

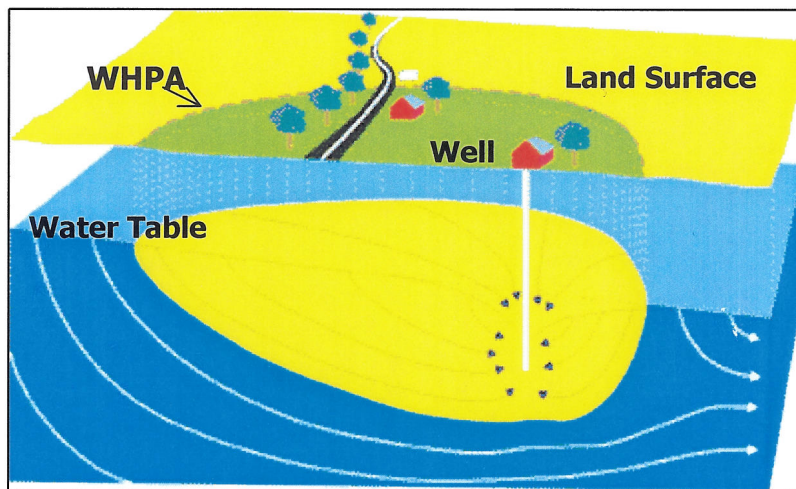
Am final copy
6/17/05

SOURCE WATER ASSESSMENT

for

BRIERCREST APARTMENTS

Frederick County, MD



Prepared By
Water Management Administration
Water Supply Program
June, 2005



Robert L. Ehrlich
Governor

Michael S. Steele
Lt. Governor

Kendl P. Philbrick
Secretary

Jonas A. Jacobson
Deputy Secretary

TABLE OF CONTENTS

	Page
Summary.....	2
Introduction.....	3
Well Information.....	3
Table 1. Briercrest Apartment's Well Information	
Hydrogeology.....	3
Source Water Assessment Area Delineation	4
Potential Sources of Contamination.....	4
Table 2. Land Use Summary for the WHPA	
Water Quality Data	5
Table 3. Summary of Water Quality Samples for Briercrest Apartment's Water Supply	
Susceptibility Analysis.....	7
Table 4. Susceptibility Chart for Briercrest Apartment's Water Supply	
Management of the Wellhead Protection Area.....	9
References.....	11
Other Sources of Data.....	11
Figures	12
Figure 1. Location Map of Briercrest Apartment's Well	
Figure 2A. Briercrest Apartments Wellhead Protection Area	
Figure 2B. Briercrest Apartments Wellhead Protection Area	
Figure 3. Land Use Map of the Briercrest Apartments Wellhead Protection Area	
Figure 4. Sewer Map of the Briercrest Apartments Wellhead Protection Area	
Figure 5. Briercrest Apartments Well, FR-72-0448	

SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for Briercrest Apartments. The required 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 protecting the drinking water supply conclude this report.

The source of Briercrest Apartment's water supply is an unconfined fractured rock aquifer, known as the Upper Pelitic Schist of the Wisshickon Formation. The system currently uses one well to obtain its drinking water. The Source Water Assessment Area was delineated by the Water Supply Program using U.S. EPA approved methods specifically designed for each source.

Potential sources of contamination within the assessment area were identified based on site visits, database reviews and land use maps. Well information and water quality data were also reviewed. Figures showing land uses and potential contaminant sources within the Source Water Assessment Area and an aerial photograph of the well locations are enclosed at the end of the report.

The susceptibility analysis for Briercrest Apartment'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 Briercrest Apartment's water supply is not susceptible to contamination by nitrates, synthetic organic compounds, volatile organic compounds, other inorganic compounds, radon, or other radionuclides, but may be susceptible to microbiological contaminants.

INTRODUCTION

Briercrest Apartments is located east of Old Middletown Road in Jefferson in Frederick County (Figure 1). Briercrest Associates, LLC owns and operates the apartment building and its water supply system that serves the 24 units with a population of approximately 45 persons. Currently, water is supplied by one well.

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 well data and sanitary surveys of the water system indicates that the Briercrest Apartment well was drilled prior to 1973, when the State's well construction regulations went into effect, and may not meet current construction standards. Well information is shown in Table 1 below.

PLANT ID	SOURCE ID	SOURCE NAME	PERMIT NO	TOTAL DEPTH (ft)	CASING DEPTH (ft)	YEAR DRILLED
01	03	Briercrest 3	FR720448	345	101	1972

Table 1. Briercrest Apartment's Well Information.

The apartment building is in the process of obtaining a new Water Appropriation Permit that will allow it to use an average of 5,000 gallons per day (gpd) and 8,000 gpd in the month of maximum use.

HYDROGEOLOGY

Briercrest Apartments lie in the Blue Ridge physiographic province, which is composed of the crystalline bedrock formations that form the core of the mountains in the western portion of the County. This province is underlain by the Upper Pelitic Schist of the Wissahickon Formation, which is an unconfined, fractured rock aquifer composed of albite-chlorite-muscovite quartz schist with sporadic thin beds of laminated micaceous quartzite (Cleaves, et al, 1968). In this type of setting, the underlying crystalline rocks have negligible primary porosity and permeability and ground water is stored in and moves through fractures in the rocks. Ground water flow rates depend upon the openness of the fractures and their degree of interconnection. Unconsolidated overburden (saprolite) above the crystalline rock frequently has much greater primary porosity and permeability than the rock has, allowing additional ground water to be stored (Duigon, 1994). Ground water systems in crystalline rock tend to be localized and flow is within topographic divides towards the nearest perennial streams. (Bolton, 1998).

SOURCE WATER ASSESSMENT AREA DELINEATION

For ground water systems, a Wellhead Protection Area (WHPA) is considered to be the source water assessment area for the system. The WHPA for Briercrest Apartment's water supply was delineated by the WSP. As defined in Maryland's SWAP, the source water assessment area for public water systems using an average of less than 10,000 gallons per day (gpd), in unconfined fractured-rock aquifers is a fixed radius of 1,000 feet around the well. This radius is based on calculating the land area needed to provide a yield of 10,000 gpd assuming a 400 gpd per acre recharge rate (drought year recharge conditions) and a safety factor. The same source water assessment area applies to carbonate rock aquifers, unless the source has been determined to be ground water under the direct influence of surface water (GWUDI). GWUDI sources would require a more detailed study to delineate their source water assessment area.

POTENTIAL SOURCES OF CONTAMINATION

For this assessment, MDE Waste and Water Management databases and Frederick County's database were reviewed, and staff consulted, to identify potential sources of contamination in and around the WHPA. WSP staff conducted a field survey of the WHPA in April 2005 and met with Mr. Tom Horner, operator of the water system, to discuss potential contamination sources and water quality concerns.

No potential point sources of contaminants were identified in the WHPA (Figure 2A and 2B).

The Maryland Department of Planning's (MDOP) 2002 digital land use map for Frederick County was used to determine the predominant types of land use in the WHPA (Figure 3). Table 3 shows the land use categories in the WHPA. According to MDOP data a large portion of the WHPA is made of residential land (65%) followed by pasture (23%). While the MDOP's land use map shows the fields on the west side of Middletown Road are all pasture, the aerial photo (Figure 2A) shows about half is in crop production.

LAND USE CATEGORIES	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Low Density Residential	13.87	19.24
Medium Density Residential	20.81	28.86
High Density Residential	12.51	17.36
Commercial	4.46	6.19
Open Urban Land	3.05	4.24
Pasture	16.84	23.36
Forest	0.55	0.76
Total	72.1	100.00

Table 3. Land Use Summary for the WHPA.

Agricultural lands, particularly cropland is a source of nitrate to ground water and is potentially a source of herbicides. Residential areas may also be a source of these contaminants; fertilizers and pesticides are not used carefully for lawns and gardens.

A review of the Maryland Department of Planning's 2004 Frederick County Sewer Map indicates that almost the entire WHPA has existing sewer service (Figure 4). Approximately one acre of the WHPA does not currently have sewer service. The area is programmed for service within 7 to 20 years.

WATER QUALITY DATA

Water Quality data was reviewed from the Water Supply Program's database and system files for Safe Drinking Water Act contaminants. The State's SWAP defines a threshold for reporting water quality data as 50% of the Maximum Contaminant Level (MCL). If a monitoring result is at or greater than 50% of a MCL, this assessment will describe the sources of such a contaminant and, if possible, locate the specific sources which are the cause of the elevated contaminant level. All data reported is from the finished (treated) water unless otherwise noted. The treatment that Briercrest Apartments currently uses is hypochlorination (post) for disinfection.

A review of the monitoring data since 1994 for Briercrest Apartments water supply indicates that it meets the current drinking water standards. The water quality sampling results are summarized in Table 4. It must be noted that the radionuclide numbers used in this table include detections of radon-222 using proposed lower MCL of 300 picoCuries/Liter (pCi/L).

PLANT NO	Nitrate		SOCs		VOCs		IOCs (except nitrate)		Radionuclides	
	No. of Samples Collected	No. of samples > 50% MCL	No. of Samples Collected	No. of samples > 50% MCL	No. of Samples Collected	No. of samples > 50% MCL	No. of Samples Collected	No. of samples > 50% MCL	No. of Samples Collected	No. of samples > 50% MCL
01	99	0	4	1	14	0	18	0	4	0

Table 4. Summary of Water Quality Samples for Briercrest Apartment's Water Supply.

Inorganic Compounds (IOCs)

No IOCs above 50% of the MCL have been detected in Briercrest Apartment's water supply. Nitrates have been detected generally once or twice a year. Detected levels range from 2.45 to 4.9 parts per million (ppm). The MCL for nitrate is 10 ppm.

Volatile Organic Compounds (VOCs)

No VOCs above 50% of the MCL have been detected in Briercrest Apartment's water supply. There are three VOCs that have been detected since 1994.

Chloroform and dibromochloromethane were detected in May 1997 (2 parts per billion (ppb) and 1 ppb), in July 1998 (2.5 ppb and 0.7 ppb), and in October 2001 (3.9 ppb and 1.7 ppb). Bromodichloromethane was detected in May 1997 (2 ppb) and July 1998 (1.3 ppb). These compounds are formed as a result of chlorine reacting with natural organic compounds in the water during disinfection and are known as trihalomethanes. The maximum contaminate level for total trihalomethanes is 80 ppb.

Synthetic Organic Compounds (SOCs)

One SOC above 50% MCL has been detected in Briercrest Apartment's water supply. The only contaminant reported greater than 50% of the MCL was di (2-ethylhexyl) phthalate (also known as DEHP) in October 2001 at 12.4 ppb. DEHP was detected in the laboratory blank analyzed concurrently with this sample. Therefore, it was determined that no violation occurred. The MCL for this contaminant is 6 ppb. DEHP has been detected on two other occasions well below the MCL, in June 1995 at 1.98 ppb and in September 2004 at 1.4 ppb. DEHP was also found in the laboratory blanks analyzed concurrently with these samples. Only one other SOC has been detected, di (ethylhexyl) adipate in October 1991 at 0.9 ppb. The MCL for di (ethylhexyl) adipate is 400 ppb.

Radionuclides

No radionuclides above 50% of the MCL have been detected in Briercrest Apartment's water supply. Gross beta was detected in January 1995 at 3.2 picoCuries/Liter (pCi/L). Both gross alpha and gross beta were detected in May 1999 at 5 pCi/L and 3 pCi/L and again in March 2003 at 1 pCi/L and 3.2 pCi/L. The MCL for gross alpha is 15 pCi/L and for gross beta is 50 pCi/L. Radon-222 was detected in May 1997 at 25 pCi/L. At present there is no MCL for radon-222, however EPA has proposed an MCL of 300 pCi/L and an alternate MCL of 4000 pCi/L for community water systems if the State has a program to address the more significant risk from radon in indoor air.

Microbiological Contaminants

The one well serving the apartment complex was sampled in April of 1999 to determine its susceptibility to microbial pathogens. No coliform bacteria were present. Routine bacteriological sampling from the distribution system occurs monthly. Due to the presence of chlorine these results are not indicative of raw water quality.

SUSCEPTIBILITY ANALYSIS

Briercrest Apartments well obtains water from an unconfined fractured-rock aquifer. Wells in unconfined aquifers are generally vulnerable to any activity on the land surface that occurs within the WHPA. Therefore, managing this area to minimize the risk to the supply and continued routine monitoring of contaminants is essential in assuring a safe drinking water supply. The susceptibility of the wells to contamination is determined for each group of contaminants based on the following criteria: (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.

In the Blue Ridge region, if a well is constructed properly with the casing extended to competent rock and with sufficient grout, the saprolite serves as a natural filter and protective barrier. Properly constructed wells with no potential sources of contamination in their WHPA should be well protected from contamination. The susceptibility of the water supply to the various types of contaminants is described below and summarized in Table 6.

Inorganic Compounds (IOCs)

No IOCs have been detected in Briercrest Apartment's water supply above 50% of the MCL. Nitrates have been detected generally once or twice a year, primarily in the fall with levels ranging from 1.0 ppm to 4.9 ppm. The MCL for nitrate is 10 ppm. Sources of nitrate can generally be traced to land use. Septic systems and the fertilization of cropland and residential properties are all sources of nitrate loading in ground water. Since the entire WHPA (99%) has existing sewer service, the primary source of nitrates could be from the cropland shown in the aerial photo, pastureland, or residential uses. These levels of nitrates do not show any trend of increasing over the past ten years.

Based on the above analysis, Briercrest Apartment's water supply **is not** susceptible to nitrate or other inorganic compounds.

Volatile Organic Compounds (VOCs)

No VOCs have been detected in Briercrest Apartment's water supply above the 50% of the MCL. No significant sources of volatile compounds were identified within the wellhead protection area.

Based on the above analysis, Briercrest Apartment's water supply **is not** susceptible to VOC contamination.

Synthetic Organic Compounds (SOCs)

The only contaminant in this group detected above 50% of the MCL was di (2-ethylhexyl) phthalate, which can be attributed to its presence in the laboratory environment. No point sources of SOC were identified within the source water assessment area.

Based on the above analysis, Briercrest Apartment's water supply is **not** susceptible to SOC contamination.

Radionuclides

No radionuclides above 50% of the MCL have been detected in Briercrest Apartment's water supply. Radionuclides are naturally occurring contaminants and are not expected to increase over time.

Based on the above analysis, Briercrest Apartment's water supply is **not** susceptible to radionuclides.

Microbiological Contaminants

Ground water is generally thought to be not susceptible to contamination by pathogenic microorganisms due to the natural filtration ability of soil and aquifer material. The exceptions to this are 1) wells that are classified as "Ground water under the direct influence of surface water" (GWUDI) and 2) wells with construction deficiencies that allow contamination directly to the well.

From microbiological data collected in 1999, Briercrest Apartment's well was determined not to be under the direct influence of surface water. However, this well **maybe** susceptible to microbiological contamination due to a deficiency noted in a 2003 inspection report that noted a loose well cap. It is recommended that the system correct this item, if it has not already done so, and resample water for coliform organisms.

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
Nitrate	YES	NO	NO	YES	NO
Inorganic Compounds (except nitrate)	NO	NO	NO	NO	NO
Volatile Organic Compounds	NO	NO	NO	NO	NO
Synthetic Organic Compounds	NO	YES	NO	NO	NO
Radionuclides	NO	NO	NO	NO	NO
Microbiological Contaminants	NO	NO	YES	NO	MAYBE

Table 6. Susceptibility Summary for Briercrest Apartment's water supply.

MANAGEMENT OF THE WHPA

Form a Local Planning Team

- The water supply owner should request assistance of Frederick County Planning and Public Works departments to develop a wellhead protection plan.

Public Awareness and Outreach

- The Consumer Confidence Report should include a summary of this report and information that this report is available to the general public through their county library, or MDE.
- Placing signs at the WHPA boundaries is a good way to make the public aware of protecting their source of water supply.

Cooperative Efforts with Other Agencies

- Farmers can participate in the New Conservation Reserve Program (CREP) applicable to the cropland located within a WHPA. Government funding is available to qualified farmers equal to the cost and financial benefit of farming the area. The Natural Resources Conservation Service is responsible for determining the relative environmental benefits of each acre offered for participation.

Monitoring

- Continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.
- The facility's raw water (unchlorinated) should be resampled for microbiological contaminants on an annual basis to ensure the well's integrity.

Land Acquisition/Easements

- Loans are available for the purchase of property or easements for the protection of the water supply. Eligible property must lie within the designated WHPA. Loans are currently being offered at zero percent interest and zero points. Contact the WSP for more information.

Contingency Plan

- COMAR 26.04.01.22 regulations require all community water systems to prepare and submit for approval a plan for providing a safe and adequate drinking water supply under emergency conditions.

Changes in Use

- Any increase in pumpage or addition of new wells to the system may require revision of the WHPA. The system is required to contact the Water Supply Program when an increase pumpage is applied for or when new wells are being considered.

Contaminant Source Inventory/Well Inspection

- The system owners should review the potential sources of contaminants within the WHPA and update them if necessary, including a consideration of historical uses.
- Periodic inspections and a regular maintenance program for the supply wells will ensure their integrity and protect the aquifer from contamination. If the well cap has not already been tightened than it should for protection against vandalism and microbial contaminants.

REFERENCES

- Bolton, David W., 1996, Network Description and Initial Water-Quality Data from a Statewide Ground-Water Quality Network in Maryland: Maryland Geological Survey Report of Investigations No. 60, 167 p.
- Duigon, Mark T., 1994, Sykesville Quadrangle, Maryland Geological Survey, Quadrangle Atlas No. 24.
- Cleaves, E. T., Edwards, Jr., J., and Glaser, J. D., 1968, Geology Map of Maryland, Maryland Geological Survey.
- Maryland Department of the Environment, Water Supply Program, 1999, Maryland's Source Water Assessment Plan, 36 p.
- U.S. Environmental Protection Agency, 1991, Delineation of Wellhead Protection Areas in Fractured Rocks: Office of Water and Drinking Water, EPA/570/9-91-009, 144 p.

OTHER SOURCES OF DATA

Water Appropriation and Use Permit: FR1970G014
Public Water Supply Inspection Reports
MDE Water Supply Program Oracle Database
MDE Waste Management Sites Database
Frederick County WHP Database
Department of Natural Resources Digital Orthophoto Quarter Quadrangle – Point of Rocks
USGS Topographic 7.5 Minute Quadrangles - Middletown
Maryland Department of Planning 2002 Frederick County Land Use Map
Maryland Department of Planning 2004 Frederick County Sewer Map

FIGURES

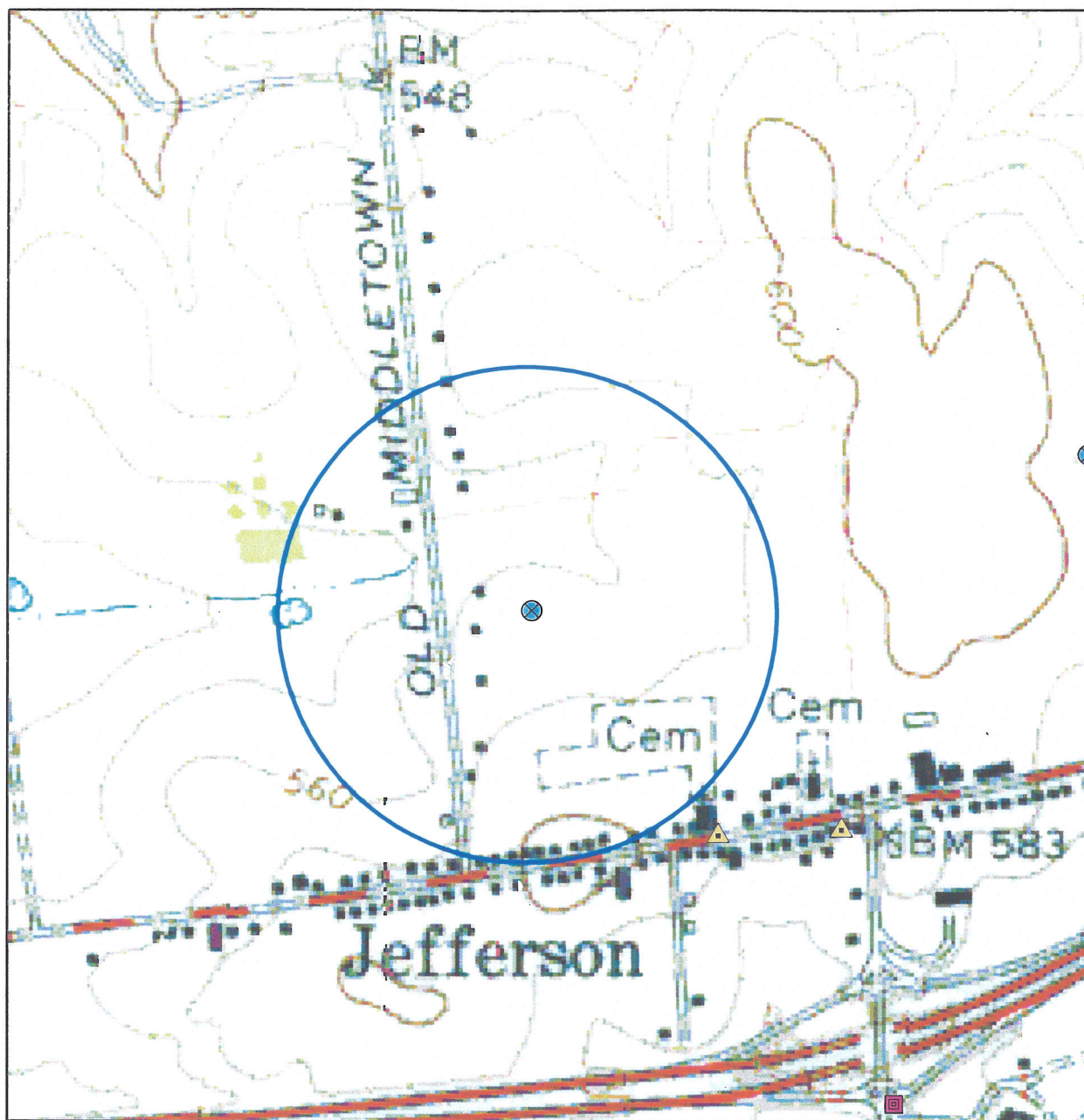
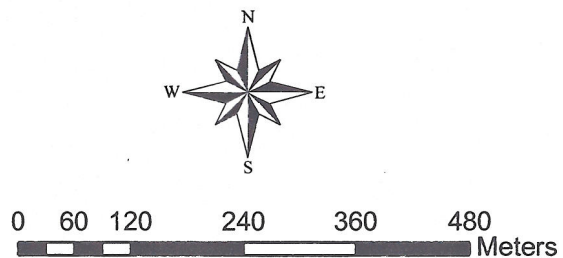
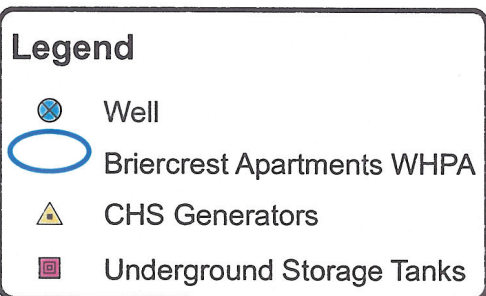


Figure 2B. Briercrest Apartments Wellhead Protection Area



Base Photo: USGS 7.5 minute Topographic Quadrangle - Middletown

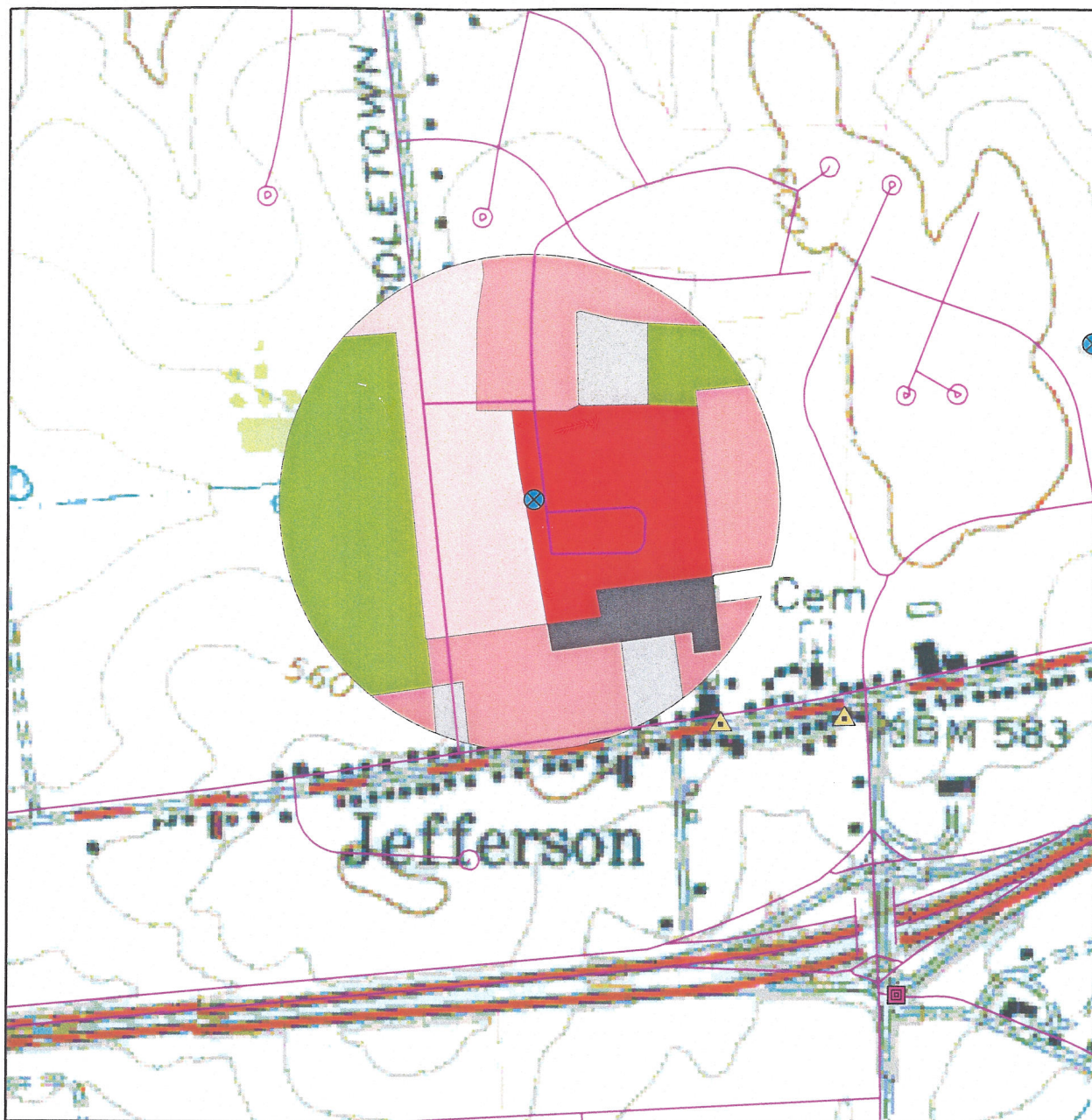


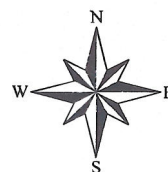
Figure 3. Land Use Map of the Briercrest Apartments Wellhead Protection Area

Legend

-  Well
-  Briercrest Apartments WHPA

Land Use Categories

-  Low Density Residential
-  Medium Density Residential
-  High Density Residential
-  Commercial
-  Open Urban Land
-  Pasture

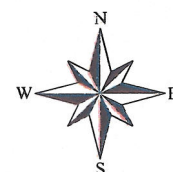
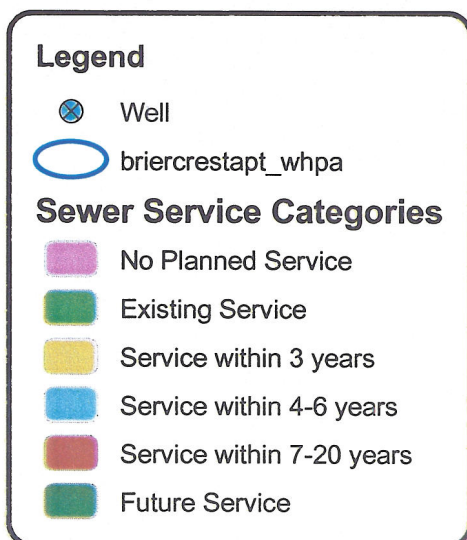


0 60 120 240 360 480
Meters

Base Photo: USGS 7.5 minute Topographic Quadrangle - Middletown
Maryland Department of Planning 2002



Figure 4. Sewer Map of the Briercrest Apartments Wellhead Protection Area



0 70 140 280 420 560 Meters

Base Map: MD Dept. of Planning Frederick County Sewer Map 2004