SOURCE WATER ASSESSMENT

for

Conowingo Water Treatment Plant

Darlington, Maryland

Prepared by
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Water Management Administration
Water Supply Program
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EXECUTIVE SUMMARY

The 1996 Safe Drinking Water Act Amendments require each state to develop and implement source water assessment programs to evaluate the potential for contaminants to affect the sources of all public drinking water systems. The Conowingo Water Treatment Plant's raw water source is the Susquehanna River, which is also the City of Baltimore's emergency source of water that serves the Baltimore Metropolitan area. A Source Water Assessment for the Susquehanna River was completed by the Susquehanna River Basin Commission in May 2003 for Maryland Department of the Environment (MDE). (See Appendix A) The assessment report describes the watershed characteristics, maps, potential sources of contamination, reviews water quality data from the reservoirs, analyzed the susceptibility of the source and makes recommendations for a source water protection plan. The Susquehanna report should be considered as an integral part of the source water assessment for the Conowingo Water Treatment Plant.

Conowingo Water Treatment Plant is owned by Exelon Energy Company and operated by the Maryland Environmental Service. Withdrawals from the Susquehanna River vary depending on the demand for water. The water treatment plant treats an average of 25,000 gallons per day.

The susceptibility of the Conowingo Pool watershed is very similar to that described in the City of Baltimore's Susquehanna Source Water Assessment report. Based on water quality data from the operation of the Conowingo water plant and the Susquehanna watershed assessment, the water supply for Conowingo Water Treatment Plant is susceptible to disinfection by-product precursors, nutrients (particularly phosphorus), and spills upstream of the Conowingo Reservoir. Like all surface water sources, protozoas, viruses and bacteria and turbidity are contaminants of significant concern.

In addition to the recommendations listed in the Susquehanna River Watershed Assessment, specific recommendations to better understand and improve the treated water quality from the Conowingo Pool are explained in Section 8 of this report and should be considered for implementation.

1.0 BACKGROUND

The 1996 Safe Drinking Water Act Amendments require states to develop and implement source water assessment programs to evaluate the potential for contaminants to affect the sources of all public drinking water systems. A Source Water Assessment (SWA) follows a process for evaluating the susceptibility of a public drinking water supply. The assessment does not address the treatment process or the storage and distribution of the water system, which are covered under separate provisions of the Safe Drinking Water Act. The Maryland Department of the Environment (MDE) is the lead state agency in this SWA effort.

There are three main steps in the assessment process: (1) *delineating* the watershed drainage area that is likely to contribute to the drinking water supply, (2) *identifying* potential contaminants within that area and (3) *assessing* the vulnerability of the system to those contaminants. This document reflects all of the information gathered and analyzed required by those three steps for the Conowingo Water Treatment Plant's surface water source (Susquehanna River). MDE looked at many factors to determine the vulnerability of this water supply to contamination, including the size and type of water system, available water quality data, the characteristics of the potential contaminants, and the capacity of the natural environment to attenuate any risk.

Maryland has more than 3,800 public drinking water systems. Approximately 50 of Maryland's public drinking water systems obtain their water from surface supplies, either from a reservoir or directly from a river. The remaining systems use ground water sources. Maryland's Source Water Assessment Plan was submitted to the Environmental Protection Agency (EPA) in February 1999, and received final acceptance by the EPA in November 1999. A copy of the plan can be obtained at MDE's website, www.mde.state.md.us, or by calling the Water Supply Program at 410 537-3714.

2.0 DEVELOPMENT OF WATER SUPPLY

The Conowingo water system is a nontransient noncommunity system that serves approximately 70 employees at Conowingo Dam hydroelectric power plant. Exelon Energy Company owns and operates the Conowingo Water Filtration Plant which is located at the Conowingo Dam in Darlington, Harford County, Maryland. The plant was originally constructed in 1928 with the design capacity of 50,000 gallons per day and has not undergone any major upgrades since then. The water plant also supplies water to a recreational area with a swimming pool, and to the hydroelectric plant's fire protection system.

Maryland Environmental Service, an agency of the State of Maryland, is currently operating the water treatment facility at the Conowingo Dam. The plant treats water from the Susquehanna River and the treatment consists of coagulation, sedimentation, filtration, and disinfection.

3.0 DESCRIPTION OF SURFACE WATER SOURCE

The raw water source is Conowingo Pool, a 2,936 acre impoundment of the lower Susquehanna River by Conowingo Hydroelectric Station owned by Exelon Energy Company for the purpose of electric power generation.

The Susquehanna River flows from its headwaters at Ostego Lake near Cooperstown, New York to Havre de Grace, Maryland where it meets the Chesapeake Bay. The City of Baltimore also treats water received from Conowingo Pool during periods of drought. A source water assessment for the City's Susquehanna River source was completed by the Susquehanna River Basin Commission (SRBC) on May 30, 2003 for MDE. A copy of the assessment report that includes information regarding watershed characterization, potential sources of contamination, review of water quality data, susceptibility analysis and recommendations for source water protection plan is attached and should be considered as an integral part of the source water assessment for the Conowingo Water Treatment Plant. Additional water quality data (raw and finished water from the water treatment plant) was reviewed to complete this assessment.

4.0 RESULTS OF SITE VISITS

Water Supply Program conducted a site survey of the Conowingo Water Treatment Plant water sources and other facilities in order to accomplish the following tasks:

- To collect information regarding the locations of raw water sources by using Global Positioning System (GPS) equipment.
- To determine the general condition and structural integrity of intakes and other raw water facilities.
- To conduct a windshield survey of the watershed in the immediate vicinity of the intake and to document potential problem areas.

4.1 Intake Description

The Conowingo Water Treatment Plant's intake is located in the Conowingo Pool at the dam. The intake is located approximately 40 feet below the surface of the water. The raw water from the Conowingo Pool pumps to the treatment plant located inside the Conowingo Dam.

4.2 Operator Concerns

The primary concern was spills from transportation activities and from industrial facilities upstream of the Conowingo Pool.

5.0 WATERSHED CHARACTERIZATION

Please refer to *Source Water Assessment and Protection Report (SRBC 2003)* in Appendix A.

6.0 REVIEW OF WATER QUALITY DATA

In addition to an extensive water quality data review conducted by SRBC for Susquehanna River Watershed (Section V, Appendix A), Conowingo Water Treatment Plant's data are also reviewed and summarized as below.

6.1 Existing Plant Data

Exelon Energy Company is required to perform water quality tests on the drinking water produced from Conowingo Water Treatment Plant in order to ensure compliance with the EPA's Safe Drinking Water Act (SDWA) requirements. They are also required to submit monthly operating reports to MDE's Water Supply Program, which includes daily testing of some raw water quality parameters such as turbidity (cloudiness of water), alkalinity and pH. Other plant data included in the Monthly Operating Report (MOR) reflect the quality of treated (finished) water. Detects from the plant data (finished water) and the raw water turbidity and pH for years 2001 and 2002 are discussed below.

6.1.1 Raw Water Turbidity and pH

Below is a summary of Average, Maximum and Minimum values for turbidity and pH during the year 2004.

	Turbidity (NTU)			pH		
Months	Average	Max.	Min.	Average	Max.	Min.
January	7.4	24	1	7.6	7.8	7.3
February	7.6	37	3	7.0	8.1	7.7
March	14.7	45	3	7.7	8.1	7.5
April	22.7	72	10	7.8	8.0	7.7
May	19.5	107	9	7.8	8.5	7.4
June	16.4	39	6	7.7	8.0	7.5
July	10.3	27	2	7.6	7.9	7.4
August	17.2	38	10	7.7	7.8	7.5
September*	136.0	562	31	7.5	7.7	7.2
October	10.9	35	2	7.9	8.1	7.7
November	6.9	22	4	7.9	8.1	7.6
December	20.8	49	7	7.6	7.7	7.4

*The plant was in operation for only 9 days during month of September.

6.1.2 Inorganic Compounds (IOCs)

Conowingo Water Treatment Plant regularly tests for presence of nitrates and other inorganic compounds in finished drinking water. Below is a summary of testing results for IOCs detected in finished water. No IOCs exceeded any MCL in the treated or raw water. Fluoride is added during the treatment process; therefore, levels are not reflective of raw water conditions.

Contam Name	Sample Date	Result	Units	MCL
BARIUM	22-Dec-1993	0.021	mg/l	2
BARIUM	30-Jul-1996	0.02	mg/l	2
BARIUM	19-Apr-1999	0.01	mg/l	2
BARIUM	29-Sep-1999	0.018	mg/l	2
BARIUM	6-Nov-1999	0.018	mg/l	2
BARIUM	7-Jun-2000	0.026	mg/l	2
BARIUM	17-Oct-2001	0.032	mg/l	2
BARIUM	2-Dec-2004	0.028	mg/l	2
FLUORIDE	1-Nov-1995	0.6	mg/l	4
FLUORIDE	29-Sep-1999	0.246	mg/l	4
FLUORIDE	6-Nov-1999	0.246	mg/l	4
MERCURY	2-Dec-2004	0.0002	mg/l	0.002
NITRATE	2-Feb-1993	2.9	mg/l	10
NITRATE	5-Apr-1993	2.5	mg/l	10
NITRATE	13-Jul-1993	3.5	mg/l	10
NITRATE	6-Oct-1993	3.17	mg/l	10
NITRATE	22-Dec-1993	1.8	mg/l	10
NITRATE	5-Apr-1994	2.47	mg/l	10
NITRATE	5-May-1994	1.97	mg/l	10
NITRATE	9-May-1994	1.97	mg/l	10
NITRATE	3-Aug-1994	1.58	mg/l	10
NITRATE	3-Oct-1994	1.49	mg/l	10
NITRATE	4-Jan-1995	1.57	mg/l	10
NITRATE	5-Jul-1995	1.61	mg/l	10
NITRATE	2-Oct-1995	1.55	mg/l	10
NITRATE	1-Nov-1995	1.97	mg/l	10
NITRATE	3-Jan-1996	3.52	mg/l	10
NITRATE	3-Jun-1996	1.1	mg/l	10
NITRATE	30-Jul-1996	2.5	mg/l	10
NITRATE	13-Jan-1997	3.1	mg/l	10
NITRATE	4-Jun-1997	0.9	mg/l	10
NITRATE	14-Jan-1998	1.17	mg/l	10
NITRATE	21-Apr-1998	0.9	mg/l	10
NITRATE	11-Jan-1999	1.5	mg/l	10
NITRATE	29-Sep-1999	1.37	mg/l	10
NITRATE	6-Nov-1999	1.37	mg/l	10
NITRATE	3-Jan-2000	1.3	mg/l	10
NITRATE	7-Jun-2000	0.98	mg/l	10

Contam Name	Sample Date	Result	Units	MCL
NITRATE	4-Jun-2001	1.3	mg/l	10
NITRATE	17-Oct-2001	1.51	mg/l	10
NITRATE	11-Feb-2002	1.3	mg/l	10
NITRATE	11-Sep-2002	0.607	mg/l	10
NITRATE	12-Aug-2003	1.07	mg/l	10
NITRATE	4-Aug-2004	1.33	mg/l	10
NITRATE	8-Aug-2004	1.33	mg/l	10
NITRITE	3-Jun-1996	0.003	mg/l	1
SODIUM	4-Jun-1997	32.6	mg/l	
SODIUM	21-Apr-1998	24.7	mg/l	
SODIUM	29-Sep-1999	50.2	mg/l	
SODIUM	6-Nov-1999	50.2	mg/l	
SODIUM	7-Jun-2000	4.52	mg/l	
SODIUM	4-Jun-2001	29	mg/l	
SODIUM	17-Oct-2001	36.6	mg/l	
SODIUM	11-Feb-2002	27	mg/l	
SODIUM	2-Dec-2004	13.6	mg/l	
SODIUM	14-Jun-2005	15.2	mg/l	
SULFATE	3-Jun-1996	127	mg/l	
SULFATE	4-Jun-1997	43	mg/l	
SULFATE	21-Apr-1998	45.4	mg/l	
SULFATE	4-Jun-2001	64.7	mg/l	
SULFATE	11-Feb-2002	61.2	mg/l	

6.1.3 Synthetic Organic Compounds (SOCs)

Following is a summary of SOCs detected for the years 1993-2002. SOCs include herbicides, pesticides and other man-made organic compounds. Di(2-ethylhexyl) phthalate was the only SOC to exceed 50% of the maximum contaminant level (MCL). This contaminant was detected in laboratory blanks analyzed at the same time as the samples and is therefore not considered to be reflective of actual levels in the source water. Low levels of Dalapon were also detected in finished water. Dalapon is a herbicide commonly used on highways and road right of ways.

Contam Name	Sample Date	Result	Units	MCL
DALAPON	31-Jul-1995	0.819	ug/l	200
DALAPON	3-Jun-1996	0.814	ug/l	200
DALAPON	4-Jun-1997	1.13	ug/l	200

DALAPON	30-Jul-1997	1.81	ug/l	200
DALAPON	21-Apr-1998	0.94	ug/l	200
DALAPON	4-May-1999	1.55	ug/l	200
DALAPON	15-May-2000	3.24	ug/l	200
DALAPON	5-May-2003	4.52	ug/l	200
DALAPON	19-May-2004	4.34	ug/l	200
DI(2-ETHYLHEXYL) ADIPATE	3-Nov-1999	13	ug/l	400
DI(2-ETHYLHEXYL) ADIPATE	4-Jun-2001	0.8	ug/l	400
DI(2-ETHYLHEXYL) PHTHALATE	31-Jul-1995	0.69	ug/l	6
DI(2-ETHYLHEXYL) PHTHALATE	15-May-2000	1	ug/l	6
DI(2-ETHYLHEXYL) PHTHALATE	4-Jun-2001	3.3	ug/l	6 Y
DI(2-ETHYLHEXYL) PHTHALATE	2-Apr-2002	4.2	ug/l	6 Y
DI(2-ETHYLHEXYL) PHTHALATE	5-May-2003	0.5	ug/l	6
DI(2-ETHYLHEXYL) PHTHALATE	19-May-2004	1.3	ug/l	6

6.1.4 Volatile Organic Compounds (VOCs)/Disinfection Byproducts (DBPs)

In addition to the disinfection byproducts, one volatile organic compound, trichloroethylene, was also reported at levels exceeding 50% of its MCL. The greatest use of this compound is for removal of grease from fabricated metal parts. A total of 24 samples has been collected and tested for trichloroethylene for the periods of 1994 through 2004. Two samples dated April 2, 2002 and May 5, 2003 shows detection levels of 1.5 ug/l and 4.1 ug/l respectively. Only one sample exceeded the 50% of 5.0 ug/l MCL. The presence of trichloroethylene is not believed to be representative of levels in the Susquehanna River, but may be related to machinery specific for power generators. Levels of disinfection byproducts in finished water from Conowingo Water Treatment Plant occasionally exceeded the MCL for total THM (80 ug/l) and Haloacetic acids (HAA) (60 mg/l), as shown in the table that follows.

Year	THM (ug/l)				HAA (ug/l)			
	Average	Max	Min	Count	Average	Max	Min	Count
2002	128.35	226.35	50.78	4	63.99	122.89	34.87	4
2003	117.93	215.80	67.10	4	80.03	119.60	47.70	4
2004	69.68	84.30	46.50	4	46.08	74.30	31.10	4
2005	34.15	43.60	24.70	2	30.60	30.60	30.60	1
Total	95.15	226.35	24.70	14	60.84	122.89	30.60	13

7.0 SUSCEPTIBILITY ANALYSIS

The susceptibility of the Conowingo Water Treatment Plant (WTP) source water is very similar to that described in the Susquehanna River Watershed Assessment report (attached). Based on water quality data from Conowingo Water Treatment Plant, the water supply is not susceptible to volatile organic compounds, synthetic organic compounds and inorganic compounds. All of the sections in Chapter VII of the SRBC report in Appendix A apply to the Conowingo intake. In summary, the water supply for Conowingo is susceptible to:

a. Protozoas, viruses and bacteria and turbidity as are all surface sources.
b. Disinfection byproduct precursors.
c. Nutrients.
d. Spills from upstream locations.

8.0 RECOMMENDATIONS FOR SOURCE WATER PROTECTION PLAN

In addition to the recommendations listed in the Susquehanna River Watershed Assessment (attached), specific recommendations regarding watershed management for Conowingo Water Treatment Plant are listed below:

- Exelon Energy Company or their operators, Maryland Environmental Services, is encouraged to participate in SRBC and Pennsylvania DEP early warning communication network for Susquehanna River and major tributaries.
- Monitor for E. coli in the raw water. Weekly sampling is recommended.
- Monitor for total and dissolved organic carbon in raw and treated water.
- Monitor for chlorophylla during the growing season.
- Optimize plant's enhanced coagulation process in order to comply with Disinfection Byproducts Rule requirements.

9.0 ADDITIONAL REFERENCES

- MDE Water Supply Program Inspection Reports.
- Conowingo Water Treatment Plant Monthly Operating Reports (MORs) and Self-Monitoring Reports.
- MDE Water Supply Program database (PDWIS).