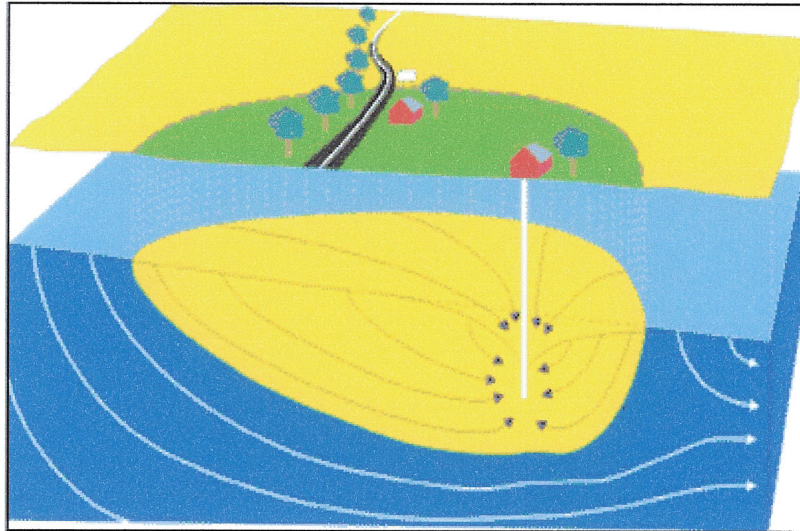


SOURCE WATER ASSESSMENT
for
LISBON SHOPPING CENTER
HOWARD COUNTY, MD



Prepared By
Water Management Administration
Water Supply Program
September 2005



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Ground Water Discharge Permit (02-DP-3405) Summary and Fact Sheet

SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for Lisbon Shopping Center. 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 Lisbon Shopping Center's water supply is an unconfined fractured rock aquifer, known as the Wissahickon Formation. The system currently uses three wells 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 Lisbon Shopping Center'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 the Lisbon Shopping Center water supply is susceptible to contamination by nitrates and volatile organic compounds, but not to synthetic organic compounds, microbiological contaminants or to other inorganic compounds. It may be susceptible to radon if noncommunity nontransient systems are regulated for radionuclides.

INTRODUCTION

The Water Supply Program has conducted a source water assessment for the Lisbon Shopping Center water supply in Howard County (figure 1). The Lisbon Shopping Center water supply is considered a nontransient noncommunity (NTNC) water system, which is defined as a public water system that regularly serves at least 25 of the same individuals over six months per year. The shopping center owns and operates its water supply system and serves water to two buildings that have a number of businesses with a combined population of approximately 80 persons. The shopping center also includes a McDonalds restaurant, a Pizza Hut restaurant Food Lion's store and a bank. Each of these facilities has its own supply well and is not part of this assessment. McDonald's and Pizza Hut are classified as transient noncommunity systems and have been assessed under a countywide study completed in June 2005 (Advanced Land and Water, Inc., 2005).

WELL INFORMATION

Lisbon Shopping Center is served water by three wells (Nos. 1, 2 and 3). 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 Liberty Shopping Center water system indicates that all three wells were drilled after 1973, when the State's well construction regulations went into effect, and may should be in compliance with current construction standards. Well information is shown in Table 1 below.

SOURCE ID	SOURCE NAME	PERMIT NO	TOTAL DEPTH (ft)	CASING DEPTH (ft)	YEAR DRILLED
01	Lisbon Shopping Center 1	HO942082	400	60	1999
02	Lisbon Shopping Center 2	HO941694	400	86	1998
03	Lisbon Shopping Center 3	HO811978	405	80	1987

Table 1. Liberty Shopping Center Well Information.

Lisbon Shopping Center has a Water Appropriation Permit that allows it to use an average of 10,000 gallons per day (gpd) and 14,500 gpd in the month of maximum use. This permit includes all the facilities on the property like McDonald, Pizza Hut and Food Lion. Based on reported pumpage for the past three years, the shopping center, including all the above-mentioned facilities, pumped an average of 7,700 gpd.

HYDROGEOLOGY

The Lisbon Shopping Center area lies in the Piedmont physiographic province and is underlain by the Wissahickon Formation (remapped as the Prettyboy Schist by Edwards in 1993). This formation is an unconfined, fractured rock aquifer composed of greenish gray-tan to medium gray, fine-grained quartz-muscovite-

chlorite-schist. 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 source water assessment area for public water systems with an average appropriation amount of greater than 10,000 gpd and drawing from fractured-rock aquifers is the watershed area that contributes to the well. This area is modified by geological boundaries, ground water divides and by annual average recharge needed to supply the well (MD SWAP, 1999). The delineated WHPA represents the areas which contribute ground water to the wells. The total area of the WHPA is about 56 acres, which is more than sufficient to support the daily permitted average even under drought conditions.

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, ground water discharge permits, large scale feeding operations and Superfund sites. These sites are generally associated with commercial or industrial facilities that use chemical substances that may, if inappropriately handled, contaminate ground water via discrete point location. Non-point sources of contamination are associated with certain types of land use practices such as the 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 as well as a field survey revealed three point sources of contamination in and adjacent to the WHPA. Figure 2 identifies an Underground Storage Tank (USTs) site, two Ground Water Discharge Permit (GWD) sites, and Controlled Hazardous Substance (CHS) site. Table 2 lists the facilities identified and their potential types of contaminants. The Ground Water Permit is for the discharge of treated wastewater from the shopping center. The permit requires 60% nitrate removal from the wastewater before its discharge to ground water. The treated wastewater is pumped to drainfields in two areas (figure 2, sites 3 and 4). Site 3 is the main disposal area with site 4 being the secondary area. A fact sheet and summary for the Ground Water Discharge Permit (02-DP-3406) is included at the back of the report. Five

monitoring wells have been installed to monitor the ground water quality from the discharge sites. Potential contaminants are grouped as Volatile Organic Compounds (VOC), Synthetic Organic Compounds (SOC), Heavy Metals (HM), and Metals (M), Nitrate (N), and Microbiological Pathogens (MP).

ID	Type	Site Name	Address	Potential Contaminant	Comments
1	UST	Lisbon Shell	Lisbon Shopping Center	VOC	Several Tanks
2	CHS	U S Cleaners	Lisbon Shopping Center	VOC	Onsite Dry Cleaning
3	GWD	Lisbon Shopping Center	Lisbon Shopping Center	N, MP	Main Area for discharge
4	GWD	Lisbon Shopping Center	Lisbon Shopping Center	N, MP	Secondary Area for discharge

Table 2. Potential Contaminant Point Sources within Lisbon Shopping Center's WHPA (see figure 2 for locations).

Non-Point Sources

The Maryland Department of Planning's 2002 digital land use map for Howard County was used to determine the predominant types of land use in the WHPA. This map was modified and original cropland areas changed to commercial land based on site plan review and inspection (figure 3). Table 3 shows the revised land use categories in the Lisbon Shopping Center WHPA. The largest portion of the WHPA is commercial land, followed by cropland land.

LAND USE CATEGORIES	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Commercial	37.25	66.8
Cropland	18.55	33.2
Total	55.80	100.00

Table 3. Land Use Summary for Liberty Shopping Center's WHPA.

Cropland is commonly associated with nitrate loading of ground water. Cropland represents a potential source of SOCs depending on fertilizing practices and use of pesticides. Commercial properties may be a source of nitrates and SOCs if fertilizers and pesticides are not used carefully for landscaping activities.

A review of the Maryland Department of Planning's 2002 Howard County Sewer Map indicates that there is no planned sewer service for the entire WHPA. The shopping center, several businesses and residences in the WHPA all have onsite septic systems for wastewater disposal. The onsite septic systems and may be potential sources of the nitrates to the supply wells.

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 may be the cause of the elevated contaminant level. All data reported is from the finished (treated) water unless otherwise noted. The only treatment that the Lisbon Shopping Center water system currently has is ph adjustment is for corrosion control.

A review of the monitoring data since 1993 for the Lisbon Shopping Center 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 MCLs.

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	37	37	3	0	16	0	5	0	1	1

Table 4. Summary of Water Quality Samples for the Lisbon Shopping Center Water Supply.

*not regulated

Inorganic Compounds (IOCs)

The only IOC detected above 50% of the MCL was nitrate. The MCL for nitrate is 10 ppm. The nitrate detections above 50% of the MCL in Lisbon Shopping Center's water supply are shown in Table 5. One detection above the MCL is shown in bold print.

CONTAMINANT NAME	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
NITRATE	10	16-JUN-93	5.1
NITRATE	10	30-SEP-93	6.07
NITRATE	10	09-NOV-93	5.34
NITRATE	10	07-FEB-94	5.1
NITRATE	10	02-MAY-94	5.44
NITRATE	10	31-AUG-94	5.7
NITRATE	10	31-JAN-95	7.16
NITRATE	10	01-MAY-95	5.66
NITRATE	10	11-SEP-95	6.17
NITRATE	10	30-NOV-95	5.37
NITRATE	10	16-JAN-96	5.99
NITRATE	10	17-JUL-96	5.7
NITRATE	10	26-AUG-96	6.49
NITRATE	10	24-SEP-96	5.9
NITRATE	10	24-OCT-96	6.47
NITRATE	10	23-JAN-97	7.49
NITRATE	10	02-JUL-97	6.32

Table 5. IOC detections above 50% of the MCL for the Liberty Shopping Center Water Supply.

CONTAMINANT NAME	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
NITRATE	10	10-JUL-97	5.8
NITRATE	10	26-JAN-98	5.58
NITRATE	10	07-APR-98	10.4
NITRATE	10	22-JUL-98	5.97
NITRATE	10	12-JAN-99	5.56
NITRATE	10	25-MAR-99	5.6
NITRATE	10	20-JUL-99	6.1
NITRATE	10	19-OCT-99	5.6
NITRATE	10	12-DEC-00	5
NITRATE	10	08-FEB-01	6.1
NITRATE	10	22-JAN-02	5.7
NITRATE	10	11-MAR-02	7.3
NITRATE	10	04-FEB-03	5.6
NITRATE	10	03-JUL-03	5.4
NITRATE	10	09-OCT-03	5.7
NITRATE	10	06-JAN-04	6.2
NITRATE	10	01-APR-04	5.3
NITRATE	10	01-JUL-04	6.6
NITRATE	10	07-OCT-04	5.6
NITRATE	10	18-JAN-05	5

Table 5 (contd). IOC detections above 50% of the MCL for the Liberty Shopping Center Water Supply.

Volatile Organic Compounds (VOCs)

No VOCs have been detected in Lisbon Shopping Center's water supply.

Synthetic Organic Compounds (SOCs)

No SOCs above 50% of the MCL have been detected in Lisbon Shopping Center's water supply. The only SOC detected one time was di(ethylhexyl)phthalate in a sample collected on March 17, 2005. This SOC was also detected in the laboratory blank on the same date and is not believed to represent Lisbon Shopping Center's water quality.

Radionuclides

Nontransient noncommunity systems are currently not regulated for radionuclides. The only radionuclide detected in one sample collected on February 18, 1997 was radon-222 at 2895 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

Ground water under the influence of surface water (GWUDI) testing was conducted for the Lisbon Shopping Center wells. GWUDI testing requires

collection and analysis of raw water samples for bacteria (total and fecal coliform). No coliform bacteria were detected in the raw water samples. All nontransient noncommunity systems are required to conduct quarterly routine bacteriological sampling for their water supply as required by the Safe Drinking Water Act. These samples are generally collected from finished (treated) water, which may not be indicative of the source water conditions. None of the thirty-seven routine bacteriological samples collected for Lisbon Shopping Center's water supply have shown any coliform detection.

SUSCEPTIBILITY ANALYSIS

Lisbon Shopping Center's wells obtain 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 non-carbonate rocks of the Piedmont 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 from microbial contamination. 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 summarized in Table 6.

Inorganic Compounds (IOCs)

Nitrate has been detected in Lisbon Shopping Center's water supply above 50% of the MCL in nearly all the samples collected, and has exceeded the MCL one time (table 5). A review of the nitrate data shows no increasing or decreasing trends. Sources of nitrate can generally be traced to land use. A large portion of the WHPA (66.8%) is currently commercial land, but was mostly cropland in the past. Fertilizer applied to agricultural fields, and commercial and residential properties for landscaping, are source of nitrate loading in ground water. The entire WHPA is in an area not planned for public sewer. Commercial and residential onsite septic systems are also sources of nitrate in ground water.

Based on the persistence of nitrate in the water supply, the vulnerability of the aquifer to land activity, and the presence of nitrate sources in the WHPA, Lisbon Shopping Center's water supply is susceptible to nitrate contamination, but is not susceptible to other inorganic compounds.

Volatile Organic Compounds (VOCs)

No VOCs have been detected in Lisbon Shopping Center's water supply since 1993. There are two potential source of VOC contamination in the WHPA (figure 2). MDE's experience with other water systems with similar geology and commercial land use in proximity to the water supply have show that VOCs are commonly found in the water supply.

Based on the above discussion, Lisbon Shopping Center's water supply is determined to be susceptible to VOC contamination.

Synthetic Organic Compounds (SOCs)

No SOC's have been detected in Lisbon Shopping Center's water supply. Application of pesticides in commercial, residential properties and cropland can be sources of SOC's. But so far, due to combination of proper application, aquifer and well characteristics no SOC's have been detected in the water supply. SOC contamination is uncommon for wells in this type of setting.

Based on the above analysis, Lisbon Shopping Center's water supply is **not** susceptible to SOC contamination.

Radionuclides

Nontransient noncommunity systems are currently not regulated for radionuclides. The only radionuclide detected was radon-222 at 2895 pCi/Li/L. Radon is a naturally occurring compound and is prevalent in ground water due to the radioactive decay of uranium bearing minerals in the bedrock (Bolton, 1996).

Based on the above analysis, Lisbon Shopping Center's water supply **maybe** susceptible to radon if a standard is adopted, but not to other radionuclides.

Microbiological Contaminants

Based on raw water bacteriological data Lisbon Shopping Center's wells were determined not to be GWUDI. In addition, no bacteria have been detected in any of the routine bacteriological samples collected for Lisbon Shopping Center's water supply.

Based on the above discussion, Lisbon Shopping Center'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
Nitrate	YES	YES	NO	YES	YES
Inorganic Compounds (except nitrate)	NO	NO	NO	YES	NO
Volatile Organic Compounds	YES	NO	NO	YES	YES
Synthetic Organic Compounds	NO	NO	NO	YES	NO
Radionuclides (except radon)	NO	NO	NO	YES	NO
Radon	YES	YES	NO	YES	MAYBE*
Microbiological Contaminants	YES	NO	NO	YES	NO

Table 6. Susceptibility Summary for Lisbon Shopping Center's water supply.

*based on proposed MCL for community systems

MANAGEMENT OF THE WHPA

Public Awareness and Outreach

- Notify businesses and facilities that are located in the WHPA about best management practices for handling, storing and disposing hazardous substances on site and new underground tank regulations.

Cooperative Efforts with Other Agencies

- Work closely with Howard County Health Department to ensure that the two transient systems in the shopping center are in compliance with the Safe Drinking Water Act.
- Also work with them to identify any unused wells in the WHPA and to ensure that they are abandoned and sealed in compliance with the State's well construction standards.

Monitoring

- Continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.
- Closely monitor nitrate levels and analyze data to determine whether there is an increases in concentration.

- Ensure that the Ground Water Discharge permit requirements for wastewater treatment and disposal are being complied with and carefully review monitoring data especially for nitrate and coliform organisms.

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.

REFERENCES

- Advanced Land and Water, Inc., 2005, Source Water Assessment for Ground Water Supplies serving Transient Non-Community Systems in Western Howard County, Maryland, 15 p
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- Dingman, R. J., and Meyer G. M., 1954, The Water Resources of Howard and Montgomery Counties: Maryland Department of Geology, Mines and Water Resources Bulletin 14, 260 p.
- Maryland Department of the Environment, Water Supply Program, 1999, Maryland's Source Water Assessment Plan, 36 p.
- Nutter, L. J., and Otton, E. G., 1969, Ground-Water Occurrence in the Maryland Piedmont: Maryland Geological Survey Report of Investigations No. 10, 56p.
- 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: HO1987G005
Public Water Supply Inspection Reports
MDE Water Supply Program Oracle Database
MDE Waste Management Sites Database
Department of Natural Resources Digital Orthophoto Quarter Quadrangles:
Woodbine
USGS Topographic 7.5 Minute Woodbine Quadrangle
Maryland Department of Planning 2002 Howard County Land Use Map
Maryland Department of Planning 2002 Howard County Sewer Map

APPENDIX

Maryland Department of the Environment
Water Supply Program Complaint Record

System: Brunswick PWSID #: 010-0005
County: Frederick Date: August 31, 2005 Time:

Date of Incident: Time:
 On-going problem Previously Reported Occurring at time of call

Complaint Received By: Phone Letter Emergency Response
 Referral from: Phone:

Person taking complaint: Zoë Goodson

Complainant: Name: Thomas "Bo" Overton
Address: 3619 Petersville Rd., Brunswick 21758
Phone: 301-834-5264 (H) cell 301-676-5463 (W)

Complaint Type: Taste/odor Cloudy Water Discolored Water Low Pressure
 Outage Spill Other:

Description of Complaint: Complainant called MRWA, Chris McAfee responded and called me during his visit. Complainant has about 2 - 3 psi when one tap is running (as measured by Chris). Complainant has replaced the water line to his house that is on his property with 1" plastic lines; however, part of his service connection is not on his property (runs under a road) and this connection is an old tuberculated galvanized line. Additionally the 4" cast iron main in the area is tuberculated. There is also no chlorine at the complainant's house. The city is flushing a hydrant (city is de-chlorinating) in the area continuously to try to maintain chlorine residual, but this is not helping with the pressure situation. Neighbors also have low pressure, but complainant thinks his house is the worst. County has performed flow testing of hydrants in the area - got 60 gpm - this is extremely inadequate.

Results of Investigation: Contacted Patrick Hoffmaster on 8/31. This is a political situation. The city claims that the distribution system in this area is not the property or responsibility of the city; they will fix main breaks in the area because they are protecting the water/don't want to waste water. The residents claim that it is the City's responsibility to maintain the distribution. Only some homes in this area have city water, about 30% or so have wells. Don't anticipate that the new tower will help this situation at all. This area is outside city limits, according to Patrick. Patrick checked chlorine after I discussed complaint with him at complainant's house on 8/31, chlorine was 0.232. The city has also started taking monthly bactis in this area.

Talked to Bo on 8/31. He is outside city limits. the County came out and determined that he gets 2 gpm at 4 psi; if another tap is opened up essentially nothing comes out of the other tap. They also determined that the section of his service connection that goes under the road is severely tuberculated; there was no chlorine residual during the county's visit. He reports that Rosemont is not taking any action or responsibility for improving his water supply. Lines are probably circa 1940. He has contacted his state delegate, Rick Weldon, and Rick has written a letter to Ken Philbrick.

Next step - call burgess of Rosemont Jacquelyn Ebersole 301-834-7444. left mess. 9/6. Spoke w/ Jackie Ebersole on 9/6. Jackie has minutes of a mtg in 1939 which states that after water lines are built, that they will become the property of the City. Rosemont was not incorporated when the lines were installed - not incorporated until 195something, well after lines installed. Rosemont has never claimed or taken responsibility for the mains. Rosemont has some funds set aside that can be used to fix this situation, but they are waiting for a formal meeting with Brunswick (and the county too?) to let them know. She had started to apply in the past

for funding to fix the problem, but was asked if Rosemont owned the lines she had to say "no". This stopped the funding application process. County has planned a \$150,000 feasibility study to cover all water lines outside of Brunswick City limits (including lines on other side of town into Washington Co.)

9/6 spoke with Dave Dunn, administrator of Brunswick. There is no clear documentation as to who owns those lines. Since this area is outside of Brunswick city limits and within the boundaries of another municipality (Rosemont), Brunswick is not willing to use Brunswick taxpayer money to upgrade this section of the dist. system. It is also Brunswick's position that in this situation that the homeowner is responsible for the entire length of his service connection, even the part under the road - this is because the City of Brunswick does not own the road and the city has no easement across this road. He thinks the solution will be for the county to take over this section of the distribution system. Mike Marschner and the county is starting a study; Brunswick, Rosemont and the County will be meeting soon to determine the parameters of the study, but results of the study will take several months.

Left message w/ Mike Marschner on 9/6. Spoke with Mike on 9/22. Study commissioned w/RK&K. Study should be completed by December 2005. If county council approves the county taking over the distribution, system could be designed and built in 12 months. The county's testing thus far indicate that the water main is not causing the pressure problem at Bo's house. If the county takes over the distribution, they would bring the system up to their code, which includes service lines up to the property line. Two other solutions that may be proposed by the study would be Brunswick or Rosemont taking control and responsibility for the distribution system. Mike will forward me a plan when it is proposed - hopefully in November.

Plan to install pressure recorder at complainant's house on 9/14/05. Recorder installed 9/14 - 21. See attached. Home gets water, even with three taps open, but pressure is low at all taps. Left detailed voice message on Bo's cell phone on 9/22. Relayed info about county's study - if county takes over, will still be another year and 3 months at the earliest before the situation is fixed. Mailed copy of chart to Bo.

Special Sample Ordered? Yes No

Sample #

Action Taken By Investigator:

- Complainant Contacted, on-going investigation
- Complainant Contacted, no further action needed
- Other:

- Anonymous Complaint, no investigation
- Anonymous Complaint, investigation conducted

Field Engineer _____

Date: 9/22/05

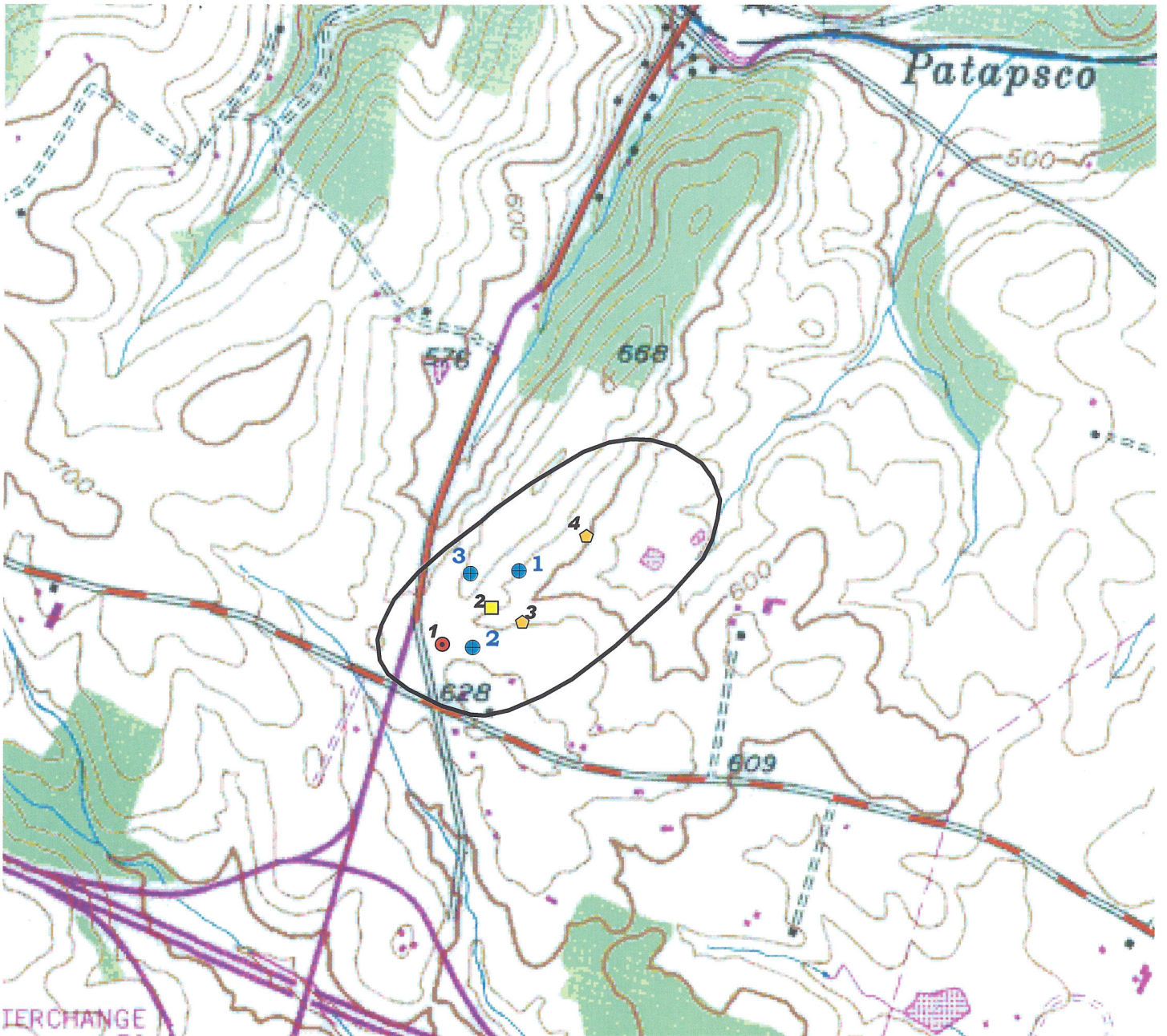
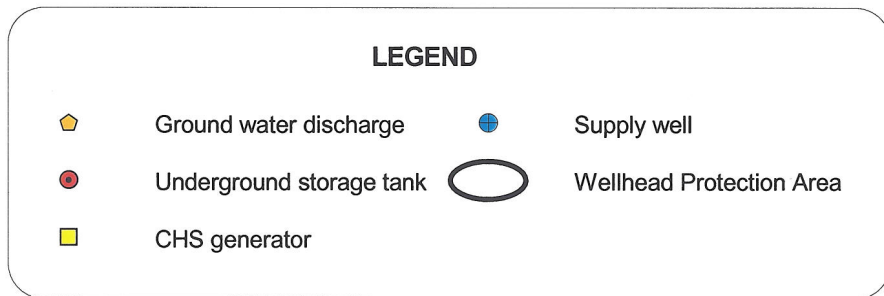


Figure 2. Lisbon Shopping Center's Wellhead Protection Area with Potential Contaminant Sources



Base Map: USGS 7.5 minute topographic quadrangle- Woodbine

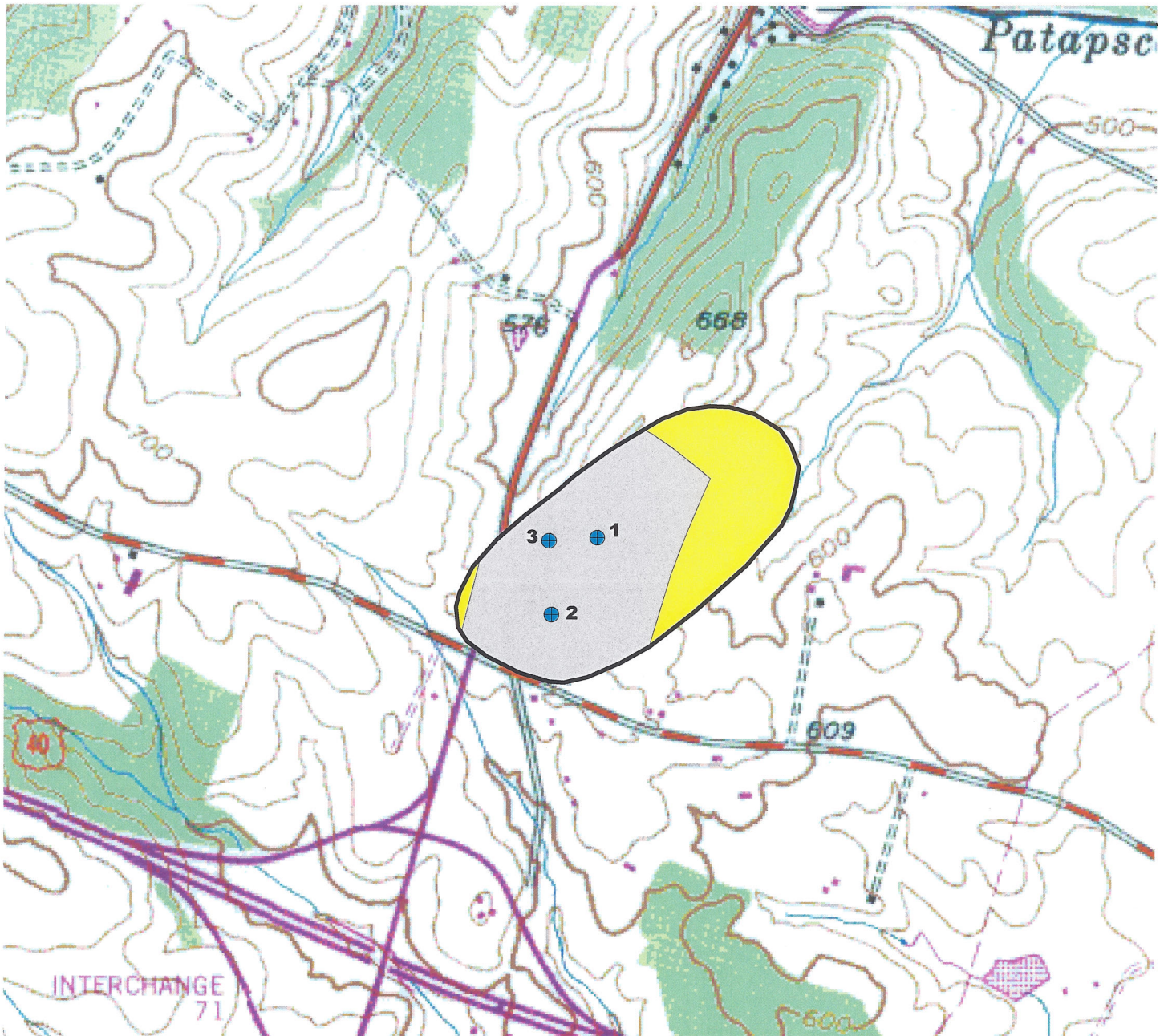
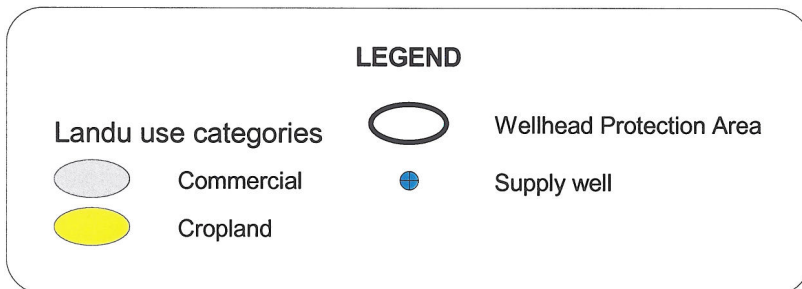


Figure 3. Land Use Map for Lisbon Shopping Center's Wellhead Protection Area



Base Map: USGS 7.5 minuter topographic quadrangle - Woodbine

APPENDIX

**Department of The Environment
Groundwater Discharge Permit
Summary Report and Fact Sheet**

Executive Summary

Municipal Ground Water Discharge Permit

State Application No.: 02-DP-3405

Facility Name and Location: Lisbon Business Center
Lisbon Center Drive
Woodbine, Maryland 21797

Description of Facility: Shopping Center

Facility Discharges: Wastewater from the shopping center is collected by building sewers, directed to a treatment plant, treated to reduce BOD, TSS, and Nitrogen. The major flow from the treatment plant is discharged via a pressure distribution network to drain-fields, and subsequently to groundwaters of the State. The remaining flow is pumped to a remote drainfield where it is distributed to trenches by gravity, and subsequently to groundwaters of the State.

Pollutants Limited: Subsurface absorption system. Effluent limits required for BOD, TSS and Nitrogen.

Changes From Previous Permit: New Permit

Controversial Provisions: None.

Unusual Conditions: None.

Major Facility: No.

Summary of Wastewater Facility

The applicant has applied for a permit to discharge treated domestic effluent to drain-fields and subsequently to groundwater of the State. Information regarding the sewerage facility is summarized as follows:

The Lisbon Business Center's on-site system will receive treated sewage effluent from the shopping/business center. Sewage is collected by building sewers and transported to a treatment plant where it is treated for reduction of BOD, TSS, and Nitrogen. The majority of treated effluent is pumped to drain-fields in system A and distributed via a pressure distribution network. The remaining treated effluent is pumped to trenches in drainfield system B where it is distributed by gravity. The trenches in subsurface disposal system A constitute 150% of the trenches required for the flow. The system will operate so that a portion of the system is allowed extended rest periods. The disposal trenches in drainfield system A are three feet wide, and sufficiently deep to provide

Ground Water Discharge Permit
Summary Report and Fact Sheet
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a minimum of 3 feet of porous sidewall in the trench. Maximum trench depths are seven and eight feet depending on their location in the system. A minimum of four feet is maintained between the bottom of the trenches and the highest anticipated water table taking into account the projected increase in groundwater levels due to mounding after 20 years of system operation.

Project Type: Absorption Trench System

State Application No.: 02-DP-34057

Facility Name: Lisbon Business Center

Address: Lisbon Center Drive
Woodbine, Maryland 21797

County: Howard

Contact (name, title): Ramon Benitez

Phone: (410) 788-0400

Applicant is engaged in: Property Management

Legal Name of Applicant: MIE Properties, Inc.

Address: 5720 Executive Drive
Baltimore, Maryland 21228-1789

Basin Code: 02-13-11

SIC Code:

Receiving Water Name (class): Groundwater Type I Aquifer
Oella and Loch Raven formations of Wissahickon Group

MD Coordinates: East: 781,000 North: 552,000

Public Notice Issue Date:
Application Received:

Project Manager: Ching-Tzone Tien

Phone: (410) 537-3662

Groundwater System

Aquifer Name: Wissahickon Formation, Type I

Estimated Aquifer Transmissivity: 26,000 to 65,000 gallons per day per foot.

Estimated Aquifer Permeability: 40 to 100 ft/day as hydraulic conductivity.

Estimated Total Dissolved Solids Concentration: 20 to 180 mg/l

Other Properties:

The Wissahickon Formation is an important water bearing formation having a potential for large short-term yields. Transmissivity of the Wissahickon formation has been reported to range from 6.7 to 2,000 ft²/day. Hydraulic conductivities range from 0.11 – 220 ft/day. Specific Yield range is from .0002 - .12 (Wiley, R. and Achmad, G., Md. Geological Survey, Report of Investigations No. 45, 1986).

Projected Impact:

The impact on groundwater from the discharge of pretreated effluent at this site should be negligible. Nitrogen balance calculations indicated that pretreatment to reduce nitrogen to 15 mg/l would be required to prevent nitrogen from exceeding EPA drinking standards in groundwater down-gradient from the site. Pretreatment of the wastewater is required to limit nitrogen concentrations in the wastewater to 15 mg/l or less.

The remaining constituents of concern in the wastewater (eg. pathogenic bacteria, phosphorous) will be adequately treated in the four foot unsaturated soil treatment zone that is maintained between the bottom of the absorption trenches and the groundwater. Groundwater mounding was calculated to ensure that the treatment zone is maintained after groundwater elevation increases due to wastewater loading.

Present Use:

The Wissahickon Formation is used for domestic and agricultural water sources in Howard County, Carroll County and the western area of Baltimore County.