SRBC #72
06/12/02

# Susquehanna River Basin Commission

*a water management agency serving the Susquehanna River Watershed*

## PROJECT INFORMATION

**1. Applicant Information:**

Applicant Name or Registered Fictitious Name PPL Susquehanna, LLC

Parent Corporation Name, if different PPL Corporation

Mailing Address Two North Ninth Street

GENPL5

City Allentown State PA Zip 18101-1179

Contact Person Jerome S. Fields, REM Title Sr. Environmental Scientist - Nuclear

Telephone ( 610 ) 774-7889 Fax ( 610 )774-7782 E-Mail jsfields@pplweb.com

**2. Preparer (Hydrogeologist/Engineer):**

Name Jan C. Phillips, P.E.

Title

Company Jan C. Phillips, P.E.

Address 2611 Walnut Street

Allentown, PA 18104-0160

Phone (610) 821-0160 Fax (610) 821-0160

Signature Jan C Phillips

Date 12-19-06 E-Mail Address jcphllps@enter.net

**3. Project Engineer:**

Name N/A

Title

Company

Address

Phone ( ) Fax ( )

Signature

Date E-Mail Address

**4. Location of proposed source(s), if applicable:**

State Pennsylvania County Luzerne

Municipality Salem Township

Latitude N 41° 05' 12.4" Longitude W 76° 07' 53.2"

**5. State, county, or other regulatory/permitting contacts:**

Agency N/A Department

Name Position

Permit/Area of Concern:

Address

Phone E-Mail

Agency Department

Name Position

Permit/Area of Concern:

Address

Phone E-Mail

Agency Department

Name Position

Permit/Area of Concern:

Address

Phone E-Mail

**PPL Susquehanna, LLC**
Two North Ninth Street
Allentown, PA 18101-1179
Tel. 610.774.7889
jsfields@pplweb.com

December 20, 2006

Mr. Paul O. Swartz, Executive Director
Susquehanna River Basin Commission
1721 North Front Street
Harrisburg, PA 17102-2391

Attn: Project Review Coordinator

**PPL SUSQUEHANNA, LLC**
**APPLICATION FOR SURFACE WATER WITHDRAWAL**
**REQUEST TO MODIFY APPLICATION 19950301**
**EPUL- 0578**

Dear Mr. Swartz:

Enclosed for the Susquehanna River Basin Commission's (Commission's) approval please find an application to increase the existing maximum daily surface water withdrawal at the Susquehanna Steam Electric Station (SES) from approximately 58 million gallons per day (MGD) to 66 MGD. This application includes a proposed water use monitoring plan. In addition, PPL Susquehanna, LLC hereby requests modification of Application 19950301 dated March 9, 1995 to eliminate the 30-day average consumptive water use limit of 40 MGD at the Susquehanna SES.

**Background**

The Susquehanna SES is a two-unit, baseload, boiling-water-reactor electric generating station. Unit 1 and Unit 2 each have a present electrical capacity of 1,190 MWe. Ownership of the Susquehanna SES is shared by PPL Susquehanna, LLC, Berwick, PA (90 percent) and Allegheny Electric Cooperative Inc., Harrisburg, PA (10 percent). PPL Susquehanna is a subsidiary of PPL Generation, LLC, which in turn is an indirect subsidiary of PPL Corporation. PPL Susquehanna (hereinafter "PPL") is the licensed operator of the Susquehanna SES.

The Susquehanna SES is located on the west bank of the Susquehanna River, in Salem Township, Luzerne County, PA. The largest community within 10 miles is the Borough of Berwick, PA located approximately five miles southwest of the station. Susquehanna SES property (owned by PPL and Allegheny Electric) is 1,574 acres in area; 1,173 acres lie to the west of U.S. Route 11 and contain most of the station facilities, and 401 acres lie between U.S. Route 11 and the river and comprise the Susquehanna Riverlands Recreation Area. The Susquehanna Riverlands Recreation Area includes

natural and recreational areas. Also, PPL owns an additional 717 acres of mostly undeveloped property on the east side of the river.

In September 2006, PPL submitted an application to the U.S. Nuclear Regulatory Commission (USNRC) to renew the Susquehanna SES operating licenses for an additional 20 years (Unit 1 to 2042 and Unit 2 to 2044). In October 2006, PPL submitted to the USNRC an application for an Extended Power Uprate (EPU) for both units. The EPU will occur between the second quarter 2008 and the second quarter 2010 and will increase electrical generation up to approximately 1,300 MWe for each unit. Major EPU modifications associated with the station systems will be initiated during the March 2008 or subsequent refueling outages; the river water make-up, circulating water, and blowdown systems will not be modified for the EPU.

The Susquehanna SES withdraws water from the Susquehanna River through a river intake (River Intake Structure) along the west bank of the river adjacent to the station. The River Intake Structure includes four operating pumps, each with an individual design capacity of 13,500 gallons per minute (gpm). The operational combined capacity of the four pumps is approximately 45,000 gpm but can vary depending on river conditions and the conditions of the pumps. Blowdown from the station's cooling water system is discharged back to the river through a diffuser pipe located on the river bottom downstream of the river intake.

**Application to Increase Surface Water Withdrawal from the Susquehanna River**

The estimated maximum daily rate of river water withdrawal for the existing station is approximately 58 MGD. This withdrawal preceded the effective date (November 1995) of the Commission's surface water withdrawal regulations and, therefore, did not require the approval of the Commission. PPL estimates that the maximum daily post-EPU withdrawal will be no greater than 65.35 MGD. Accordingly, PPL submits the enclosed application for a surface water withdrawal of 66 MGD.

Information on the environmental impact of the EPU may be found in two reports prepared by PPL and submitted to the USNRC, copies of which were given to Commission staff at a meeting on November 13, 2006:

- "Supplemental Environmental Report – Extended Power Uprate" dated March 2006; and
- "Environmental Report – Operating License Renewal Stage – Appendix E" (Section 3.1.2 – Cooling and Auxiliary Water Systems) dated September 2006; see the following website for the entire report:

http://www.nrc.gov/reactors/operating/licensing/renewal/applications/susquehanna.html.

**Water Use Monitoring Plan**

ATTACHMENT C to the enclosed application is a proposed Water Use Monitoring Plan. PPL will continue using the cooling tower performance diagram to estimate cooling tower evaporation. Total cooling tower water loss will be estimated by adding an allowance for cooling tower drift loss to the cooling tower evaporation. Total surface water withdrawal will be determined as the sum of (a) the total cooling tower water loss, (b) the cooling tower blowdown, and (c) the makeup flow to the emergency spray pond. Daily volumes of cooling tower water loss and total surface water withdrawal will be reported to the Commission quarterly.

The River Intake Structure includes flow meters to measure withdrawal. However, metering of the withdrawal has been inaccurate due mainly to corrosion and fouling of the intake pipes. The intake pipes are made of carbon steel, and PPL is evaluating replacement of sections of this pipe with stainless steel pipe to minimize flow meter measurement error. Following replacement of sections of pipe from two of the four make-up pumps, it may be possible during one-unit outages to operate the station with those two pumps and to compare the metered withdrawal flow to the calculated sum of cooling tower water loss, cooling tower blowdown, and emergency spray pond makeup. If the pipe replacement project proceeds and withdrawal quantities determined by the two methods are comparable, then PPL will use the metered withdrawal to periodically verify the calculated withdrawal based on the sum of cooling tower water loss, cooling tower blowdown, and emergency spray pond makeup. If the metered withdrawal is significantly different from the calculated withdrawal, PPL will discuss with the Commission the appropriate next steps for measuring withdrawal. PPL will keep the Commission apprised of these activities.

**Modification of Consumptive Water Use Application 19950301**

On March 9, 1995 (Application No. 19950301), the Commission approved the consumptive water use at the Susquehanna SES up to a 30-day average of 40 MGD, not to exceed a daily usage of 48 MGD. As discussed with Commission staff at the November 13, 2006 meeting, PPL requests a modification to this approval to eliminate the 40 MGD 30-day average limit. This is consistent with other recent consumptive water use application modifications.

**Comments**

PPL does not expect the maximum daily river water withdrawal to exceed 65.35 MGD. For purposes of this application, PPL is requesting approval of a maximum daily river water withdrawal of 66 MGD. Also, PPL does not expect the maximum daily consumptive water use to exceed the currently approved 48 MGD. In the event of an apparent exceedance, PPL requests an opportunity to evaluate the problem and to discuss it with the SRBC staff prior to the Commission issuing a notice of violation.

**Fees**

Based on the Commission's Project Fee Schedule effective through December 31, 2006, the fees for the Susquehanna SES permitting activities requested herein are as follows:

| | |
|---|---|
| • Surface Water Withdrawal Application (66 MGD): | $186,000.00 |
| • Project Modification (elimination of 30-day average consumptive water use limit of 40 MGD): | $2,500.00 |
| Total | $188,500.00 |

Payment of these fees is being sent to the Commission under separate correspondence.

**Public Notice**

PPL is proceeding to issue public notice of this application in accordance with the Commission's regulations. Notifications will be made to Luzerne County, Salem Township, a local newspaper, and property owners in Salem Township either contiguous to or nearby the Susquehanna SES.

PPL requests the Commission's prompt review and approval of the enclosed surface water withdrawal application and the request for modification of the approved consumptive water use. Should you or your staff have any questions, please contact me at (610) 774-7889 or by e-mail at jsfields@pplweb.com. Thank you for your consideration.

Sincerely,

Jerome S. Fields, REM
Senior Environmental Scientist – Nuclear

Enclosure: SRBC Surface Water Withdrawal Application

Cc Delivered via electronic mail to:

| | |
|---|---|
| Ms. P. A. Ballaron | SRBC |
| Mr. T. W. Beauduy | SRBC |
| Mr. M. G. Brownell | SRBC |
| Mr. A. D. DeHoff | SRBC |

X:\Special Projects\EPU Project\EPU\EPULs

Bcc Delivered via electronic mail to:

| | |
|---|---|
| J. A. Bartos | GENPL5 |
| M. H. Crowthers | GENPL4 |
| M. B. Detamore | GENPL5 |
| J. G. Dorn | NUCSB2 |
| N. A. Evans | GENTW17 |
| M. S. Gorski | GENPL5 |
| F. J. Hickey | NUCSA3 |
| A. Khanwalkar | GENTW3 |
| J. L. McCormick | NUCSA3 |
| J. M. Nachtwey | NUCSB3 |
| J. C. Phillips | jcphllps@enter.net |
| R. J. Pistolas | GENPL5 |
| L. A. Ramos | SSO |
| B. E. Rhoads | NUCSA3 |
| W. M. Rigotti | NUCSB2 |
| C. H. Saxton | NUCSA3 |
| B. A. Snapp | GENTW3 |
| P. M. Witman | GENPL5 |
| CMDCS | GENPL4 |

# Susquehanna River Basin Commission

*a water management agency serving the Susquehanna River Watershed*

**Surface Water Withdrawal Application for up to 66 MGD at the existing Susquehanna Steam Electric Station (SES) on a maximum day, in conjunction with the Extended Power Uprate (EPU). ATTACHMENT C to this application is a proposed Water Use Monitoring Plan.**

1. **Applicant Information:**

   Company Name: PPL Susquehanna, LLC (PPL)

   Mailing Address: Two North Ninth Street – GENPL5

   Allentown, PA 18101-1179

   Contact Person: Jerome S. Fields, REM, Senior Environmental Scientist-Nuclear

   Telephone: (610) 774-7889 Fax: (610) 774-7782 E-mail: jsfields@pplweb.com

2. a. **Location of sources:**

   State: Pennsylvania County: Luzerne

   Municipality: Salem Township

   b. You must attach a copy of a USGS 7 1/2 Minute Quadrangle map indicating location of proposed intake(s), all existing project sources, and any water storage facilities.

   ATTACHMENT A to this application is an electronically formatted copy of adjoining USGS quadrangles Berwick (PA) and Sybertsville (PA) showing the locations of the facilities, water resources and discharges associated with this application.

3. **Purpose of withdrawal:** The Susquehanna Steam Electric Station (SES) is an existing, two unit, 2,380-megawatt electrical (MWe), nuclear-fueled electric generating station. An Extended Power Uprate (EPU) is planned for the Susquehanna SES to be implemented in stages from the second quarter 2008 through the second quarter 2010. The EPU is expected to increase the station output to approximately 2,600 MWe.

   The Susquehanna River is the primary source of water for the Susquehanna SES and provides essentially all of the cooling water associated with the generation of electricity. The withdrawal of surface water from the Susquehanna River for commercial operation of the Susquehanna SES began in 1983. Water is pumped from the river at an intake

adjacent to the station. The River Intake Structure contains four pumps, each rated at 13,500 gpm. The estimated maximum daily withdrawal by the existing station is approximately 58 MGD. The maximum daily withdrawal from the river is expected to gradually increase to approximately 65 MGD as the EPU is implemented; however, this application is being submitted for 66 MGD. The increased withdrawal will not require modification to the intake, the pumps or the cooling system.

**4. Source(s) from which withdrawal is being requested:**

| Name of Source | Quantity of Withdrawal Requested | | Safe Yield or Q7-10 Low Flow[2] at Point of Taking (mgd[1]) | Drainage Area (square miles) | Location of Taking Point (latitude/longitude) |
|---|---|---|---|---|---|
| | Maximum 30-Day Average (mgd[1]) | Maximum Day (mgd[1]) | | | |
| Susquehanna River | NA | 66 MGD Note 3 | Note 4 | Approx. 10,200 sq. miles Note 5 | lat: N41°05'12.4" long: W76°07'53.2" |
| **Total** | NA | 66 MGD Note 3 | Note 4 | | |

[1] mgd = million gallons per day
[2] Use acceptable hydrologic practices in determining 7-day, 10-year low flow.
[3] Quantities shown do not include allowance for measurement error.
[4] A Q7-10 flow of 814 cfs (525 MGD) at the USGS gage at Wilkes-Barre (No. 01536500) has been used by the Commission in determining the need for consumptive use compensation releases from Cowanesque Reservoir. The Wilkes-Barre gage is approximately 20 miles upstream from the SSES river intake. At the Wilkes-Barre gage, the 90-percent exceedance flow is 1,670 cfs, the minimum seven-day low flow is 546 cfs (September 1964), and the minimum daily flow is 532 cfs (September 1964).
[5] The drainage area at the Wilkes-Barre gage is 9,960 sq. miles. The drainage area at the USGS gage at Danville (No. 01540500), approximately 30 miles downstream, is 11, 200 sq. miles.

**5. Prior or pending state or federal permits:**

| Permit Name | Status[1] | Agency | Permit Issue Date | Permit Number |
|---|---|---|---|---|
| Safe Drinking Water Permit | Prior | PaDEP | 2/17/89 | 2400994 |
| | " | " | 12/4/85 | 2400995 |
| | " | " | 12/4/85 | 2400999 |
| | " | " | 12/4/85 | 2400938 |
| Dams Permit | N/A | | | |
| Encroachment or Water Obstruction Permit (intake and discharge diffuser) | Prior | USACOE & PaDEP | 9/13/06 | CENAB-OP-RPA 06-10107-P12; E40-195 |
| | Prior | " | 8/31/88 | CENAB-OP-RR 87-1767-4;E40-192 |
| Water Allocation/Appropriation | Prior | SRBC | 3/9/95 | 19950301 Note 3 |

| | | | | |
|---|---|---|---|---|
| Permit | | | | |
| Other (NPDES) | Prior | PaDEP | 9/1/05 | NPDES PA-0047325 |
| Other (Operating license) | Prior<br><br>Pending | USNRC<br><br>USNRC | 7/17/82<br>3/23/84<br>Note 2 | NPF-14<br>NPF-22<br>NPF-14<br>NPF-22 |

[1] If not applicable list (NA); if pending, (P); if required but not applied for, (R)

[2] An application was submitted to the US Nuclear Regulatory Commission on Sept. 13, 2006 to renew operating licenses NPF-14 and NPF-22 for an additional 20 years.

[3] See also contract between the Commission and Pennsylvania Power & Light Company for development of water supply storage in Cowanesque Reservoir, dated June 30, 1986.

6. **Show by <u>calculation</u> how the "Quantity of Withdrawal Requested" was determined.** Describe how sufficient this allocation will be in meeting the future needs of this project. Describe alternative sources of supply considered in lieu of requesting a new or increased allocation from the sources listed in Application Section 4. (Attach additional sheets, as necessary.)

See ATTACHMENT B.

7. **Existing and projected total water use:**

| Total Project Water Usage[1] | Existing (mgd)[2] | Projected (mgd)[3] for Design Year 2008 and beyond |
|---|---|---|
| Average Daily Water Demand | 42 MGD Note 5 | 46 MGD in 2008<br>49 MGD in 2009<br>52 MGD in 2010 and beyond<br>Notes 7 and 8 |
| Maximum Daily Water Demand | 58 MGD: Note 6 | 60 MGD in 2008<br>64 MGD in 2009<br>65.35 MGD in 2010 and beyond<br>Notes 7 and 9 |
| System Capacity[4] | The river intake has four pumps, each rated at 13,500 gpm. However, the system capacity with all four pumps operating is approximately 45,000 gpm but can vary depending on river conditions and the conditions of the pumps. | The existing system capacity is adequate and will not need to be increased for the EPU. |

[1] Project water usage should be on an annual basis, unless the application is for a seasonal operation. For seasonal uses, indicate the duration of the use (the number of months on which the average is based).

[2] For new projects, the existing use should be the proposed use during the first year of operation.

[3] The projected use should be for 25 years in the future (design year). If the project duration is less than 25 years, indicate the year for which projections were made.

[4] The existing system capacity should not include the proposed sources unless the application is for a new project having no prior withdrawal.

[5] Average usage, years 2002-2005: cooling tower water loss (29.5 MGD, from cooling tower performance diagram) + average cooling tower blowdown (11.8 MGD, metered) + emergency spray pond makeup (0.4 MGD, estimated) = 41.7 MGD.

[6] Maximum daily usage, years 2002-2005: cooling tower water loss (40 MGD, from cooling tower performance diagram) + maximum cooling tower blowdown (17.3 MGD, metered) + emergency spray pond makeup (0.4 MGD, estimated) = 57.7 MGD.

[7] Estimates do not include allowance for measurement error.

[8] Annual average consumptive water use upon completion of the EPU is expected to be 37 MGD.

[9] Maximum daily consumptive water use upon completion of the EPU is expected to be 48 MGD.

8. **Existing sources of water:**

a. **Wells – Well system began operation in 1974 to provide domestic water supply and (wells TW-1 and TW-2) miscellaneous station purposes excluding condenser cooling. The EPU will not affect the withdrawal or use of groundwater at the Susquehanna SES.**

| Well Identification | Frequency of Use[1] | Purpose[2] | Well Depth (ft) | Cased Depth (ft) | Screened Interval (ft to ft) | Pump Capacity (mgd) | Number of Days Used During Calendar Year | Metered (yes/no) | Average Daily Withdrawal (mgd) | Safe Yield MGD[3] |
|---|---|---|---|---|---|---|---|---|---|---|
| PWS2400994 (TW-1) | E | Domestic + Misc Station | 75 | Unknown | Unknown | 0.07 (50 gpm) | 0 | Yes | 0 | 0.072 |
| PWS2400994 (TW-2) | R | Domestic + Misc Station | 75 | Unknown | Unknown | 0.22 (150 gpm) | 365 | Yes | 0.094 | 0.216 |
| PWS2400999 | R | Domestic - Energy Information Center | 100 | Unknown | Unknown | N/A | 365 | No | Note 4 | 0.022 |
| PWS2400995 | R (Apr-Oct) | Domestic - Riverlands | 105 | Unknown | Unknown | N/A | 200 | No | Note 4 | 0.043 |
| PWS2400938 | R | Domestic - West Bldg. | 55 | Unknown | Unknown | N/A | 365 | No | Note 4 | 0.043 |
| | | | | | | | | Total | <0.114 | 0.396 |

[1] Indicate if well is used on Regular (R), Auxiliary (A), or Emergency (E) basis.
[2] Indicate purpose such as potable supply, non-contact cooling, or water quality remediation.
[3] Provide method of computation or submit copies of pumping test data. Data listed in PaDEP Brief Description forms; method(s) not listed.
[4] The combined withdrawal from these three nearby wells is estimated to be below 0.02 MGD. These wells are not used for station operation but for domestic use at various nearby facilities associated with the station.

**b. Other sources of water (stream intakes, interconnections, reservoirs, springs, etc.):**

| Name | Description | Frequency of Use[1] | Purpose[2] | Drainage Area, If Applicable (square miles) | Existing Pump Capacity[3] (mgd) | Number of Days Used During Calendar Year | Metered (yes/no) | Average Daily Withdrawal (mgd) | Safe Yield or Q7-10 Low Flow[4] (mgd) |
|---|---|---|---|---|---|---|---|---|---|
| None | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | **Total** | | |

[1] Indicate if source is used on Regular (R), Auxiliary (A), or Emergency (E) basis.
[2] Indicate purpose such as potable supply, process water, non-contact cooling, or irrigation.
[3] If gravity-fed, give maximum hydraulic capacity and label as such.
[4] Provide method of computation for 7-day, 10-year low flow for run-of-stream sources.

**9. Raw water ponds, lakes, intake dams, and storage dams (existing and/or proposed):**

| Name | Year Constructed | Year of Last Sedimen-tation Survey | Storage Capacity (mg) | Surface Area (acres) | Drainage Area (sq mi) | Release Works[1] | |
|---|---|---|---|---|---|---|---|
| | | | | | | (yes) | (no) |
| Lake Took-A-While Note 2 | 1978-1979 | March 1999 | Est. 30 | Est. 30 Note 3 | Estimated 0.53 | | Note 4 |

[1]Does the dam have facilities to provide a release of water to the stream when water is not flowing over the spillway or top of dam? If yes, describe length, diameter, depth, valving, etc.
[2] Lake Took-A-While is located within the Riverlands Recreation Area and is solely a recreation facility.
[3] Surface area has varied in different reports from 24 to 35 acres. For the License Renewal environment report 30 acres was used for area.
[4] The spillway has stop logs that can be removed and replaced manually to control lake level.

**10. Preparer:**

Name: Jan C. Phillips, P.E.

Address: 2611 Walnut Street

Allentown, PA 18104-6230

Phone: (610) 821-0160 Fax: (610) 821-0160

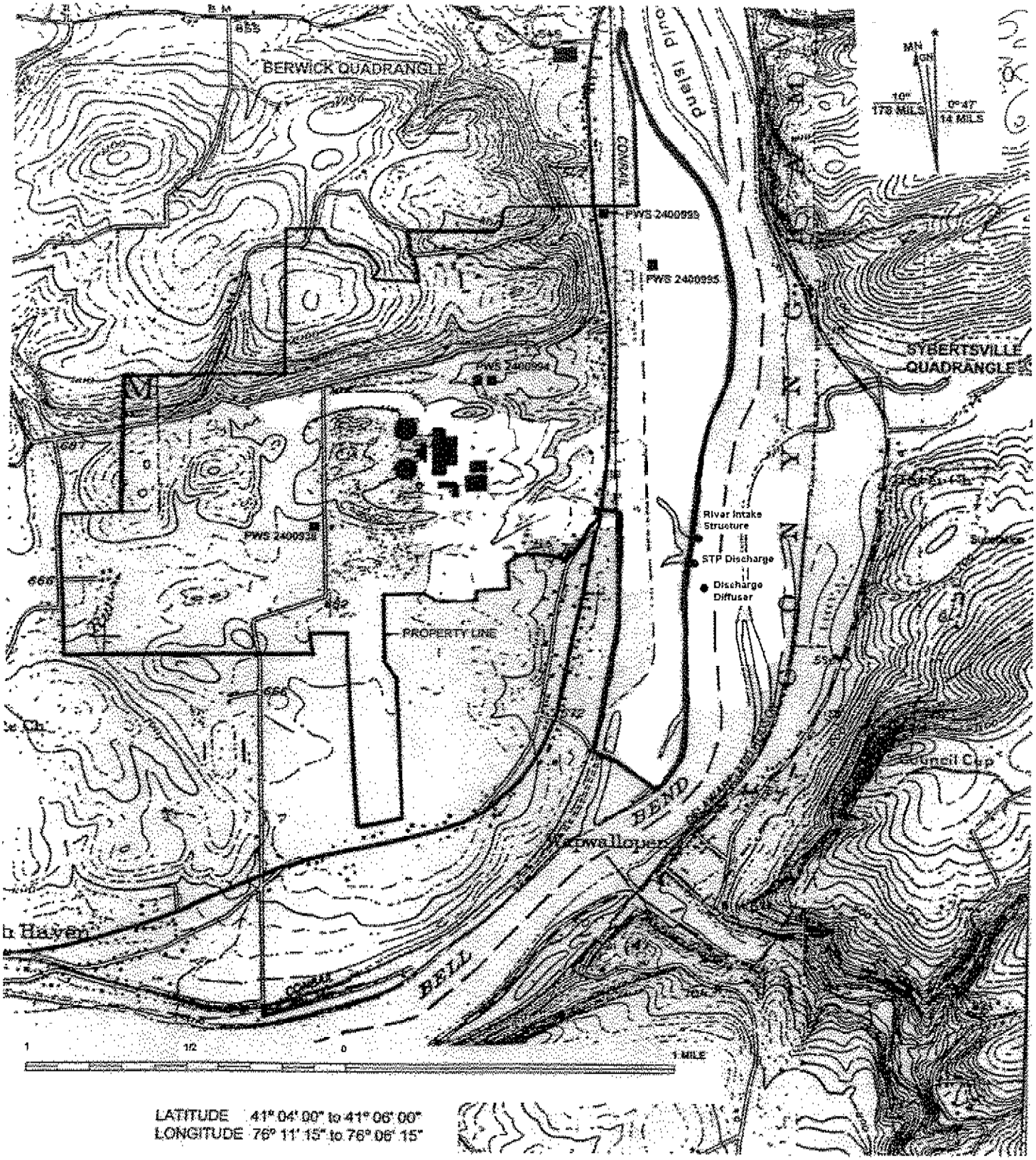
Signature _____

Date: December 19, 2006 E-mail Address: jcphllps@enter.net

**11. Applicant:**

Name: Britt T. McKinney, Sr. Vice President & Chief Nuclear Officer

Signature _____ Date: December 20, 2006




LATITUDE 41° 04' 00" to 41° 06' 00"
LONGITUDE 76° 11' 15" to 76° 06' 15"

**Attachment A**
**Topographic Map**
**SSES**

# ATTACHMENT B

## PPL Susquehanna, LLC
## Application to SRBC for Surface Water Withdrawal
## December 2006

## Application Section 6
## Determination of Quantity of Withdrawal Requested

The Quantity of Withdrawal Requested is 66 MGD on a maximum day. This amount is the sum, to the next higher MGD, of (a) the estimated maximum daily water loss from the cooling towers (evaporation plus drift allowance) following full implementation of the Extended Power Uprate, (b) the cooling tower blowdown rate associated with the estimated maximum daily cooling tower loss, and (c) the estimated makeup flow to the emergency spray pond, less (d) a small contribution of well water to the cooling water flow. The Quantity of Withdrawal Requested does not include an allowance for flow measurement error.

Cooling tower evaporation is determined from the designer's cooling tower performance diagram (Exhibit A hereto). Cooling tower evaporation as a percentage of the cooling tower water flow is a function of wet-bulb temperature, relative humidity and cooling range. The post-EPU maximum daily consumptive water use has been determined assuming the following conditions:

Wet-bulb temperature (WBT): 77.0°F
Relative humidity (RH): 40 percent
Cooling range: 35.7 F degrees
Cooling tower water flow: 511,000 gpm per tower

The selected environmental conditions (WBT and RH) are considered to be conservative for estimating the maximum daily evaporative loss.

The cooling tower water flow combines circulating water flow (484,000 gpm) and service water flow (27,000 gpm). The cooling range (35.7 F degrees) was calculated based on the combined heat contributions of the circulating and service water flows.

From Exhibit A, for the assumed WBT, RH and cooling range, the rate of evaporation expressed as a percentage of the cooling tower water flow is 3.22 percent. Thus, the evaporative loss per cooling tower expressed in gpm is:

Evaporative loss per tower = 511,000 gpm x 0.0322 = 16,454 gpm.

The cooling tower manufacturer's estimate of the rate of cooling tower drift loss is 0.02 percent of the cooling tower water flow. Thus, the drift loss per cooling tower expressed in gpm is:

Drift loss per tower = 511,000 gpm x 0.0002 = 102 gpm.

Thus, the estimated post-EPU maximum daily water loss from the two cooling towers combined, expressed in MGD, is:

2 x (16,454 gpm + 102 gpm) x 0.00144 MGD/gpm = 47.68 MGD.

Cooling tower blowdown comprises most of the non-consumptive water use at the Susquehanna SES. The blowdown rate is a function of water chemistry, among other things. The cooling tower blowdown rate is approximated as:

Blowdown per tower = [evaporation / (concentration factor – 1)] – drift.

Assuming a concentration factor of 3.7, the blowdown rate per tower expressed in gpm is:

[16,454 gpm / (3.7 – 1)] – 102 gpm = 5,992 gpm.

Thus, the estimated blowdown rate corresponding to the maximum daily evaporative loss for the two towers combined, expressed in MGD, is:

2 x 5,992 gpm x 0.00144 MGD/gpm = 17.26 MGD.

The makeup flow to the emergency spray pond is estimated to be 300 gpm. Expressed in MGD, the estimated emergency spray pond makeup is:

300 gpm x 0.00144 MGD/gpm = 0.43 MGD.

A flow of approximately 0.02 MGD originating from the station wells is added to the cooling water system.

Thus, the total post-EPU maximum daily surface water withdrawal is estimated as:

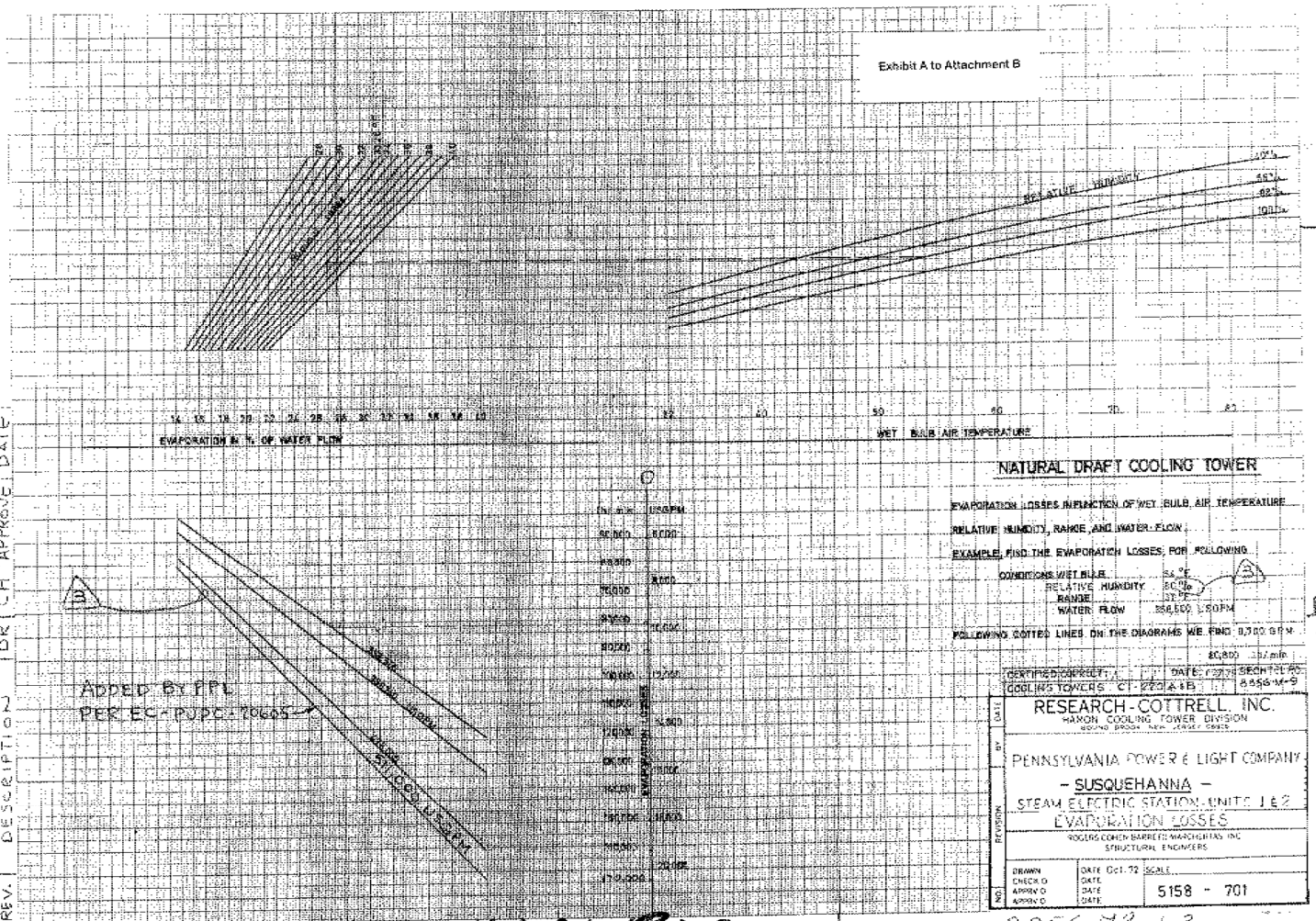
| | |
|---|---|
| 47.68 MGD | Cooling tower evaporation and drift loss |
| + 17.26 MGD | Cooling tower blowdown |
| + 0.43 MGD | Emergency spray pond makeup |
| - 0.02 MGD | Flow from station wells |
| = 65.35 MGD | Maximum daily surface water withdrawal |

or 66 MGD, to the next higher MGD.

The "Quantity of Withdrawal Requested" shown in the table of Item No. 4 of the application is the 66 MGD estimated maximum daily surface water withdrawal rate. This 66 MGD is anticipated to be adequate for the foreseeable life of the Susquehanna SES.

No alternative sources for the amount of additional water needed by the Susquehanna SES following the EPU were considered, nor would any be practicable.

Exhibit A to Attachment B




FF 105590 SH. 0101 Rev. 3

ATTACHMENT C

PPL Susquehanna, LLC
Application to SRBC for Surface Water Withdrawal
December 2006

Proposed Susquehanna SES Water Use Monitoring Plan

This Plan provides for the metering and measurement of data necessary to determine, for reporting to the Commission, the following water quantities at the Susquehanna SES:

- Daily cooling tower water loss (evaporation and drift loss) for each generating unit; and
- Daily surface water withdrawal from the Susquehanna River.

Exhibit A to this Plan is a station water flow schematic diagram ("SSES Water Flow Diagram – Post-EPU Maximum") showing the facilities and flows indicated herein.

The daily surface water withdrawal is determined from the estimated daily cooling tower water loss, the metered cooling tower blowdown, and the estimated makeup flow to the emergency spray pond.

**COOLING TOWER WATER LOSS**

*Meteorological Data*

PPL maintains and operates a meteorological station on the Susquehanna SES site. Wet-bulb temperature (WBT) and Relative humidity (RH) are calculated using temperature and dew point. Daily averages of hourly temperature and dew point readings are used to calculate daily WBT and RH. Temperature is accurate within ±0.9°F and dew point to ±2.7°F.

*Cooling Tower Water Flow*

The total water flow to each cooling tower is the sum of the respective generating unit's circulating water flow (approximately 95 percent) and the unit's service water flow (approximately 5 percent). The rate of circulating water flow is measured continuously, by ultrasonic metering at Unit 1 and by metering power inflow to the circulating water pumps at Unit 2. The rate of service water flow is assumed to be a constant 27,000 gpm at each unit. Measurement of the circulating water flow is accurate to within ±2.5 percent.

*Cooling Range*

The cooling range is the difference between the hot-water temperature and the cold-water temperature in the cooling water flow. The cooling range at Susquehanna SES is determined from the hot-water temperature and the cold-water temperature in the circulating water flow; this assumes that the temperature difference in the circulating water flow is representative of the temperature difference in the service water flow. The hot-water temperature and the cold-water temperature in the circulating water flow are measured continuously. According to manufacturer specifications, the temperature measurements are accurate to within ±2 percent.

*Cooling Tower Evaporation*

PPL believes that the most accurate way to estimate cooling tower evaporation at the Susquehanna SES is by use of the cooling tower performance diagram (Exhibit A to ATTACHMENT B of this application). The cooling tower performance diagram was prepared by the cooling tower designer and updated by PPL to indicate the expected post-EPU maximum cooling tower water flow rate (511,000 gpm per generating unit). The diagram permits cooling tower evaporation (gpm) to be estimated from the values of WBT, RH, cooling range and cooling water flow rate. To estimate daily evaporation, the daily average WBT, RH, cooling range and cooling water flow rates are used.

*Cooling Tower Drift Loss*

The cooling tower manufacturer estimates that drift loss rate is equal to 0.02 percent of the cooling tower water flow rate. The nominal EPU cooling tower water flow rate is 511,000 gpm per unit, so that the estimated drift rate is 102 gpm per tower. For purposes of estimating actual loss, it will be sufficiently accurate to assume a constant drift loss of 100 gpm or 0.15 MGD per tower when the respective generating unit is on line.

*Total Cooling Tower Water Loss*

The total cooling tower water loss for each generating unit when operating is thus the estimated evaporation loss plus an allowance of 0.15 MGD for drift loss.

## COOLING TOWER BLOWDOWN

Cooling tower blowdown represents nearly all of the non-consumptive water use at the Susquehanna SES. Blowdown from each cooling tower is metered continuously. Cooling tower blowdown flow metering is accurate to within ±2.5 percent. Cooling tower blowdown is discharged to the river downstream from the station.

## EMERGENCY SPRAY POND MAKEUP

The emergency spray pond has a surface area of approximately eight (8) acres. The estimated makeup flow to the emergency spray pond is 300 gpm, or approximately 0.43 MGD. Most of this flow is discharged from the pond to the cooling tower blowdown line downstream of the cooling tower blowdown meters. Emergency spray pond levels are monitored, and discharge can be monitored at an overflow weir. A small portion of the emergency spray pond makeup replaces evaporation from the pond.

## SURFACE WATER WITHDRAWAL

Each generating unit's total water usage is the sum of its cooling tower water loss (consumptive water use) and cooling tower blowdown (non-consumptive water use). The total station surface water withdrawal is estimated as the combined water usage of the two generating units plus an allowance of 0.4 MGD for the emergency spray pond makeup.

## DATA

Data monitored under this Plan are continuously entered in the Susquehanna SES Plant Integrated Computer System and readily integrated into daily averages. Final daily quantities of the data to be recorded and reported (below) are organized and/or derived by spreadsheet. The relationships depicted on the cooling tower performance diagram are programmed in spreadsheet format to facilitate estimating cooling tower evaporation from the relevant daily average data.

## RECORD-KEEPING AND REPORTING

PPL will keep daily records of (a) the cooling tower water loss for each generating unit, (b) the cooling tower blowdown for each generating unit, and (c) the total station surface water withdrawal, all estimated or measured as described herein, and will report the daily cooling tower water loss and the daily total station surface water withdrawal amounts, expressed in million gallons, to the Commission each quarter.

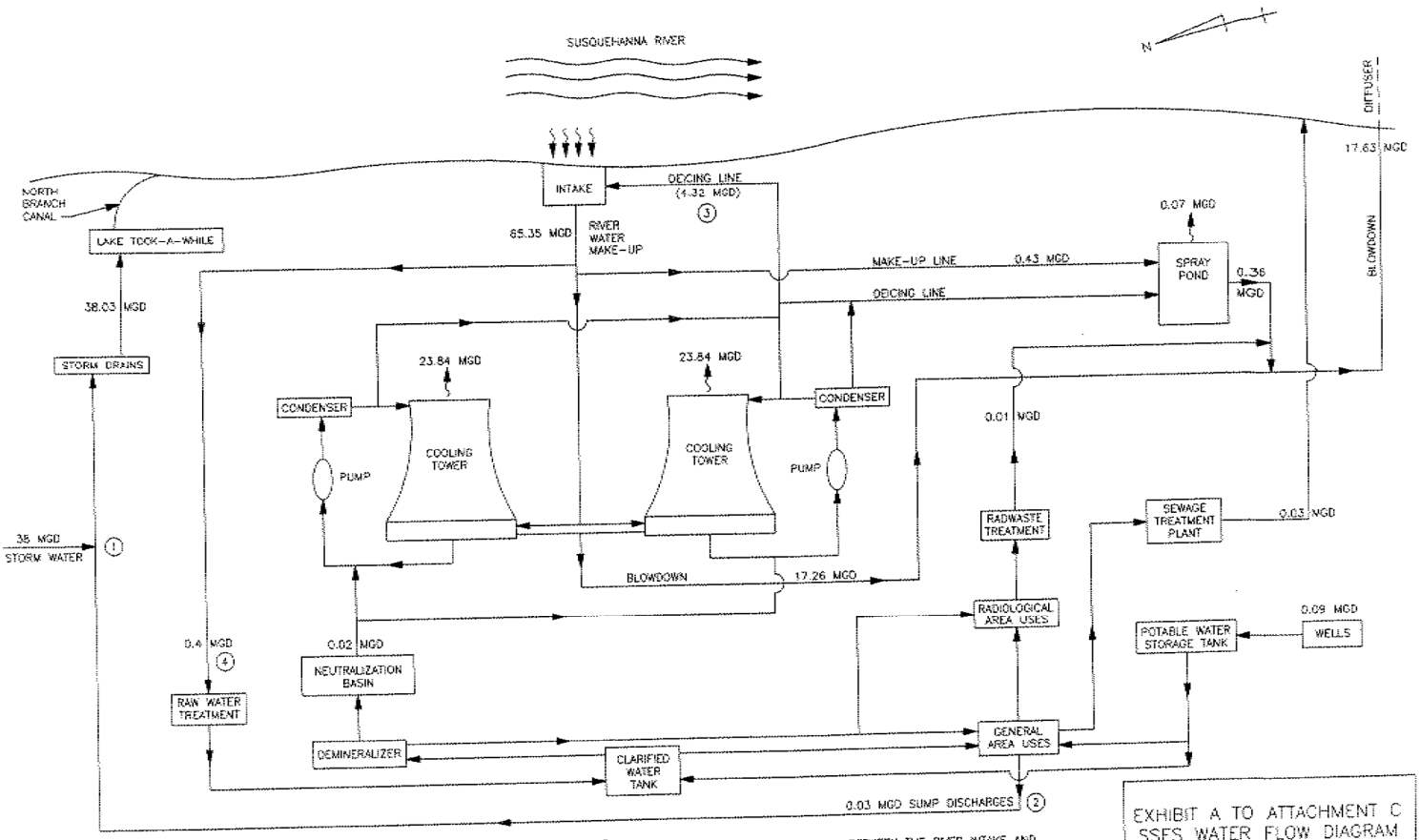



EXHIBIT A TO ATTACHMENT C
SSES WATER FLOW DIAGRAM
POST-EPU MAXIMUM

1. STORM EVENT
2. WHEN OUTSIDE SUMPS ARE DISCHARGED
3. DEICING LINE WATER IS RECIRCULATED BETWEEN THE RIVER INTAKE AND CIRCULATING WATER SYSTEM FROM MID-NOV. THROUGH MID-MARCH. IT IS NOT INCLUDED IN THE STATION'S WATER BALANCE.
4. APPROXIMATELY ONE MONTH PER YEAR AND IS NOT INCLUDED IN STATION'S WATER BALANCE.