations: (i) is less than 7.0 mg/l instantaneous during the period March 1 to June 15, or (ii) is equal to or less than 5.1 mg/l daily average or equal to or less than 4.2 mg/l instantaneous value during the remainder of the year."

Monitoring data collected between August 9 through November 30, 1985, shows that there were 31 more days that Schuylkill River water was available for consumption using the D.O. limitation in lieu of the existing temperature limit. If the D.O. limit had been in effect for all of 1985, the record indicates a gain of 58 days when Schuylkill River water would have been available for consumptive use at Limerick.

PECO has requested that the proposed D.O. limits be met at five out of six monitoring points noting that individual monitoring sites may be impacted by localized conditions resulting from point source discharges.

However, one of the purposes of the original 59° F temperature limitation was to prohibit any further degradation of D.O. during low D.O. conditions, by allowing depletion of streamflow via consumptive use at Limerick. Regardless of the cause of low D.O. at any one of the monitoring sites, depletion of streamflow by consumptive use at Limerick could aggravate the D.O. problem.

PECO has also requested that the proposed D.O. limits of 5.1 mg/l average and 4.2 mg/l instantaneous apply throughout the year and have stated that a more restrictive limit during the fish spawning season is overly conservative.

In the previous temporary approval to substitute D.O. limits for temperature during 1985, a limit of 7.0 mg/l from March 1 to June 15 was included in response to the recommendation of the Pennsylvania Fish Commission (PFC). In response to this pending application for 1986, the PFC, under date of January 17, 1986, requested that additional monitoring stations be required towards the head end of Plymouth, Norristown and Black Rock pools to monitor the D.O. and to use the limit of 7.0 mg/l as measured at those sites during the March 1 - June 15 period to keep those areas suitable for spawning of smallmouth bass. In a subsequent letter dated April 4, 1986, the PFC stated the D.O. limits in game fish spawning areas should be an average of 7.0 mg/l and a minimum of 6.0 mg/l.

Approval of the portion of the application to transfer existing consumptive use from Titus and Cromby to Limerick and allow the transferred consumptive use by Limerick Unit 1 to occur regardless of the existing docket constraints also requires revision of the project in the Comprehensive Plan and approval of those revisions under Section 3.8 of the Compact.

The Titus Generating Station is two miles downstream from Reading, Pa. and approximately twenty-three miles upstream from the Limerick Generating Station. Accordingly, any cutbacks in the consumptive use at Titus and transfer for consumptive use at Limerick will increase the quantity of streamflow in the Schuylkill River from Titus to Limerick. The flow increase for the twenty-three mile segment would be a maximum of 3.5 mgd (5.4 cfs).

Cromby Generating Station is located approximately nine miles below the Limerick facilities and conversely, the cutback in consumptive use at Cromby and transfer for consumptive use at Limerick will decrease the quantity of streamflow in the Schuylkill River from Limerick to Cromby. The decrease in streamflow could be a maximum of 1.7 mgd (2.6 cfs). This represents approximately one percent of the  $Q_{7-10}$  flow for that section of the Schuylkill River. Below Cromby there would be no change in the flow regime caused by the proposed transfer.

The transfer of the location of the consumptive use from Titus to Limerick will result in a slight lowering of total dissolved solids level in the Schuylkill River between Titus and Limerick. At a flow of 360 cfs and with the Titus units operating, the TDS level averages about 375 mg/l and calculations indicate that if the three units were shut down, the TDS should drop to 370 mg/l. At Limerick, when operating with a consumptive use of 5.2 mgd, the TDS would increase from 370 mg/l to 378 mg/l and below Cromby there should be no change in TDS resulting from the proposed transfer.

Titus Units 1, 2, and 3 are coal fired, having an electric generating capacity of 234 mw and Cromby Unit 2 is oil fired and has an electric generating capacity of 201 mw. If the three Titus units and Cromby Unit 2 are all shut down and Limerick Unit 1's generating capacity is limited to the transferred consumptive use (250 mw), there will be a net reduction of generating capacity of 185 mw. The applicant has indicated this loss of generating capacity, if needed, will be replaced with power generated with no additional consumption of Delaware Basin water.

The net effect on fuel and interchange costs resulting from the proposed transfer range from a savings of \$3.5 million/month to an additional cost of 0.7 million/month. The savings would occur if the 185 mw could be purchased from economical units outside the Delaware River Basin. The additional cost was computed assuming a 10 percent reduction in consumptive use was in effect and the 185 mw were generated within the Delaware Basin by gas turbines.

The PJM (Pennsylvania, New Jersey and Maryland) Interconnection system has reviewed the PJM load and capacity situation for 1986 summer peak load conditions and considered the reduction of 185 mw in PJM generating capacity and concluded that the temporary loss of capacity associated with this application will not cause the PJM system to be short of capacity to meet the demand. Additionally, if needed, PECO has agreed that in the event of a PJM shortage, they would curtail Limerick and allow Titus and Cromby to resume operation as needed to meet demands.

#### DECISION

I. The Comprehensive Plan of the DRBC as amended by Docket No. D-69-210 CP (Final) on November 5, 1975, is hereby revised as follows:

- (1) For the period ending December 31, 1986, the provisions of Docket No. D-69-210 CP, [attached and included as part thereof to D-69-210 CP (Final)] headed "FINDINGS," "Sources of Water Supply," "1. Schuylkill River" paragraph "(a)" on page 5 are temporarily suspended, and in place thereof the following provision is substituted:

"(a) No withdrawals for consumptive use shall be made from the Schuylkill River or the natural flow of any of its tributaries whenever dissolved oxygen (i) is less than 7.0 mg/l daily average or 6.0 mg/l instantaneous during the period March 1 to June 15 at any one of the monitoring sites in riffle spawning areas located below Limerick approved by the Executive Director in consultation with the Pennsylvania Fish Commission (PFC) or (ii) is equal to or less than 5.1 mg/l daily average or equal to or less than 4.2 mg/l instantaneous value at any of the six existing monitoring stations temporarily approved by DRBC Docket No. D-69-210 CP (Final)(Revised).

- (2) For the period ending December 31, 1986, the provisions of Docket No. D-69-210 CP, [attached and included as part thereof to D-69-210 CP (Final)] headed "FINDINGS," "Source of Water Supply," "1. Schuylkill River" is further revised by the addition of a new paragraph "(c)" on page 5 which reads as follows:

- "(c) Water may be withdrawn for consumptive use at Limerick whenever the consumptive use at Titus Generating Station or the Cromby Generating Station has been curtailed. The consumptive use at Limerick shall not exceed the volume equal to a quantity saved by the curtailment of generating units at Titus and/or Cromby generating stations. The maximum quantity that can be considered saved in this process is 3.5 mgd at Titus and 1.7 mgd at Cromby."
- (3) For the period ending December 31, 1986, the following conditions shall be added to the provisions of Docket No. D-69-210 CP (Final), "DECISION" on page 15, subheaded "II.":
- "o. Accurate dissolved oxygen measurements shall be taken at all sites designated by the Executive Director in consultation with the PFC from March 1 to June 15.
- "p. Detailed plans of the location of each new dissolved oxygen monitoring site shall be submitted to and approved by the Executive Director and the PFC.
- "q. The calibration, maintenance and operation of all dissolved oxygen monitors and any interim manual measurements of dissolved oxygen shall be under the supervision and control of the U.S. Geological Survey.
- "r. Weekly records of all dissolved oxygen monitoring shall be submitted to the Commission in writing within three working days, together with a log of power plant operations and consumptive water use. Such information shall be a matter of public record.
- "s. PECO shall immediately notify the Commission whenever dissolved oxygen levels at any monitoring station trigger the criteria set forth in this docket, and advise the Commission of all alternative steps taken.
- "t. Philadelphia Electric Company shall maintain accurate records of all water withdrawals and discharges at the Limerick generating plant. The time of any change in the rate of water withdrawal must be recorded. PECO shall maintain records of water withdrawals at the Cromby generating station. The time of any change in the rate of withdrawal due to a change in the operation of Unit 2 shall be recorded.

- "u. PECO shall arrange for Metropolitan Edison Company to maintain accurate records of all water withdrawals at the Titus generating station. The time of any change in the rate of water withdrawal due to a change in the operation of Units 1, 2 and 3 shall be recorded. This information shall be submitted to PECO and a copy to DRBC each time there is a change in the operation of Units 1, 2 and 3.
- "v. PECO will compile the information recorded for the Limerick and Cromby plants together with the information supplied by Metropolitan Edison Company for the Titus plant, into a format that clearly demonstrates compliance with the operating requirements of this docket.
- "w. Water may not be withdrawn for use at Limerick in lieu of operating Titus Units 1, 2 and 3 unless Titus Units 1, 2 and 3 have not operated for the previous 10 hours.
- "x. Water may not be withdrawn for use at Limerick in lieu of operating Cromby Unit 2 unless Cromby Unit 2 is reduced within 5 hours of the use of the transferred water at Limerick.
- "y. PECO will notify DRBC staff by telephone each time there is a change in the operation of Titus Units 1, 2 and 3 and/or Cromby Unit 2 operations as a result of the conditions imposed by this docket. The notification shall be in advance or at the time of the change. In addition, PECO will submit to DRBC a copy of all recorded information once each week.

If, at any time, the Executive Director determines that the proposed project is not operating as planned or is causing substantial impacts on the water resources of the Basin, he may cancel or suspend this approval and all operation thereunder shall terminate until subsequent action by the Commission."

- (4) The provisions set forth in paragraphs (1), (2) and (3) above shall terminate on December 31, 1986, unless otherwise extended or directed by the Commission, and all provisions of Docket No. D-69-210 CP temporarily suspended by this docket shall become operative in full force and effect.

II. The above revisions of the Limerick Nuclear Generating Station project are approved pursuant to Section 3.8 of the Compact, subject to the conditions listed above.

BY THE COMMISSION

DATED: April 29, 1986

DOCKET NO. D-69-210 CP (Final) (Revision 6)

DELAWARE RIVER BASIN COMMISSION

Philadelphia Electric Company  
Limerick Electric Generating Station  
Limerick Township, Montgomery County, Pennsylvania

Reading Anthracite Company  
Diversion from Beechwood Pool  
New Castle Township, Schuylkill County, Pennsylvania

Borough of Tamaqua and  
Tamaqua Borough Authority  
Diversion from Still Creek and Owl Creek Reservoirs  
Rush Township and Rahn Township, Schuylkill County, Pennsylvania



PROCEEDINGS

The Philadelphia Electric Company (PECO), jointly with the Reading Anthracite Company (RAC), the Borough of Tamaqua (BOT) and Tamaqua Borough Authority (TBA), applied on March 4, 1986, for an additional temporary modification of Docket D-69-210 CP (Final).

The application was reviewed for temporary revision of the project in the Comprehensive Plan and approval of these temporary changes under Section 3.8 of the Delaware River Basin Compact. A public hearing on this application was held by the Delaware River Basin Commission (DRBC) on April 15, 1986, and the record remained open until April 21, 1986. In addition, the hearing record compiled in connection with the DRBC's January 22, 1986, hearing on PECO's application, known as "Revision No. 5," was incorporated into and considered part of the hearing record for this application.

DESCRIPTION

Purpose.— The purpose of this joint application is to request approval for the diversion, through December 31, 1986, of water from upstream storage facilities for discharge into the Little Schuylkill River and the West Branch Schuylkill River for subsequent withdrawal and consumptive use by Unit 1 at the Limerick Generating Station. The application requests that use of the water withdrawn from storage not be subject to the current limitations imposed by DRBC docket decisions.

Location.-- No changes are proposed in the location of any existing facilities associated with the application and the only new construction proposed is the discharge from Beechwood Pool.

Still Creek Reservoir is located in Schuylkill County, 2.3 miles north of Hometown, Pa., and approximately 5000 feet above the confluence of Still Creek and the Little Schuylkill River, in Rush Township, Schuylkill County. The existing dam is located at River Mile 92.47 - 102.1 - 30.15 - 1.0.

The Owl Creek Reservoirs are located approximately 1.5 miles southeast of the Borough of Tamaqua in Rahn Township, Schuylkill County. The existing dams are located at River Miles 92.47 - 102.1 - 22.1 - 1.7 and 92.47 - 102.1 - 22.1 - 2.3.

Beechwood Pool is located adjacent to the West Branch Schuylkill River in the southwest corner of New Castle Township, Schuylkill County, Pennsylvania.

The water diverted from Beechwood Pool would be discharged 0.2 mile downstream from the pool at River Mile 92.47 - 119.65 - 9.5.

#### Physical features

a. Design criteria.-- The applicants propose that when existing Schuylkill River flow constraints [Ref. DRBC "Docket No. D-69-210 CP (Final)"] or dissolved oxygen limitations [Ref. DRBC "Docket No. D-69-210 CP (Final)(Revision 5)"] restrict the consumptive use of Schuylkill River water for Limerick Unit 1 to the quantity transferred from reduced operation at Titus and Cromby Generating Stations [Ref. DRBC "Docket No. D-69-210 CP (Final)(Revision 5)"], water would be released from Tamaqua reservoirs and at times, the release would be supplemented with diversions from Beechwood Pool such that the total quantity would be equal to or greater than that needed to replace the consumptive use the Limerick Unit 1.

The applicants propose to release water from Still and Owl Creek Reservoir and from Beechwood Pool in a coordinated plan designed to minimize the impacts of the high total dissolved solids (1708 mg/l) in Beechwood Pool. The application proposes to release high quality water (TDS = 32 mg/l) from Still and Owl Creek Reservoirs and divert limited quantities of Beechwood Pool water and claims that after mixing downstream the proposed project will not only maintain the water quality of the Schuylkill River, but will improve it under certain low flow conditions.

The application reports that the Still and Owl Creek Reservoirs, at the headwaters of the Schuylkill River, have sufficient capacity to supply the needs of the Tamaqua area and to provide an additional billion gallons of water in 1986 to PECO and to supplement this by some 300 million gallons of water from the Beechwood Pool which would go a long way to supplying the additional consumptive needs of Limerick under moderate drought conditions.

The applicants proposed operating plan includes the following limitations:

1. No Beechwood Pool water will be discharged to the West Branch of the Schuylkill River when the natural flow of the Schuylkill River at Pottstown is below 400 cfs.
2. The use of Beechwood Pool water will be adjusted or cut off so as to maintain less than 455 ppm TDS at the Citizens Home Water intake below Limerick.
3. The maximum Beechwood Pool pumpage will be 7 cfs and will be less than 30 percent of the total Tamaqua/Beechwood discharges.
4. Three percent more water will be discharged from Tamaqua than is required to allow for potential losses in transit.

The applicants' proposed operating plan for supplying cooling water for consumptive use by Limerick Unit 1 during 1986 is:

- "1. Withdraw water from the Schuylkill River when the flow, as measured at the Pottstown gage, is greater than 530 cfs and temperature, as measured at the Linfield Bridge, is less than 59° F. Should the measurement of dissolved oxygen in lieu of temperature be approved, shift to withdrawing water as long as flow and D.O. values are satisfactory. Use past experience to judge when flows or D.O. might not be satisfactory and be prepared to shift to alternate sources.
- "2. Release 14 cfs from Tamaqua and 5 cfs from Beechwood when it is predicted flow or D.O. conditions may reach restrictive limits. Allowance must be made for the flow transit time of 3 days. Thus, when natural Schuylkill River flows drop to the neighborhood of 600 cfs or D.O. readings drop to about 1 ppm above the cut off point, reservoir releases will be made even though they may not be required.
- "3. Alert Titus and Cromby personnel that shutdowns may be required to make their allocations available to Limerick. The flow time of 10 hours can be accommodated by using water stored on site and/or by reducing unit output from 100 to 75 percent. This power adjustment can be made in less than 2 hours.
- "4. When needed, continue reservoir releases at paragraph 2 values for a minimum of 2 weeks so that data may be taken relative to reservoir performance and stream conditions.

- "5. For the following 2 week period of need, release 20 cfs from Tamaqua and 7 cfs from Beechwood, thereby releasing Titus and Cromby units for service and eliminating the approximate \$1 million/month fuel cost penalty incurred through these units not operating. Monitor reservoir and stream conditions.
- "6. Future periods of need would be met by either the plan of paragraph 4 or 5 depending on the total supplemental water used to date and the projected requirements for the balance of the summer. As a general rule, a combined total of 15 to 20 cfs will be released from Tamaqua and Beechwood whenever the docket approved levels of flow and D.O. are in jeopardy of being reached. Due to the unpredictable variation in D.O. levels historically experienced during the summer months, it is anticipated that releases may be required for the majority of the summer period. Pre-releasing water will assure that only modest power reductions will be required when permissible withdrawal limits are reached. The transfer of the Titus and Cromby allocations would then be made and river augmentations increased. The on-site storage volume will permit power production to continue while a transfer is made to the use of the Titus-Cromby allocations since the storage is equivalent to two days use of such allocations."

Using the above operating plan, the applicant has projected the impact on total dissolved solids (TDS) above and below the Limerick discharge for the three release combinations as proposed under various low flow conditions and obtained the following:

TABLE A

Schuylkill River Flow (cfs)	Pottstown		TDS above/below Limerick (ppm)		
	Maximum Natural TDS (ppm)		Augmented flow (cfs)		
		27	20	14	Tamaqua
		<u>0</u>	<u>7</u>	<u>5</u>	Beechwood
550	395	378/396	398/417	392/411	
500	405	386/406	408/430	401/423	
450	415	393/416	418/442	410/435	
400	428	403/430		422/451	
350	438	409/440	Unacceptable		
300	450	415/452			

The Still Creek and Owl Creek Reservoirs, owned by the Borough of Tamaqua, are used for municipal water supply. Consulting engineers for Tamaqua, estimated that Tamaqua has an excess stored water supply of about 1.35 billion gallons, of this amount, it is estimated that 1 billion gallons could be made available for PECO's consumptive use during 1986.

The Tamaqua reservoir system consists of three sources, namely, Still Creek Reservoir and two Owl Creek Reservoirs. Due to their close proximity to one another, the two Owl Creek Reservoirs are assumed to function as a single reservoir of combined capacity.

b. Facilities.-- The Still Creek Reservoir is formed by an earthfill dam, with an ungated concrete spillway at elevation 1,182.0 feet. The capacity at the spillway elevation is 8,290 acre-feet or 2,700 million gallons (mg) of water; 2,630 mg of which is estimated to be active storage. Still Creek has a surface area of 332 acres and is 77 feet deep. The Still Creek drainage area is 6.9 square miles.

The Owl Creek Reservoirs have a combined capacity of 332 mg, 299 mg of which is estimated to be active storage. Upper Owl Creek Reservoir has a surface area of 67 acres and is 35 feet deep. Lower Owl Creek Reservoir has a surface area of 26 acres and is 30 feet deep. The Owl Creek drainage area is 2.0 square miles.

Discharges from the Still and Owl Creek Reservoirs, for Tamaqua's use, are made directly through pipelines to the municipal water system. Treatment at the point of discharge includes chlorination and the addition of zinc compound for corrosion protection of the piping system.

The amount of water released into Still and Owl Creeks will be within the capacity of the receiving streams. Spill records for both Still and Owl Creek Reservoirs indicate that, in the course of a year, the receiving streams regularly carry more water than the 28 cfs maximum release for Limerick (27 cfs for consumptive use plus a 3 percent allowance for losses). From 1981 through 1985, 5 to 18 percent of the spill releases per year from Still Creek were in excess of the proposed maximum release for Limerick. No erosion or other adverse effects were observed by the reservoir operator as a result of these spills.

Discharges from Still Creek Reservoir will be made through an existing discharge channel which is approximately 175 yards long. This consists of a concrete section about 80 feet long. The remaining distance along Still Creek to the point where the spillway water is reintroduced into the creek is an excavated channel. This discharge channel is approximately 35 feet wide and 10 to 12 feet deep. The channel gets larger at its point of intersection with the spillway flow. The discharge channel was originally built to allow emergency releases from the reservoir to the creek. It can easily handle Limerick's required releases. The Still Creek stream channel from the spillway outfall to the mouth is large; the bottom and sides are comprised mostly of rock and boulders. No major erosional effects are expected due to the release of water for Limerick.

The release of water from the Still and Owl Creek Reservoirs will require installation of additional release control facilities added to the existing outlet pipes through the Reservoirs to regulate discharges to the Little Schuylkill River.

The abandoned strip mine pit known as "Beechwood Pool" is approximately 2500 feet long, 1000 feet wide, up to 300 feet deep at the maximum dimensions and is estimated to contain 2.2 billion gallons of water. The concentration of total dissolved solids (TDS) in the pit water is considerably higher than the TDS concentration in the West Branch Schuylkill River adjacent to the pool. The application proposes to discharge the diverted pool water 0.2 mile downstream at the point where acid mine drainage enters the West Branch Schuylkill River.

The release of water from the Beechwood Pool will require installation of rental pumps in the Beechwood Pool. These would discharge into a pipeline that is already in place from the pool to the West Branch Schuylkill River.

All existing facilities of the Limerick Electric Generating Project remain as previously approved. No new facilities are proposed at the Limerick site as part of this application.

Cost.— The new outlet pipes at the Tamaqua Reservoirs are estimated to cost \$60,000. The discharge pipeline at Beechwood Pool is in place and the installation of rental pumps is estimated to be \$5,000. Design, supervision and legal costs are expected to add \$30,000 for a total project cost of \$95,000.

#### FINDINGS

The applicant has evaluated the various combinations of the alternatives being considered and the resulting economic penalties attributed to reduced operation of Limerick if 1986 is a repeat of the flows and temperature/oxygen levels recorded during 1985.

#### Operational Restrictions for Equivalent Drought of 1985

<u>Additional Water Available</u>	<u>Equivalent Full Power Days of Operation</u>	<u>Equivalent Shutdown Days</u>
None-No Approvals	0	166
Still & Owl Creek Reservoirs	57	109
Still & Owl Creek Reservoir, Beechwood Pool	74	92
Still and Owl Creek Reservoirs, Cromby-Titus, <u>No</u> Beechwood Pool	102	64
Still and Owl Creek Reservoirs, Beechwood Pool, Cromby-Titus	121	45

The applicants' evaluation indicates that Still and Owl Creek Reservoirs alone can supply Limerick for 57 days of anticipated and actual needs. Adding Beechwood increases this to 74 days. Using the allocation of Titus and Cromby on all 166 days of postulated shortage together with the 1 billion gallons of Tamaqua water increased the number of days covered to 102. Adding Beechwood increases this to 121 days.

The applicants have assumed an operating plan which requires releases, based on predictions of flow at Pottstown, up to 3 days in advance to accommodate the travel time from Tamaqua's reservoirs to Limerick. Based on their proposed plan of operation, they have assigned 0.35 billion gallons of available storage to be used for losses and wastage. If all of the 0.35 bg could be used when needed and not wasted, it would provide an additional 20 days and combined with Cromby and Titus transfers, could provide the equivalent of 28.5 days of full power operation.

The water quality of Still Creek Reservoir is very good throughout the pool. No major adverse water quality effects are expected due to drawdown of the reservoir. There does not appear to be any significant point sources of pollutants within the watershed that would be diluted less by the reduced pool volume. An aeration system is in constant use in the near-dam (deepest water) part of the pool. This system was installed to solve certain water quality problems associated with summer stratification and hypolimnetic deoxygenation. The aeration system assures that the subsurface waters are oxygenated, appears to prevent stratification, and promotes circulation of virtually the entire water mass in the lower half of the pool. It is likely that the upper part of the pool does not have seasonal stratification due to, among other things, its shallow depth. No bottom sediment-related problems have been encountered since installation of the aeration system and alleviation of anoxic bottom water conditions.

Still Creek dam is protected with stone riprap and the lower half of the reservoir has mostly a gravel rubble with sand shoreline. Periodic drawdowns have revealed no major erosion problems. However, the applicants will initiate a water quality monitoring program if the drawdown becomes greater than 10 feet. The applicants have considered the impacts on the aquatic environment and determined no long-term or major impacts.

An assessment of the conditions of the Still and Owl Creek Dams under expected drawdown conditions was performed by the applicants. This assessment is based on available data including the Phase I Inspection Reports for each dam prepared by the Corps of Engineers, construction drawings, and visual inspections in 1985. Based on available knowledge of the construction of Still Creek Dam and the upstream slope (1 on 2.5), a drawdown at a rate not exceeding 0.3 foot per day appears satisfactory to enable the embankment to withstand drawdown conditions. A drawdown of 26 feet has been proposed as the maximum allowable drawdown due to releases for Limerick Unit. 1. The applicants claims a 26 foot drawdown to elevation 1,156 feet provides a remaining water supply to enable the Borough of Tamaqua to have an adequate water supply in the event of a number of years of drought conditions. If further drawdowns are necessary to meet Tamaqua's demands, the drawdown will be at a much lower rate and will not adversely affect embankment stability.

Due to the steep upstream slope of the Lower Owl Creek Dam (1 on 2) and the fact that the embankment has been modified several times, the maximum drawdown of the Lower Owl Creek Reservoir will not exceed 10 feet at a rate not exceeding 1.0 foot per day. Due to the steep upstream slope of the Upper Owl Creek Dam (1 on 2) and the fact that the Phase I Inspection Report indicated poor workmanship relating to the embankment, the maximum drawdown of the Upper Owl Creek Reservoir will not exceed 10 feet at a rate not exceed 0.5 foot per day.

Drawdown of the Upper Owl Creek Reservoir is not expected to have any significant adverse effects on the water quality or biota for much the same reasons as discussed for Still Creek Reservoir. Both the Upper and Lower Owl Creek Reservoirs have been drawn down to the maximum allowable drawdown proposed due to PECO releases (10 feet) on a periodic basis with no adverse effects observed by Tamaqua officials. The water quality in the Owl Creek reservoirs and in Owl Creek is excellent. Pickerel, sunfishes, minnows, suckers, and bullhead are known to be present in both pools.

The Beechwood Pool is a former strip mine and the application acknowledges the water diverted from the pool would contain approximately 1708 mg/l of TDS. Accordingly, any diversion of the Beechwood Pool water into the Schuylkill River Basin would result in significantly higher TDS concentrations in the receiving downstream waters and the application proposes to mitigate the high TDS water by making simultaneous releases of water containing very low TDS. While the concept appears simple, there are several problems with the proposed plan of operation.

#### Impact on the West Branch Schuylkill River

The water from Beechwood Pool will be pumped into the West Branch of Schuylkill River more than 9 miles upstream from its confluence with the Little Schuylkill River. Accordingly, the West Branch of Schuylkill River, which already has high TDS during low flows due to mine drainage, would have significantly higher TDS when water is diverted from Beechwood Pool.

Very limited low flow data is available for the West Branch Schuylkill River in the area near Beechwood Pool or at the proposed point of discharge. However, the Pennsylvania Department of Environmental Resources (PADER), using an areal relationship with a downstream gaging station at Cressona, has estimated the  $Q_{7-10}$  to be 2.7 cfs at the point of discharge.

PADER has collected some TDS data on the West Branch at Cressona, which is 9.0 miles downstream. No simultaneous flow data was collected. Using data collected during July and August (29 values) as representing low flows, the TDS averaged 541 mg/l.

Adding 7 cfs of water from Beechwood Pool would cause the TDS in the West Branch to increase more than 250 percent.

Section 3.10.3A.1.b. of DRBC's Basin Regulations - Water Quality as included in the Comprehensive Plan limits the increase of TDS in any stream to 133 percent of background. The applicant's proposed plan of operation would conflict with the Comprehensive Plan.

#### Impact on downstream uses

The applicant has stated that the proposed plan of operation will not cause the TDS concentration in the Schuylkill River at Pottstown to be any higher than it would be without the proposed plan of operation. (Ref. Table A, page 4 above and/or Table 2, page 5 of PECO's Response to Comments on Its Application for DO Measurements in Lieu of Temperature--Its use of Titus-Cromby Allocations and use of Tamaqua and Beechwood Water). In the same table, the applicant has also computed the impact on TDS concentrations downstream of Limerick when Unit 1 is allowed to operate at these low flows. It should be noted that when just Tamaqua water has been released, there is essentially no change. However, in each operating mode where water would be pumped from Beechwood Pool, the TDS concentration downstream of Limerick would significantly increase above that which would occur under existing approvals. This would be a significant increase in concentration of TDS in the water available to all downstream Schuylkill River water users.

#### Ability to operate plan as proposed

The application recognizes some of the difficulties in operating facilities which are separated by more than 77 stream miles and in addition, must not cause stream quality degradation in areas which are more than 124 miles downstream of the requested controls. The proposed operating plan (Ref. page 3 above) states that releases will commence based on predicted conditions with a 3-day travel time allowance and states that releases will be made even though they may not be required.

The plan does not recognize the travel time required to regulate the concentration of TDS at the critical locations downstream. Figure 24 on page 48 of a Pennsylvania report titled, "Water Resources of the Schuylkill River Basin," prepared cooperatively by the U. S. Department of Interior's Geological Survey in 1968 indicates the travel time for a chemical constituent under various flow conditions. Unfortunately, the study began at Berne and the results must be extrapolated upstream almost 40 miles for Beechwood Pool and, therefore, must be considered an approximation. At flows of 520 cfs and 340 cfs at Pottstown, the travel times should be around 210 and 275 hours, respectively. Trying to extrapolate to a  $Q_{7-10}$  (250 cfs) indicates the travel time would probably be in excess of 300 hours.

With these very long times of travel for TDS control and only approximately 3 days travel time for a wave of flow, any operation plan that adequately protected against increased TDS or degradation at the existing users would waste more water than the quantity gained by the use of Beechwood Pool.

Releases from Tamaqua reservoirs only will actually reduce the TDS levels that would otherwise occur upstream of Limerick and will not cause any degradation of TDS downstream of Limerick from that which would have existed without Limerick Unit 1 and without the proposed releases. Use of water from Tamaqua reservoir would have nearly the same impacts downstream of Limerick as using the approved diversion from the Delaware River.

PADER, Bureau of Water Resources Management, has reviewed this application including all attachments and has developed an operating curve for Still Creek Reservoir to protect Tamaqua's available water supply since, in an extended drought, Still Creek Reservoir, unlike the Owl Creek Reservoirs, was found not to refill each year. This curve, attached hereto and marked Attachment No. 1, indicates when releases for downstream withdrawals at Limerick must be discontinued to insure an adequate supply of water for public use in Tamaqua. This curve was developed by routing 1964, 1965 and 1966 hydrology through Still Creek Reservoir along with Tamaqua public water supply demands of 6.25 mgd from Still Creek. These demands alone pulled Still Creek Reservoir down by 1.196 billion gallons over a 19-month period. The shape of the curve reflects Tamaqua's actual drawdown during the 1965-1966 12-month critical period. A safety factor of approximately 800 million gallons of storage (1/3 of total storage) was applied to the curve for contingencies including more severe drought conditions, maintenance of aquatic life, possible additional siltation losses and unexpected problems that could arise from low reservoir levels not previously experienced. The bottom part of the curve was found to be some 120 million gallons higher than the bottom part of the Gannett-Fleming analysis which allows drawdowns of 26 feet to elevation 1156 with 790 million gallons remaining before releases for PECO are cut off. The higher 910 million gallon PADER proposed cutoff at elevation 1159 or 23 feet of drawdown only eliminates 6.9 days of full power operation of Limerick during a 1960's drought and, therefore, PADER feels this additional protection is prudent.

PADER also noted, and PECO confirmed at the April 15, 1986, hearing, that Limerick Unit 1 is planned to be shutdown from May 2 to June 15 while specific tests are conducted as required by the Nuclear Regulatory Commission. Beginning at the end of the six-week shutdown period and using the data collected during 1985 indicates that in a repeat of 1985 drought conditions there could be a total of 80 days that Limerick Unit 1 could not operate without alternate supplies of water for consumption.

The combination of substituting 5.2 mgd of consumptive use from Cromby and Titus Stations with the release of up to one billion gallons from Tamaqua Reservoirs will provide in excess of 81 days of operation. If a plan of operation that minimizes wastage is implemented and the total 1.35 billion gallons is available for replacement of consumptive use at Limerick Unit 1, up to 109.5 days of full power operation by Limerick Unit 1 is gained without any use of Beechwood Pool.

Accordingly, if unnecessary releases can be minimized, the use of Still Creek and Owl Creek Reservoirs in combination with the transfer from Cromby and Titus Stations will enable full operation of Limerick Unit 1 during 1986 unless a drought more severe than 1985 occurs in 1986.

Impact on Flood Flows

Comments were noted at the April 15, 1986 hearing as to the need for an emergency flood warning plan for the South Pottstown area due to the reservoir releases. It is noted that the maximum release from the reservoir would be 28 cfs and the flood stage at Pottstown (stage when damage begins) is at gage height 13.0 feet or a flow of 25,350 cfs. In view of this low percentage of the total flow at Pottstown, there is no need to develop a flood warning plan as a result of the proposed releases.

DECISION

I. The Comprehensive Plan of the DRBC, as amended by Docket No. D-69-210 CP (Final) on November 5, 1975, and as temporarily revised by Docket No. D-69-210 CP (Final)(Revision 5) on April 26, 1986, is hereby further revised as follows:

- (1) For the period ending December 31, 1986, the provisions of Docket No. D-69-210 CP [attached and included as part thereof to D-69-210 CP (Final)] headed "FINDINGS," "Sources of Water supply," "1. Schuylkill River," is revised by the addition of a new paragraph "(d)" on page 5 which reads as follows:

"(d) Water may be withdrawn for consumptive use at Limerick, regardless of all above constraints except "(b)," whenever that consumptive use has been replaced in equal volume by water released from Still Creek and/or Owl Creek Reservoirs."

- (2) For the period ending December 31, 1986, the following conditions shall be added to the provisions of Docket No. D-69-210 CP (Final), "DECISION" on page 15, subheaded "II" and as temporarily amended by Docket D-69-210 CP (Final)(Revision 5) on April 29, 1986:

"z. Releases from Still Creek and Owl Creek Reservoirs will be regulated and controlled to prevent erosion in the reservoir or in the receiving streams downstream. The applicant shall inspect all areas for erosion each day releases are made, repair any erosion problems that occur and immediately take steps necessary to eliminate any recurrence of an erosion problem.

"aa. The applicant shall monitor the dissolved oxygen content in the discharges prior to entering Still and/or Owl Creeks and 200-300 yards downstream in Still and/or Owl Creeks each day during periods of releases. D.O. readings shall be taken between 8 and 9 a.m. The Executive Director may modify the D.O. monitoring program if monitoring results indicate a change is desirable. The Executive Director may modify or suspend releases if evidence indicates that releases are causing D.O. problems in the receiving waters.

"bb. There shall be no releases from Still Creek Reservoirs for consumptive use at Limerick Unit 1 whenever the water level in the reservoir pool is below the operating rule curve shown on "Attachment No. 1." A plan of operation designed to minimize the unnecessary release of water but also recognizing the need to not cause further diminution of streamflow during low flow periods, must be submitted to and approved by the Executive Director prior to initiation of releases.

"cc. The applicants shall maintain detailed accurate records of reservoir releases. PECO will notify DRBC each morning of any planned starting, stopping or changing in releases and provide the timing and the quantities involved.

"This information on releases together with the dissolved oxygen monitoring required above and a report on the erosion inspection required above shall be submitted weekly when releases have been made. Also, the water elevation in each of Still and Owl Creek Reservoirs and the daily average, minimum and maximum flow at Pottstown shall be included in the weekly data report."

- (3) The provisions set forth in paragraphs (1) and (2) above shall terminate on December 31, 1986, unless otherwise extended or directed by the Commission, and all provisions of Docket D-69-210 CP and Docket D-69-210 CP (Final) temporarily suspended by this docket shall become operative in full force and effect.

II. The above revisions of the Limerick Nuclear Generating Station project are approved pursuant to Section 3.8 of the Compact, subject to the conditions above.

BY THE COMMISSION

DATED: April 29, 1986

MINIMUM STORAGE CURVE FOR  
LIMERICK POWER RELEASES  
AT STILL CREEK RESERVOIR

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