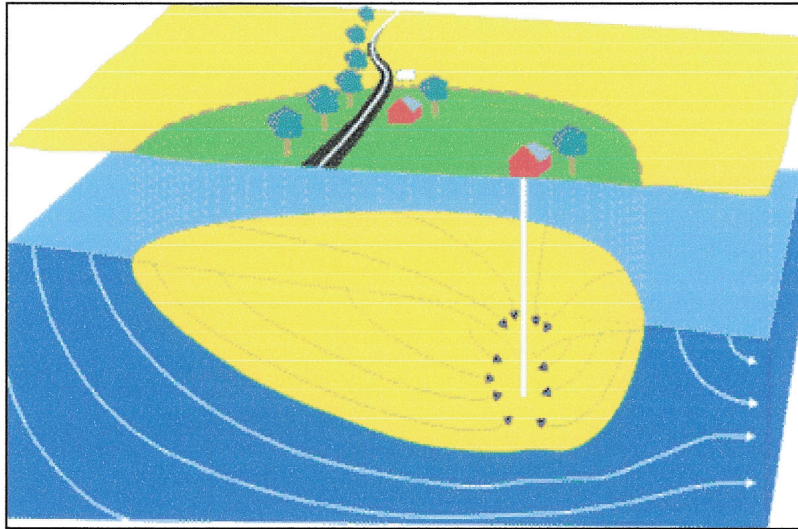


SOURCE WATER ASSESSMENT
FOR THE SEVERN WATER COMPANY
ANNE ARUNDEL COUNTY, MD



Prepared By
Water Management Administration
Water Supply Program
May 2005



Robert L. Ehrlich, Jr.
Governor

Kendal P. Philbrick
Secretary

Michael S. Steele
Lt. Governor

Jonas A. Jacobson
Deputy Secretary

TABLE OF CONTENTS

	Page
Summary.....	2
Introduction.....	3
Well Information.....	3
Table 1. Severn Water Company Well Information	
Hydrogeology.....	3
Source Water Assessment Area Delineation	4
Table 2. Parameters used for the Wellhead Protection Area delineation	
Potential Sources of Contamination.....	5
Table 3. Land Use Summary for the Wellhead Protection Area (Zone 2)	
Table 4. Sewer Service Area Summary for the Wellhead Protection Area (Zone 2)	
Water Quality Data	6
Table 5. Summary of Water Quality Samples for Severn Water Company's Water Supply.	
Susceptibility Analysis.....	7
Table 6. Susceptibility Summary for Severn Water Company's Water Supply	
Management of the Wellhead Protection Area.....	9
References.....	10
Other Sources of Data.....	10
Figures	12
Figure 1. Location Map for Severn Water Company's Wells	
Figure 2. Wellhead Protection Area for Severn Water Company	
Figure 3. Land Use within the Severn Water Company's WHPA	
Figure 4. Sewer Map of the Severn Water Company's WHPA	

SUMMARY

The Maryland Department of the Environment's (MDE) Water Supply Program (WSP) has conducted a Source Water Assessment for the Severn Water Company Water System. The major components of this report as described in Maryland's Source Water Assessment Plan (SWAP) are: 1) delineation of an area that contributes water to the source, 2) identification of potential sources of contamination, and 3) determination of the susceptibility of the water supply to contamination. Recommendations for management of the assessment area conclude this report.

The source of Severn Water Company's water supply is a Coastal Plain semi-confined aquifer- the Lower Patapsco. Two wells are currently being used to pump the water out of this aquifer. The source water assessment area was delineated by the Water Supply Program using methods approved by the U. S. EPA.

Potential sources of contamination within the assessment area were identified based on MDE site visits, and a review of MDE's databases. Well information and water quality data were also reviewed. A map showing the source water assessment area and potential contaminant sources is enclosed.

The susceptibility analysis for Severn Water Company's water supply is based on a review of the water quality data, potential sources of contamination, aquifer characteristics, and well integrity. It was determined that Severn Water Company's water supply is not susceptible inorganic compounds, organic compounds, radionuclides or microbiological contaminants.

INTRODUCTION

The Maryland Department of the Environment's (MDE) Water Supply Program (WSP) has conducted a Source Water Assessment for the Severn Water Company Water System. The system serves water to several subdivisions and a shopping center located northeast of Fort Meade in Odenton, Anne Arundel County (Figure 1). The system is operated by Maryland Environmental Service, has 1702 connections and serves a population of 5447. Currently, the water is being pumped from two wells (Nos. 1 & 2) which operate alternately, and treated at one plant located in the vicinity of the wells.

WELL INFORMATION

Well information was obtained from the Water Supply Program's database, site visits, well completion reports, sanitary survey inspection reports and published reports. A review of the well data and sanitary surveys of the system indicates both the wells were drilled prior to 1973, when the State's well construction regulations went into effect. The well completion reports indicate that Well Nos. 1 and 2 were grouted to about 179 and 165 feet, respectively. Table 1 contains a summary of the well construction data.

SOURCE ID	SOURCE NAME	PERMIT NO	TOTAL DEPTH (ft)	CASING DEPTH (ft)	YEAR DRILLED	AQUIFER NAME
01	Severn Water Company Well 1	AA700369	265	179	1970	Lower Patapsco
02	Severn Water Company Well 2	AA700370	220	165	1970	Lower Patapsco

Table 1. Severn Water Company Well Information.

HYDROGEOLOGY

Ground water flows through pores between gravel, sand and silt grains in unconsolidated sedimentary aquifers such as the one used by Severn Water Company. An aquifer is any formation that is capable of yielding a significant amount of water. The transmissivity is a measure of the amount of water an aquifer is capable of producing and is related to the hydraulic conductivity and the thickness of the aquifer. A confining layer is generally composed of fine material such as clay and silt, which transmits relatively very little water. The Lower Patapsco aquifer in the area where the Severn Water Company wells are located appears to be semi-confined. Semi-confined aquifers are those in which confining units above or below the aquifer are leaky. In areas where semi-confined or confined aquifers outcrop at the land surface they are unconfined and any precipitation falling on the ground can directly enter the aquifer and recharge it. Based on study conducted by the Maryland Geological Survey (Mack and Achmad, 1986) the outcrop area for the lower Patapsco aquifer is approximately 2 miles west of the Odenton area.

outside the WHPA to address chemical contamination before it could reach the well. The delineated Zone 2 WHPA is oval in shape and has an area of 114.89 acres.

POTENTIAL SOURCES OF CONTAMINATION

Sources of contamination at the land surface in the vicinity of the production wells are less likely to impact the water supply than if the wells were unconfined. However, because the confining units are leaky contaminants, if present, may migrate to the water supply well. In addition, poorly grouted well, or wells that are not maintained can provide a direct pathway into the aquifer through the confining units.

Potential sources of contamination are classified into two types: point or non-point sources. Examples of point sources of contamination are leaking underground storage tanks, landfills, ground water discharge permits, feed lots, large scale feeding operations, and known ground water contamination sites. These sites are generally associated with commercial or industrial facilities that use chemical substances that may, if inappropriately handled, contaminate ground water via a discrete point location.

Non-point sources are associated with certain land use practices such as pesticide and herbicide applications, land application of sludge or animal wastes, and row-crop farming, all of which may lead to ground water contamination at the outcrop area of the aquifer.

MDE Waste and Water Management databases were reviewed and a field inspection conducted to identify potential point sources of contamination for this assessment. Based on the MDE databases, no potential point sources of contamination were identified in the Severn Water Company WHPA.

Based on the Maryland Office of Planning 2000 Land Use Map, several land use categories are identified within delineated Zone 2 of the WHPA for Well 3 and are shown in table 3. Residential and forest make up a major portion of the land use within the WHPA. Figure 3 shows the land use within the WHPA.

LAND USE CATEGORIES	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Low Density Residential	1.107	0.96
Medium Density Residential	7.936	6.91
High Density Residential	35.409	30.82
Institutional	14.945	13.01
Open Urban	11.670	10.16
Cropland	4.013	3.50
Forest	39.813	34.64
Total	114.893	100

Table 3. Land Use Summary for the Wellhead Protection Area (Zone 2)

Volatile Organic Compounds (VOCs)

No VOCs have been detected in Severn Water Company's water supply since 1996.

Synthetic Organic Compounds (SOCs)

No SOCs above 50% of the MCL have been detected in Severn Water Company's water supply since 1996. Pentachlorophenol, atrazine and di(ethylhexyl)phthalate were detected one time at very low levels in the water supply.

Radionuclides

No radionuclides above 50% of the MCL have been detected in Severn Water Company's water supply. Low levels of gross alpha, gross beta, radium and radon have been detected in the water supply.

Microbiological Contaminants

Routine bacteriological monitoring is conducted in the finished water for each community water system on a monthly basis and measures total coliform bacteria. Since Severn Water Company's water supply uses disinfection for its treatment, the finished water data does not give much indication of the quality of raw water directly from the wells. Total coliform bacteria are not pathogenic, but are used as an indicator organism for other disease-causing microorganisms. A major breach of the system such as due to flooding a well, ruptured water line or back siphonage of contaminated water could cause a positive total coliform result in the distribution system, and would require follow-up total and fecal coliform analysis. Since 1997 Severn Water Company has conducted routine bacteriological sampling 96 times, and had positive total coliform three times (6/98, 9/99 & 11/01). Each time when repeat samples taken after these detections showed no positive total coliform.

SUSCEPTIBILITY ANALYSIS

The wells serving Severn Water Company's water supply withdraw water from a semi-confined aquifer. Severn Water Company's water supply is naturally protected from activity on the land surface in the vicinity of the wells due to the confining layers that retard water movement from the surface into the aquifer below. In addition, further west, the aquifer outcrops at the land surface and any contaminant entering the ground water can migrate into the aquifer and eventually flow towards the wells. Evidence from nearby studies and at this site suggest that it may take between 45 and 72 years for any contaminant introduced to the ground water in the vicinity of the wells or the outcrop area to make it to the wells. The information that was used to conduct the susceptibility analysis is as follows: (1) available water quality data (2) presence of potential contaminant sources in the WHPA (3) aquifer characteristics (4) well integrity and (5) the likelihood of change to the natural conditions. The susceptibility of Severn Water Company's water supply to the various contaminant groups is shown in table 6 at the end of this section.

Based on the aquifer characteristics, the water quality data and the lack of potential sources of contamination, Severn Water Company's water supply is not susceptible to microbiological contaminants.

CONTAMINANT TYPE	Are Contaminant Sources present in the WHPA?	Are Contaminants detected in WQ samples at 50% of the MCL	Is Well Integrity a Factor?	Is the Aquifer* Vulnerable?	Is the System Susceptible to the Contaminant
Inorganic Compounds	NO	NO	NO	NO	NO
Volatile Organic Compounds	NO	NO	NO	NO	NO
Synthetic Organic Compounds	NO	NO	NO	NO	NO
Radionuclides	NO	NO	NO	NO	NO
Microbiological Contaminants	NO	NO	NO	NO	NO

Table 6. Susceptibility Summary for Severn Water Company's Water Supply

MANAGEMENT OF THE WELLHEAD PROTECTION AREA

With the information contained in this report, Severn Water Company water system is in a position to protect its water supplies by staying aware of the areas delineated for source water protection. Specific management recommendations for consideration are listed below:

Public Awareness and Outreach

- The Consumer Confidence Report should report should list that this report is available to the general public through their county library, or by contacting the operator or MDE.

Monitoring

- Continue to monitor for all required Safe Drinking Water Act contaminants. Annual raw water bacteriological testing is a good check on well integrity.
- Test each well separately for fluoride.

Contaminant Source Inventory Updates

- Conduct a survey of the WHPA and inventory any potential sources of contamination report. Keep records of new development within the WHPA and new potential sources of contamination that may be associated with the new use.

REFERENCES

- Blandford, T. N., and Huyakorn, P. S., 1991, WHPA- A modular semi-analytical Model for the delineation of wellhead protection area, version 2.0: Office Ground-Water Protection, U.S. Environmental Protection Agency, Washington D.C., 10-9 p. with appendixes.
- Lucas, R. C., 1976, Anne Arundel County Ground-Water Information: Selected Well Records, Chemical-Quality Data, Pumpage, Appropriation Data, And Selected Well Logs, Maryland, Maryland Geological Survey Water Resources Basic Data Report No. 8, 1349 p.
- Mack, F. K., and Achmad, G., 1986, Evaluation of the Water-Supply Potential Of Aquifers in the Potomac Group of Anne Arundel County, Maryland Maryland Geological Survey Report of Investigations No. 48, 111 p.
- Maryland Department of the Environment, Water Supply Program, 1999, Maryland's Source Water Assessment Plan, 36 p.
- United States Environmental Protection Agency, Office of Ground-Water Protection, 1987, Guidelines for Delineation of Wellhead Protection Areas.

SOURCES OF DATA

Water Appropriation and Use Permit No. AA1969G016
Public Water Supply Inspection Reports
Monthly Operating Reports
Monitoring Reports
MDE Water Supply Program Oracle Database
MDE Waste Management Sites Database
DNR DOQQ Odenton (2000)
USGS 7.5 minute Odenton Quadrangle
MD Dept. of Planning Anne Arundel Co Land Use Map (2000)
MD Dept. of Planning Anne Arundel Co. Sewer Map (2000)

FIGURES

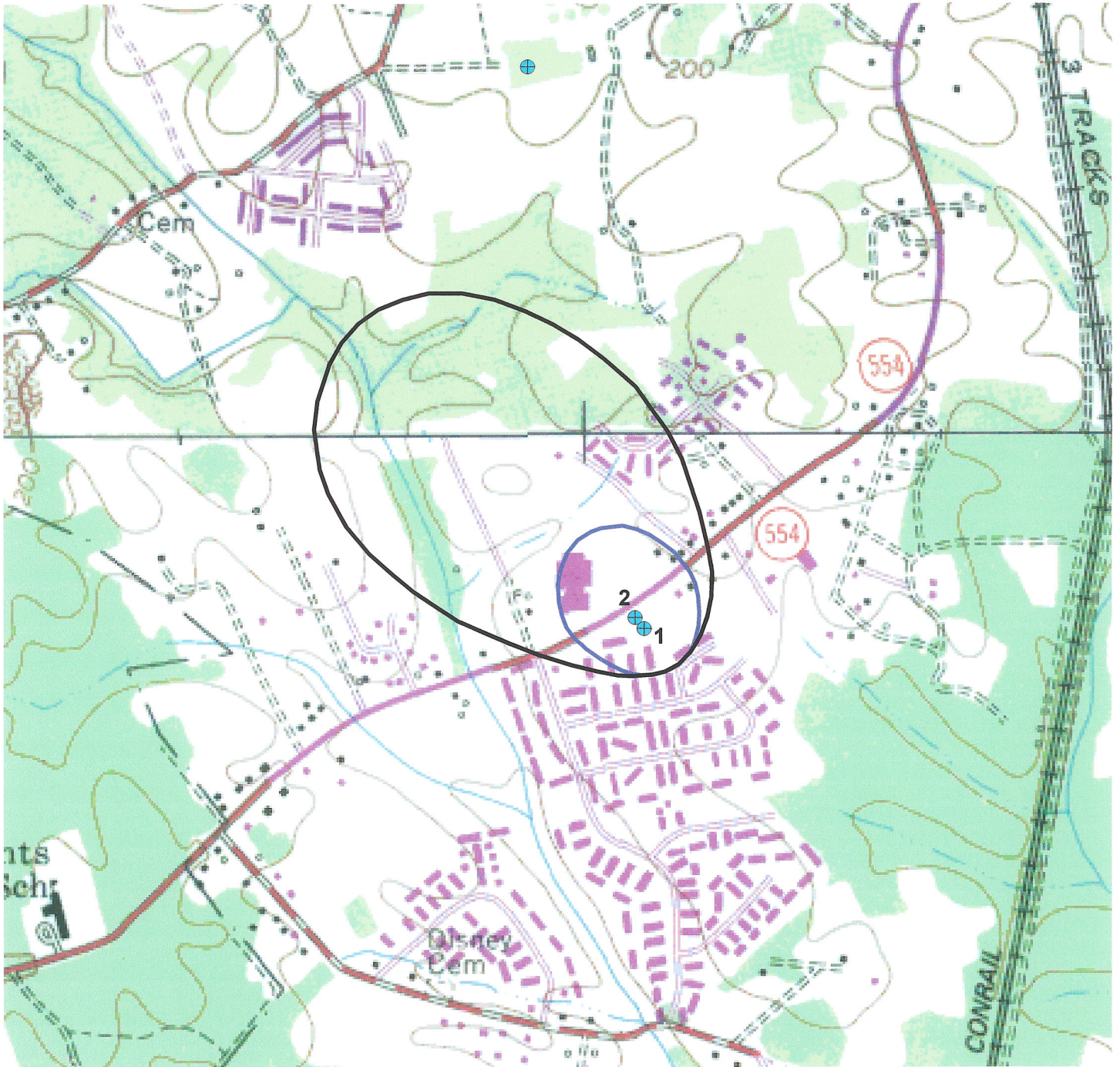


Figure 2. Wellhead Protection Area for Severn Water Company.



Base Map: USGS 7.5 minute Odenton Quadrangle

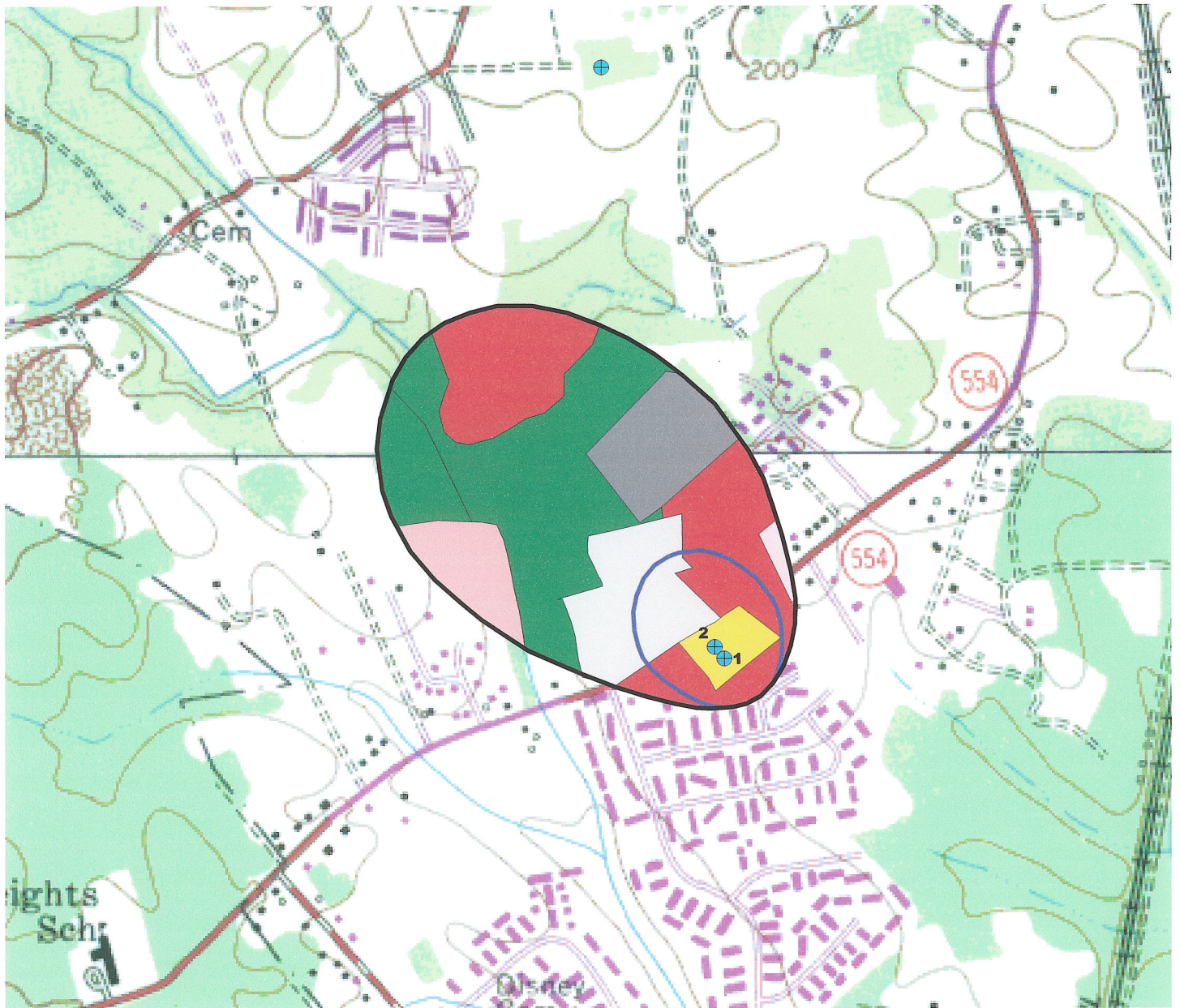
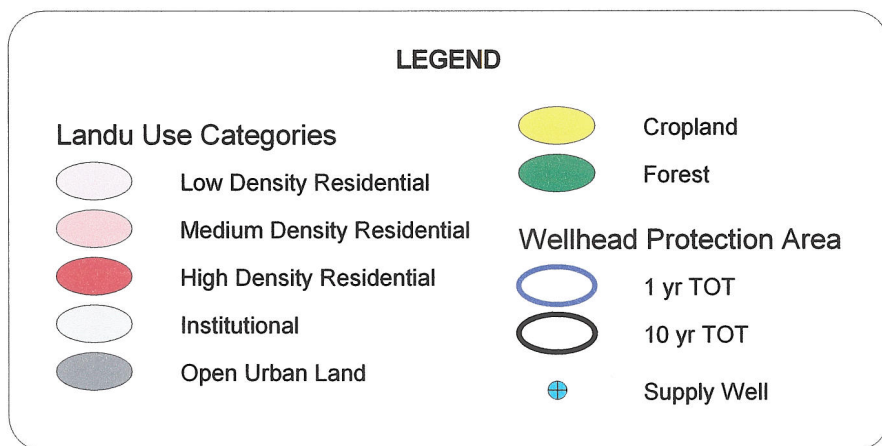


Figure 3. Land Use within the Severn Water Company's Wellhead Protection Area



Base Map: Maryland Dept. of Planning 2000
Anne Arundel County Land Use Map (modified 2004)

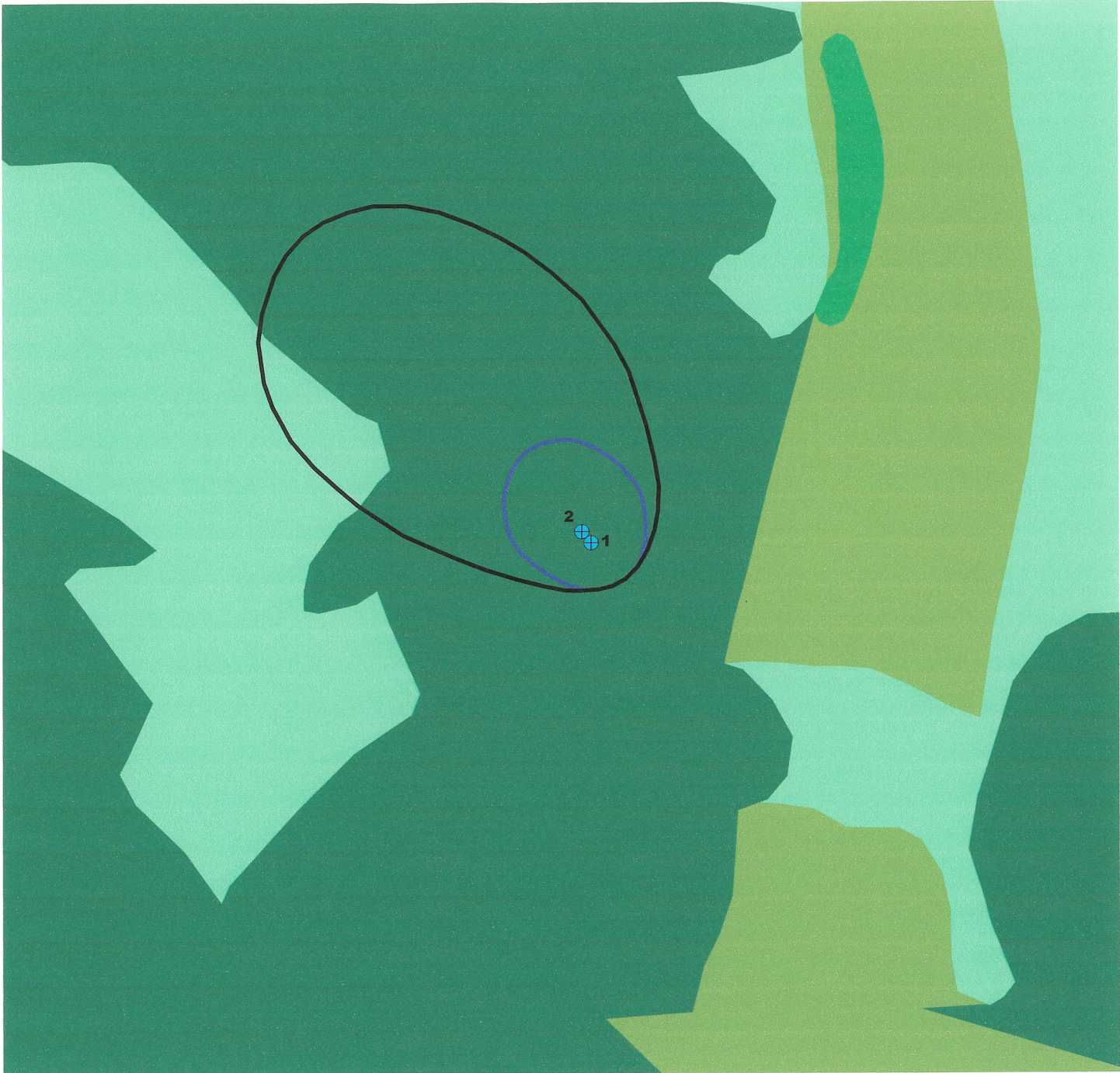








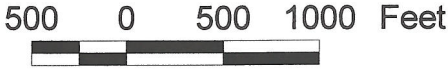


Figure 4. Sewer Map of the Severn Water Company 's Wellhead Protection Area

LEGEND

Sewer Service Area Categories		 Resource Conservation Area
 NP		Wellhead Protection Area
 Existing Service Area		 1 yr TOT
 Capital Facilities Area		 10 yr TOT
 Planned Service Area		 Supply Well
 Future Service Area		



Base Map: Maryland Dept. of Planning Anne Arundel Co. Sewer Map (2000)