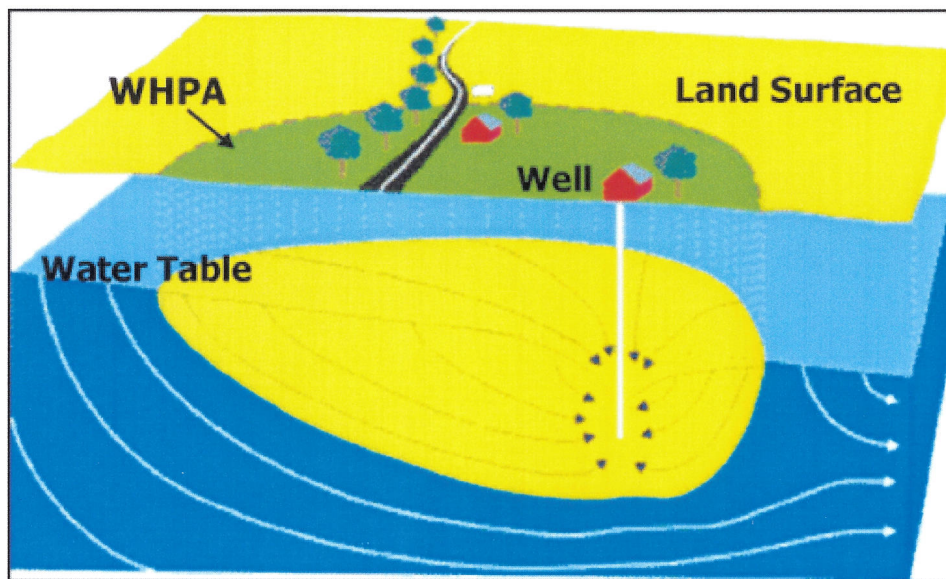


**Source Water Assessment
for the Brook Lane Psychiatric Center
Water System
Washington County, Maryland**



**Prepared By
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Water Management Administration
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SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for the Brook Lane Psychiatric Center water system. The required components of this report as described in Maryland's Source Water Assessment Program (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 sources of Brook Lane's water supply are three wells in an unconfined fractured-rock aquifer. The Source Water Assessment area was delineated by the WSP using U.S. EPA approved methods specifically designed for this source type.

Point sources of contamination were investigated within the assessment area from field inspections, contaminant inventory databases, and previous studies. The Maryland Office of Planning's 2000 digital land use map for Washington County was used to identify non-point sources of contamination. Well information and water quality data were also reviewed. An aerial photograph and maps showing land use within the Source Water Assessment area are included in the report.

The susceptibility analysis is based on a review of the existing water quality data for the Brook Lane water system, the presence of potential sources of contamination in the source water assessment area, well integrity, and the inherent vulnerability of the aquifer. It was determined that Radon-222, a naturally occurring contaminant, may pose a risk to the Brook Lane Psychiatric Center water supply. This water supply is not susceptible to other radionuclides, inorganic compounds, volatile organic compounds, synthetic organic compounds, or microbiological contaminants.

INTRODUCTION

The Water Supply Program has conducted a Source Water Assessment for the Brook Lane Psychiatric Center water system in Washington County. The Brook Lane Psychiatric Center is located approximately 8 miles northeast of Hagerstown in northern Washington County. The water system serves a population of 175 and has 17 service connections. The water system is owned by the Brook Lane Psychiatric Center and is contractually operated by the Washington County Water and Sewer department.

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. The Brook Lane system presently obtains its water supply from three wells (Fig. 1). A review of the well completion reports for Brook Lane's wells indicates that they were drilled after 1973 and should meet construction standards for grouting and casing. Well information is summarized in Table 1.

The Brook Lane water system has an appropriation permit to draw water from the Conococheague Limestone formation for an average use of 7,000 gallons per day (gpd) and a maximum of 8,500 gpd in the month of maximum use.

SOURCE ID	WELL NAME	PERMIT	TOTAL DEPTH	CASING DEPTH	YEAR DRILLED
03	UPPER WELL A	WA-81-0067	575	23	1982
01	UPPER WELL B	WA-81-0913	600	21	1984
02	LOWER (LAURELS) WELL	WA-81-0211	575	21	1982

Table 1. Brook Lane well information.

HYDROGEOLOGY

Brook Lane lies within the Hagerstown Valley physiographic province, which is underlain by a sequence of metasedimentary limestones and shales that have eroded away to form the valley bound by South Mountain and the Bear Pond Mountains west of Clear Spring. In some areas the carbonate rock formations have developed into a karst-like aquifer. Duigon (2001) has identified sinkholes, wells that penetrate cavernous zones, and other karst features in the valley. The Brook Lane wells obtain water from the Conococheague formation, a sequence of argillaceous to siliceous limestone interbedded with shales (Edwards, 1978). This is a heterogeneous formation and can be very karstic in some areas, and in others much more like a crystalline fractured-rock aquifer. The Brook Lane wells appear to be in the less soluble section of this aquifer where it is less likely to be influenced by karst features. Therefore, the primary porosity and

permeability of this aquifer are small due to the dense nature of the metamorphosed rock. Ground water moves principally through secondary porosity, fractures and joint openings, and is recharged by precipitation percolating through soil and saprolite. Due to the low primary porosity, large production wells are only common when significant, solution enlarged fractures or openings are encountered.

SOURCE WATER ASSESSMENT AREA DELINEATION

For ground water systems, a Wellhead Protection Area (WHPA) is considered the source water assessment area for the system. The source water assessment area for public water systems with an average appropriation amount of less than 10,000 gpd and drawing from fractured-rock aquifers is a circle with a 1,000-foot radius (MD SWAP, 1999). The area should be modified to account for geological boundaries and ground water divides if appropriate.

The WHPA is delineated as the modified watershed drainage area needed to supply the appropriated amount using the effective recharge rate. The WHPA was delineated following topographic divides upgradient of the wells, since a circle of 1,000 feet would include the nearby stream. These wells were determined not to be ground water under direct influence (GWUDI); therefore it would be inappropriate to include the stream in the WHPA. The WHPA is 110 acres and is illustrated in Figure 2.

POTENTIAL SOURCES OF CONTAMINATION

Potential sources of contamination are classified as either point or non-point sources. Examples of point sources of contamination are leaking underground storage tanks, landfills, discharge permits, large-scale feeding operations, and CERCLA 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 of contamination are associated with certain types of land use practices such as use of pesticides, application of fertilizers or animal wastes, or septic systems that may lead to ground water contamination over a larger area.

Point Sources

A review of MDE contaminant databases revealed no potential point sources of contamination within the WHPA.

Non-Point Sources

The Maryland Office of Planning's 2000 digital land use coverage of Washington County was used to determine the predominant types of land use in the WHPA (Fig. 3). The land use summary is given in Table 2. The majority of the WHPA is made up of agricultural land, with a smaller proportion of commercial, forested, and residential areas.

Land Use Type	Total Acres	Percent of WHPA
Low Density Residential	2	2.0
Institutional	16	14.9
Cropland	16	14.3
Pasture	69	62.3
Forest	7	6.5
Total	110	100

Table 2. Land Use Summary

Agricultural land (cropland and pasture) is commonly associated with nitrate loading of ground water and also represents a potential source of SOCs depending on fertilizing practices and use of pesticides. Pasture areas may also be a source of microbiological pathogens from animal wastes. Residential areas without sewer service can be a source of nitrate from septic systems. Additionally, residential areas may be a source of nitrate and SOCs if fertilizers, pesticides, and herbicides are not used carefully in lawns and gardens.

The Maryland Office of Planning's 1996 digital sewer map of Washington County shows that the area covered by Brook Lane property has sewer service and the remainder of the WHPA is in an area of the county that is not planned for service (Fig. 4).

WATER QUALITY DATA

Water Quality data was reviewed from the Water Supply Program's database for Safe Drinking Water Act (SDWA) 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 greater than 50% of a MCL, this assessment will describe the sources of such a contaminant and if possible, locate the specific sources that are the cause of the elevated contaminant level. All data reported is from the finished (treated) water unless otherwise noted. The Brook Lane water system currently has chlorination for disinfection and ion exchange for softening.

A review of the monitoring data for Brook Lane's water system indicates that the water supply meets drinking water standards. Contaminants have not been detected above 50% of an MCL. Radon-222 was the only contaminant present at a level of concern. The water quality sampling results are summarized in Table 3.

Inorganic Compounds (IOCs)

Inorganic compounds were not detected above 50% of an MCL. Several compounds including nitrate, fluoride, sodium and sulfate have been detected in the water supply at low levels.

Contaminant Group	No. of Samples Collected	No. of Samples over 50% of an MCL
Inorganic Compounds (except Nitrate)	74	0
Nitrate	18	0
Radiological Contaminants	4	1*
Volatile Organic Compounds	10	0
Synthetic Organic Compounds	6	0

Table 3. Summary of Water Quality Samples

*Proposed MCL for Radon-222

Radionuclides

A review of the data shows that the only radionuclide detected at a level of concern was Radon-222. There is currently no MCL for Radon-222, however EPA has proposed an MCL of 300 pCi/L or an alternate 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. The EPA received many comments in response to their proposed rule, and promulgation may be delayed. Radon-222 was detected at 250 pCi/L in the water supply, which is greater than 50% of the lower proposed MCL.

Volatile Organic Compounds (VOCs)

A review of the data shows that VOCs have not been detected above 50% of an MCL.

Synthetic Organic Compounds (SOCs)

A review of the data shows that SOC's have not been detected above 50% of an MCL.

Microbiological Contaminants

Raw water bacteriological data is available from evaluation for ground water under the direct influence of surface water (GWUDI). A review of the data shows that coliform bacteria was not detected in raw water from the well.

SUSCEPTIBILITY ANALYSIS

The wells serving the Brook Lane water supply draw water from unconfined fractured-rock aquifers. Wells in unconfined aquifers are generally vulnerable to any activity on the land surface that occurs within the wellhead protection area. Therefore, continued monitoring of contaminants is essential in assuring a safe drinking water supply. The *susceptibility* of the source to contamination is determined for each group of contaminants based on the following criteria: 1) the presence of potential contaminant sources within the WHPA, 2) water quality data, 3) well integrity, and 4) the aquifer conditions. Table 4 summarizes the susceptibility of Brook Lane's water supply to each of the groups of contaminants.

In fractured-rock areas, 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.

Inorganic Compounds

The water supply is **not** susceptible to inorganic compounds, based on water quality data and the lack of potential contaminant sources within the WHPA.

Radionuclides

The water supply **may be** susceptible to Radon-222. The source of radionuclides in ground water is the natural occurrence of uranium in rocks. The concentration of constituents such as Radon-222, Radium-226, and Radium-228 can vary considerably in the same aquifer due to many factors such as pH, exposed surface area of minerals, and other natural conditions. The Radon-222 level is higher than 50% of the lower proposed MCL of 300 pCi/L. Therefore, the system will be determined susceptible to this contaminant, if the lower MCL is adopted. Based on available data, the water supply is **not** susceptible to other radionuclides.

Volatile Organic Compounds

The water supply is **not** susceptible to volatile organic compounds, based on water quality data and the lack of potential contaminant sources within the WHPA.

Synthetic Organic Compounds

The wells are **not** susceptible to synthetic organic compounds. SOCs were not detected in the water supply. A potential source of SOCs in the WHPA may be pesticide or herbicide use in the agricultural or residential areas. However, because these contaminants have not been detected, it appears that any chemicals that may be used in the WHPA are degrading or being attenuated in the soil and are not reaching the wells.

Microbiological Contaminants

The wells are **not** susceptible to microbiological contaminants. Raw water data shows that coliform bacteria, which is used as an indicator for other microbiological contaminants, was not detected in the water supply.

Contaminant Group	Are Contaminant Sources Present in WHPA?	Are Contaminants Detected Above 50% of MCL?	Is Well Integrity a Factor?	Is the Aquifer Vulnerable?	Is the System Susceptible?
Nitrate	YES	NO	NO	YES	NO
Inorganic Compounds (except nitrate)	NO	NO	NO	YES	NO
Radiological Compounds	YES (aquifer)	YES*	NO	YES	YES* (Radon-222 Only)
Volatile Organic Compounds	NO	NO	NO	YES	NO
Synthetic Organic Compounds	YES	NO	NO	YES	NO
Microbiological Contaminants	YES	NO	NO	NO	NO

Table 9. Susceptibility Analysis Summary.

*Proposed MCL for Radon-222

MANAGEMENT OF THE SOURCE WATER ASSESSMENT AREA

With the information contained in this report the Brook Lane Psychiatric Center in cooperation with the Washington County Department of Water and Sewer are in a position to protect the water supply by staying aware of the area delineated for source water protection and evaluating future development and land planning. Specific management recommendations for consideration are listed below:

Form a Local Planning Team

- The Brook Lane Psychiatric Center and the Water and Sewer Department should contact the County Planning Department to form a local planning team to begin to implement a wellhead protection plan. The team should represent all the interests in the community, such as the water supplier, home association officers, the County Health Department, local business, developers, and property owners, and residents within and near the WHPA. The team should work to reach a consensus on how to protect the water supply.
- A management strategy adopted by the County should be consistent with the level of resources available for implementation. MDE remains available to assist in anyway we can help the process.
- MDE has grant money available for Wellhead Protection projects.

Public Awareness and Outreach

- The Consumer Confidence Report should list that this report is available to the general public through their county library, by contacting the Water and Sewer Department or MDE.
- Conduct educational outreach to the facilities that may present potential contaminant sources. Important topics include (a) appropriate use and application of fertilizers and pesticides, and (b) chemical storage.
- Road signs at the WHPA boundary are an effective way of keeping the relationship of land use and water quality in the public eye, and help in the event of spill notification and response.

Monitoring

- Continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.
- Annual raw water bacteriological samples are a good test for well integrity.

Planning/ New Development

- Review the State's model wellhead protection zoning ordinances for potential adoption. Coordinate with Washington County Department of Planning to adopt a wellhead protection ordinance.

Land Acquisition/Easements

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

Contingency Plan

- Brook Lane should have a Contingency Plan for its water system. COMAR 26.04.01.22 requires all community water systems to prepare and submit for approval a plan for providing a safe and adequate drinking water supply under emergency conditions.
- Develop a spill response plan in concert with the Fire Department and other emergency response personnel.

Contaminant Source Inventory Updates/ Inspections

- The Water and Sewer Department should conduct their own field survey of the source water assessment area to ensure that there are no additional potential sources of contamination.
- Periodic inspections and a regular maintenance program for the supply wells will ensure their integrity and protect the aquifer from contamination.

Changes in Use

- The Brook Lane Psychiatric Center is required to notify MDE if new wells are to be put into service. Drilling a new well outside the current WHPA would modify the area; therefore the Water Supply Program should be notified if a new well is being proposed.

REFERENCES

- Bolton, D.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 pp.
- Committee on Health Risks of Exposure to Radon, 1999, Health Effects of Exposure to Radon: BEIR VI, (<http://www.epa.gov/iaq/radon/beirvi1.html>).
- Duigon, M.T., 2001, Karst Hydrogeology of the Hagerstown Valley, Maryland, MGS Report of Investigations 73, 128 pp.
- Duigon, M.T., and J.R. Dine, 1991, Water Resources of Washington County, Maryland, MGS Bulletin 36, 109 pp.
- MDE, 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 Ground Water and Drinking Water, EPA/570/9-91-009, 144 pp.

OTHER SOURCES OF DATA

Water Appropriation and Use Permit WA1955G002
Public Water Supply Sanitary Survey Inspection Reports
MDE Water Supply Program Oracle® Database
MDE Waste Management Sites Database
Department of Natural Resources Digital Orthophoto Quarter Quadrangles for Smithsburg
USGS Topographic 7.5 Minute Quadrangles for Smithsburg
Maryland Office of Planning 2000 Washington County Digital Land Use Map
Maryland Office of Planning 1996 Washington County Digital Sewer Map

FIGURES

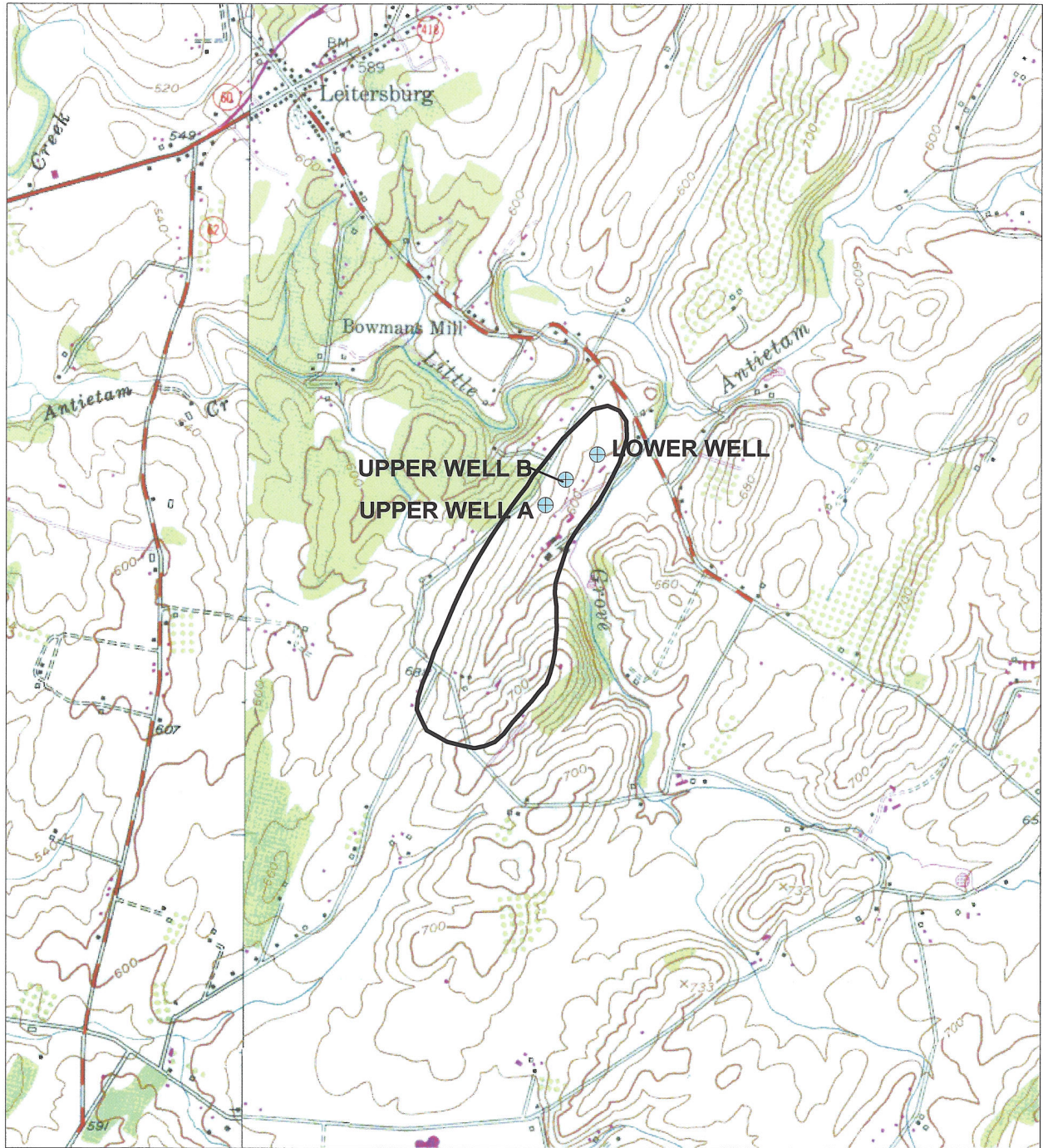
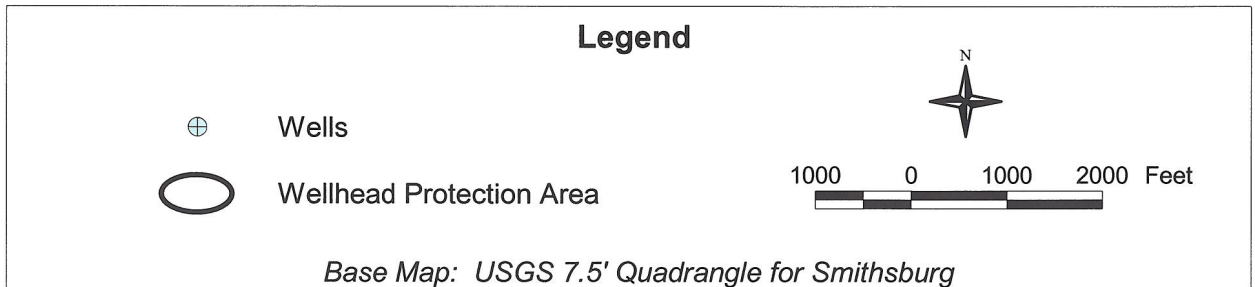


Figure 2. Brook Lane Wellhead Protection Area



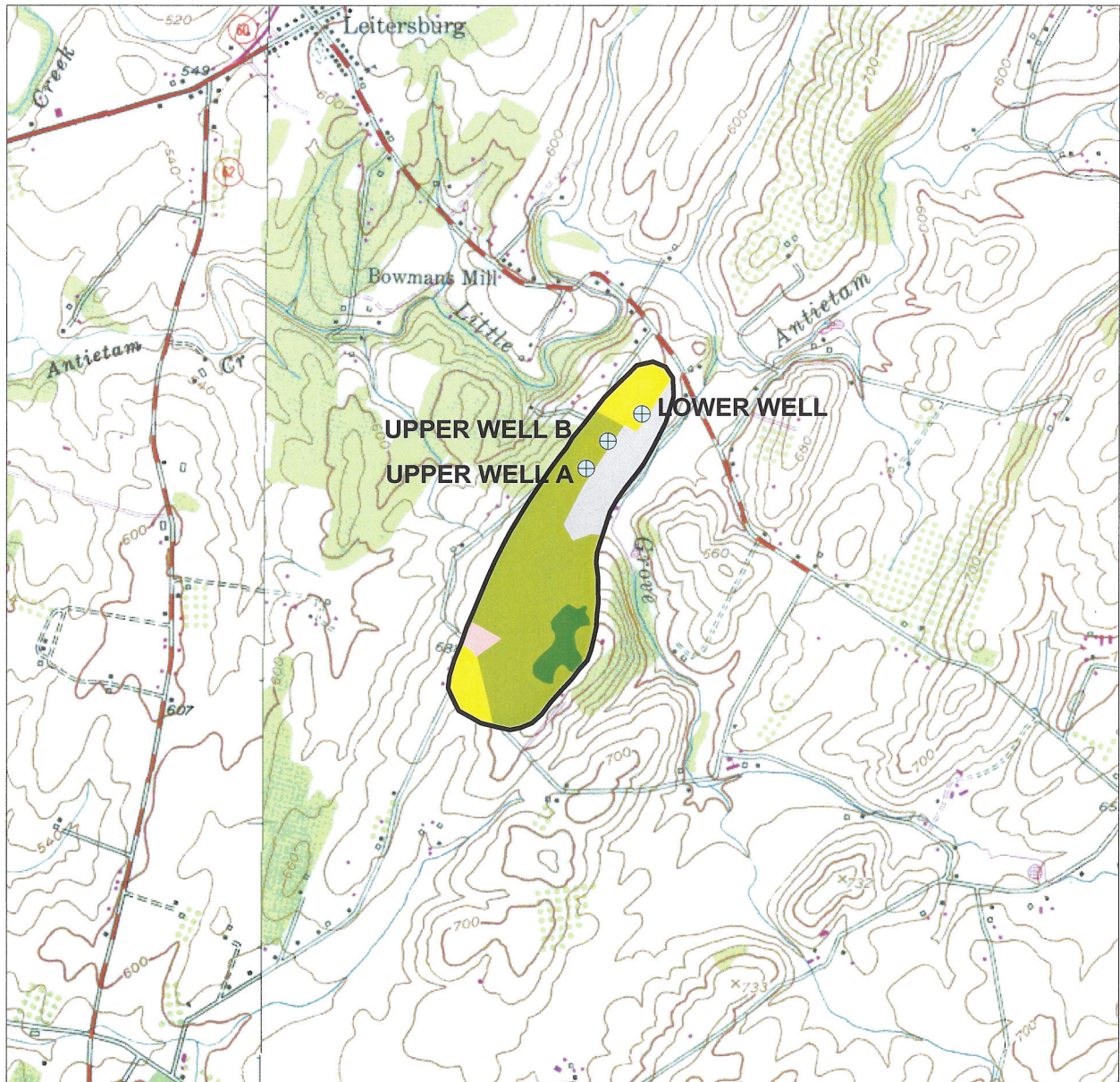
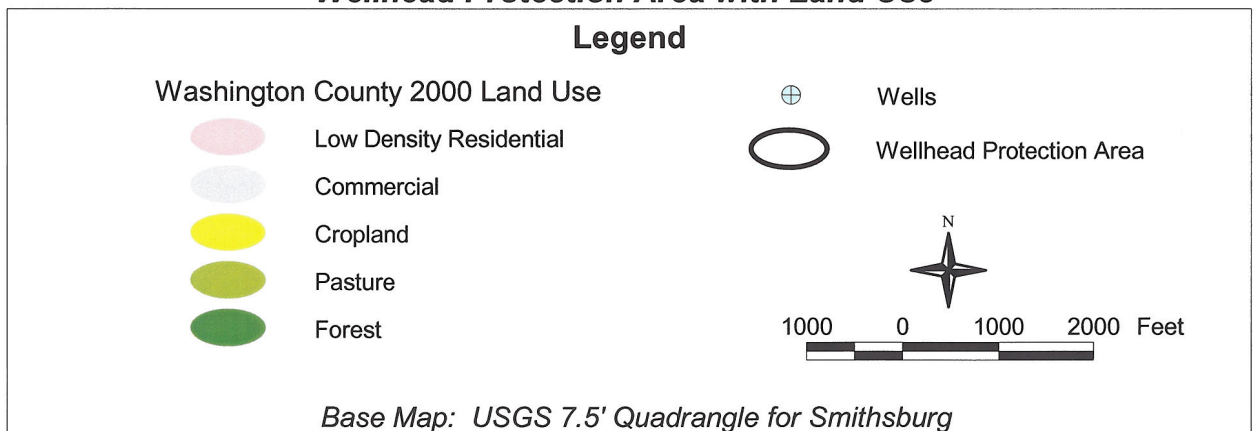


Figure 3. Brook Lane Psychiatric Center Wellhead Protection Area with Land Use



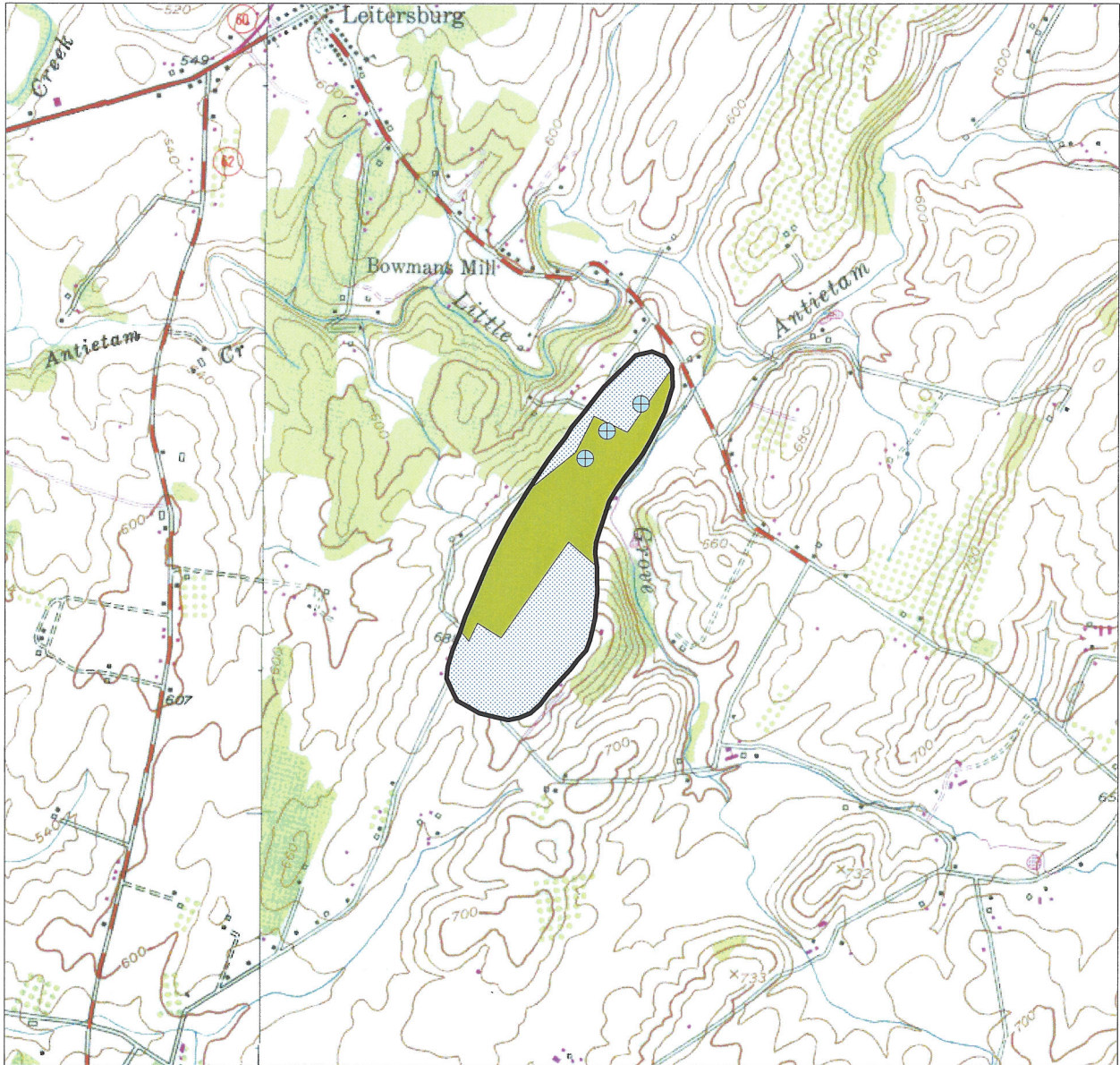


Figure 4. Brook Lane Psychiatric Center Wellhead Protection Area with Sewer Service Areas

