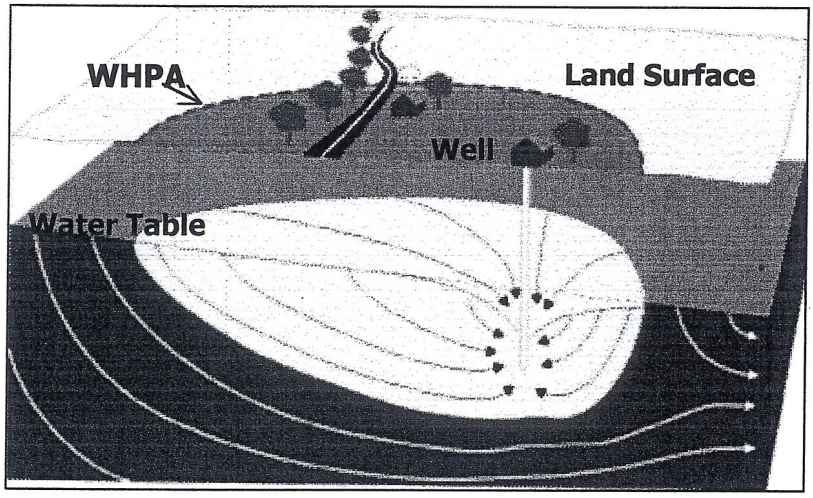
SOURCE WATER ASSESSMENT

FOR PHEASANT RIDGE

CARROLL COUNTY, MD



Prepared By
Water Management Administration
Water Supply Program
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MDE

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SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for the Pheasant Ridge 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) an inventory of potential sources of contamination, and (3) determining the susceptibility of the water supply to contamination. Recommendations for management of the assessment area conclude this report.

The source of Pheasant Ridge's water supply is an unconfined fractured-rock aquifer. Two wells are currently being used to draw the water out of the aquifer. A third well is available as a standby well. The Source Water Assessment Area for Pheasant Ridge's wells 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 review, 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 location are enclosed at the end of the report.

The susceptibility analysis of Pheasant Ridge'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 Pheasant Ridge's water supply is not susceptible to inorganic compounds, volatile organic compounds, synthetic organic compounds, bacteria or protozoans. It may be susceptible to Radon-222 if the final maximum contaminant level is 300 picoCuries/Liter.

INTRODUCTION

Pheasant Ridge is a mobile home park community located just south of Mount Airy in Carroll County (figure 1). Manufactured Home Communities, Inc. owns and operates the water system for this park. The water system serves about 100 mobile homes and 300 residents. The water is supplied by 2 wells (Nos. 1 and 2) and a third well (No. 3) is available for backup. Recently, five wells were drilled at various locations on the property in search of a productive well to support the addition of a retirement community on the west side. No productive wells were found through these efforts and plans for the expansion are being reviewed.

WELL INFORMATION

A review of well data and sanitary surveys of Pheasant Ridge's water system indicates that Well Nos. 1 and 2 were drilled in 1981 and 1974 respectively, in accordance with the State's well construction standards. Well No. 3 is the oldest well and was probably drilled prior to the implementation of the State's well construction regulations in 1973 which required grouting. Table 1 contains a summary of the well construction data.

SOURCE ID	SOURCE NAME	PERMIT NO	TOTAL DEPTH	CASING DEPTH	AQUIFER
01	Pheasant Ridge 1	CL739335	400	22	Ijamsville Fm-Marburg Schist
02	Pheasant Ridge 2	CL732535	150	21	Ijamsville Fm-Marburg Schist
03	Pheasant Ridge 3	N/A	58	N/A	Ijamsville Fm-Marburg Schist

Table 1. Pheasant Ridge Well Information

Only one well is pumped at a time supplying 38 gallons per minute (gpm). The water from the wells is pumped to a treatment plant and then stored in ground storage tank with a capacity of 63,000 gallons prior to distribution.

HYDROGEOLOGY

The Pheasant Ridge area is underlain by the Marsburg Schist member of the Ijamsville Formation. The principal rock type in the Marburg is bluish-gray to green fine-grained schist containing muscovite, chlorite, quartz, and either albite or ottrelite. The schist is injected with quartz along the layering planes and is closely folded (Meyer and Beall, 1958). Weathering of the schist results in clayey

overburden material known as saprolite, below which is fractured bedrock. In this type of aquifer, most of the ground water is stored in the saprolite and ground water flow is through fractures in the bedrock. In rock types like schist, fractures form along planes of foliation and mineral layering (Nutter and Otton, 1969). The aquifer is considered to be unconfined.

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. Hydrogeologic mapping was the method used for the delineation. This is the methodology recommended in the EPA approved Maryland's Source Water Assessment Plan (1999) for systems using an average of greater than 10,000 gallons per day (gpd) from fractured rock aquifers. It must be noted that another public water system, Pleasant View Nursing Home, is adjacent to Pheasant Ridge and is supplied by four wells. Since the wells for both systems are close to each other, they were all considered in the WHPA delineation.

The WHPA delineated represents the recharge area for Pheasant Ridge's wells and Pleasant View Nursing Home's wells (figure 2). The WHPA is the watershed drainage area that contributes to the wells. The boundary of the WHPA is based on ground water flow direction and ground divides inferred from topography and ground water discharge areas and permitted withdrawal rates. The area of the WHPA is sufficient to cover the annual recharge needed to supply all the wells for both systems.

POTENTIAL SOURCES OF CONTAMINATION

For this assessment, MDE Waste and Water Management databases and Carroll County's database were reviewed, staff consulted, and field inspections conducted, to identify potential sources of contamination in and around the WHPA. In addition, MDE staff conducted a follow up field survey of the WHPA and met with Mr. Joe Magee, Water Operator for Pheasant Ridge on February 9, 2001. Mr. Magee indicated that he did not have any water quality concerns for Pheasant Ridge.

Several potential contaminant sources in the WHPA are identified in figure 2. These potential contaminant sources are four onsite septic systems and a surface water discharge. The onsite sewer systems are on the Pleasant View property and the surface water discharge on the Pheasant Ridge property. The onsite septic systems are for two residential homes and two nursing home buildings. According to MDE's Oil Control Program records, two 10,000 gallon heating oil USTs and one 1,000 gallon gasoline UST were removed from the Pleasant View Nursing Home property. The surface water discharge is from the wastewater treatment plant for Pheasant Ridge. According to Mr. Magee, the facility has a permit to discharge to a trout stream located north of the property and meets all the permit requirements. The

only time the treated water is discharged into the pond located downgradient of Well No. 1 is during the summer months when the water levels get very low.

Based on the Maryland Office of Planning 1997 Land Use Map, the land use categories within the WHPA are as shown in table 2. Figure 3 shows the land use in and around the WHPA.

LAND USE CATEGORIES	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Low Density Residential	17.86	19.2
High Density Residential	17.02	18.4
Commercial	20.33	21.9
Pasture	10.52	11.3
Forest	27.07	29.2

Table 2. Land Use Summary for Pheasant Ridge's WHPA.

A review of the Carroll County Sewer Map (1995) shows that there is no planned sewer service in the WHPA. It must noted that all the Pheasant Ridge mobile homes are connected to a central sewer system. The wastes are treated at the wastewater plant and discharged to a stream. The Pleasant View property and other residential properties are have onsite septic systems.

Non-point sources of contamination are usually associated with land use activities in the area. Onsite septic systems may be potential sources of nitrate and microbial pathogens. Application of fertilizers and pesticides for lawn maintenance and landscaping on commercial and residential properties could result in potential sources of nitrates and synthetic organic compounds (SOCs).

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 data described is from finished water unless indicated otherwise. The treatment currently in use at Pheasant Ridge is chlorination for disinfection and pH adjustment for corrosion control. Sodium hypochlorite is used for chlorination and caustic soda for pH adjustment.

In accordance with Maryland's procedures, data from the water sources and treatment plants were compared with the Maximum Contaminant Levels (MCLs). If the monitoring data is greater than 50% of the MCL, the written 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. A review of the monitoring data since 1993 for Pheasant Ridge's finished water indicates that the system's water supply meets drinking water standards. No contaminant above 50% of the MCL was detected. Radon-222 was detected at a level above the proposed MCL of 300 picoCuries/Liter (pCi/L), but below the proposed alternate MCL of 4000 pCi/L.

Inorganic Compounds (IOCs)

Nitrate was detected at levels between 2.5 ppm to 3.2 ppm in Pheasant Ridge's water supply since 1993. The MCL for nitrate is 10 ppm. Calcium and sodium also have been detected on a couple occasions at low levels. There are no MCLs for calcium and sodium.

Volatile Organic Compounds (VOCs)

No VOCs have been detected in Pheasant Ridge's water supply since 1991.

Synthetic Organic Compounds (SOCs)

Dalapon, which has an MCL of 200 ppb, was detected on 3/18/99 at 0.36 ppb. Di(2ethylhexyl) phthalate, which has an MCl 6 ppb was detected on 3/18/99 at 0.5 ppb. A review of these results indicated that the detects were attributed to laboratory contamination and therefore do not represent actual water quality.

Radionuclides

Radon-222 was measured in a sample collected on 3/4/95 at 1595 picoCuries/Liter (pCi/L). At present there is no MCL for radon-222. EPA has proposed an MCL of 300pCi/L and an MCL of 4000pCi/L for States that have an indoor air abatement program. Gross alpha and gross beta were detected on 4/4/00 at 3 pCi/L and 2 pCi/L respectively. The MCLs for gross alpha and gross beta are 15 pCi/L and 50 pCi/L respectively.

Microbiological Contaminants

Raw water samples were collected and tested for bacteria from Well Nos. 1 and 2 on 12/9/98 to determine whether these sources are ground water under the influence of surface water (GWUDI). The results were negative for the presence of total and fecal coliform for both these wells. Since Well No. 3 is not being used, no raw water sampling was conducted.

SUSCEPTIBILITY ANALYSIS

Pheasant Ridge's wells obtain water from an unconfined aquifer. In general, water supplies in unconfined aquifers are susceptible to contamination from land use activities. Therefore, continued monitoring of contaminants is essential in assuring a safe drinking water supply. The criteria 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.

Inorganic Compounds (IOCs)

Fertilization of residential properties and onsite septic systems are usually sources of nitrate in ground water. There are no onsite septic systems on Pheasant Ridge property or within its side of the WHPA. The nitrate levels

detected in the water supply are well below the MCL for nitrate. No other regulated IOC has been detected in the water supply.

Based on the above analysis, Pheasant Ridge's water supply is **not** susceptible to IOC contamination.

Volatile Organic Compounds (VOCs)

No VOCs have been detected in Pheasant Ridge's water supply. There are no sources of VOCs in the WHPA. Therefore, Pheasant Ridge's water supply is **not** susceptible to VOC contamination.

Synthetic Organic Compounds (SOCs)

Dalapon and phthalate were the only SOCs detected in Pheasant Ridge's water supply and both were attributed to laboratory contamination and do not represent the water quality. No other SOC has been detected. Application of pesticides on residential and commercial properties can be sources of SOCs. But discussion with the operators of both Pheasant Ridge and Pleasant View indicated that no pesticides were being applied at either property. Therefore, Pheasant Ridge's water supply is **not** susceptible to SOC contamination.

Radionuclides

Radon-222 has been detected at 1595 pCi/L in Pheasant Ridge's water supply. If Maryland adopts an MCL of 300 pci/L the detected level will be above the MCL. Gross alpha and gross beta were also detected at levels below 50% of the MCL. The source of radionuclides can be traced to the natural occurrence of uranium and thorium in the bedrock. Radon is prevalent in the ground water due to the radioactive decay of uranium bearing minerals in the bedrock (Bolton, 1996).

Based on the above analysis, Pheasant Ridge's water supply **maybe** susceptible to radon depending on the MCL the EPA and the State adopt for radon-222.

Microbiological Contaminants

The absence of any coliform in raw water testing of the Well Nos. 1 and 2 indicates that these wells are **not** susceptible to protozoans and bacteria. They maybe susceptible to viruses since viruses are much smaller, can survive longer and may not be effectively filtered out by the aquifer as protozoans and bacteria.

MANAGEMENT OF THE WHPA

Form a Local Planning Team

- The team should represent all the interests in the community. Since the WHPA is the same for Pheasant Ridge and Pleasant View, owners of both facilities should be play a key role in the team. Other members for the team should be water operations personnel, residents, other property owners in the WHPA, and Carroll County Planning and Health Departments. The Town of Mount Airy may wish

to assist the team based on their own experience with wellhead protection. Team members should work to reach consensus on how to protect the water supply.

Public Awareness and Outreach

- Pamphlets, flyers and bill stuffers sent to local residents will help educate the general public about Wellhead Protection. A MDE pamphlet *Gardening in a Wellhead Protection Area* is an example.
- Placing signs at WHPA boundaries is a good way to make the public aware of protecting their source of water supply. Carroll County has placed signs at WHPA boundaries along several county roads and they may be able to assist in the effort.

Monitoring

- Continue to monitor for all Safe Drinking Water Act contaminants as required by MDE
- Since Well Nos. 1 and 2 are relatively close to a pond, raw water sampling for bacteria after 0.5 inches of rainfall is recommended to ensure that there is no connection between the pond and the wells' water supply.

Land Acquisition /Easements

- Loans are available for the purchase of property or for the purchase of easements for the 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

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

Contaminant Source Inventory/Well Inspection

- The system should review the potential sources of contamination within the WHPA and update them if necessary
- Periodic inspections and a regular maintenance program for the supply wells will ensure their integrity and protect the aquifer form contamination

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.

Maryland Department of the Environment, Water Supply Program, 199, Maryland's Source Water Assessment Plan, 36 p.

Meyer, G., and Beall, R. M., 1958, The Water Resources of Carroll and Frederick Counties: Department of Geology, Mines and Water Resources Bulletin 22, 355p.

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: CL1960G009
Public Water Supply Inspection Reports
MDE Water Supply Program Oracle Database
MDE Waste Management Sites Database
Carroll County WHP Database
Department of Natural Resources Digital Orthophoto Quarter Quadrangle: Damascus NE
USGS Topographic 7.5 Minute Quadrangle: Walkersville and Winfield
Maryland Office of Planning 1997 County Land Use Maps: Carroll and Howard
Maryland Office of Planning 1995 Carroll County Sewer Map

FIGURES

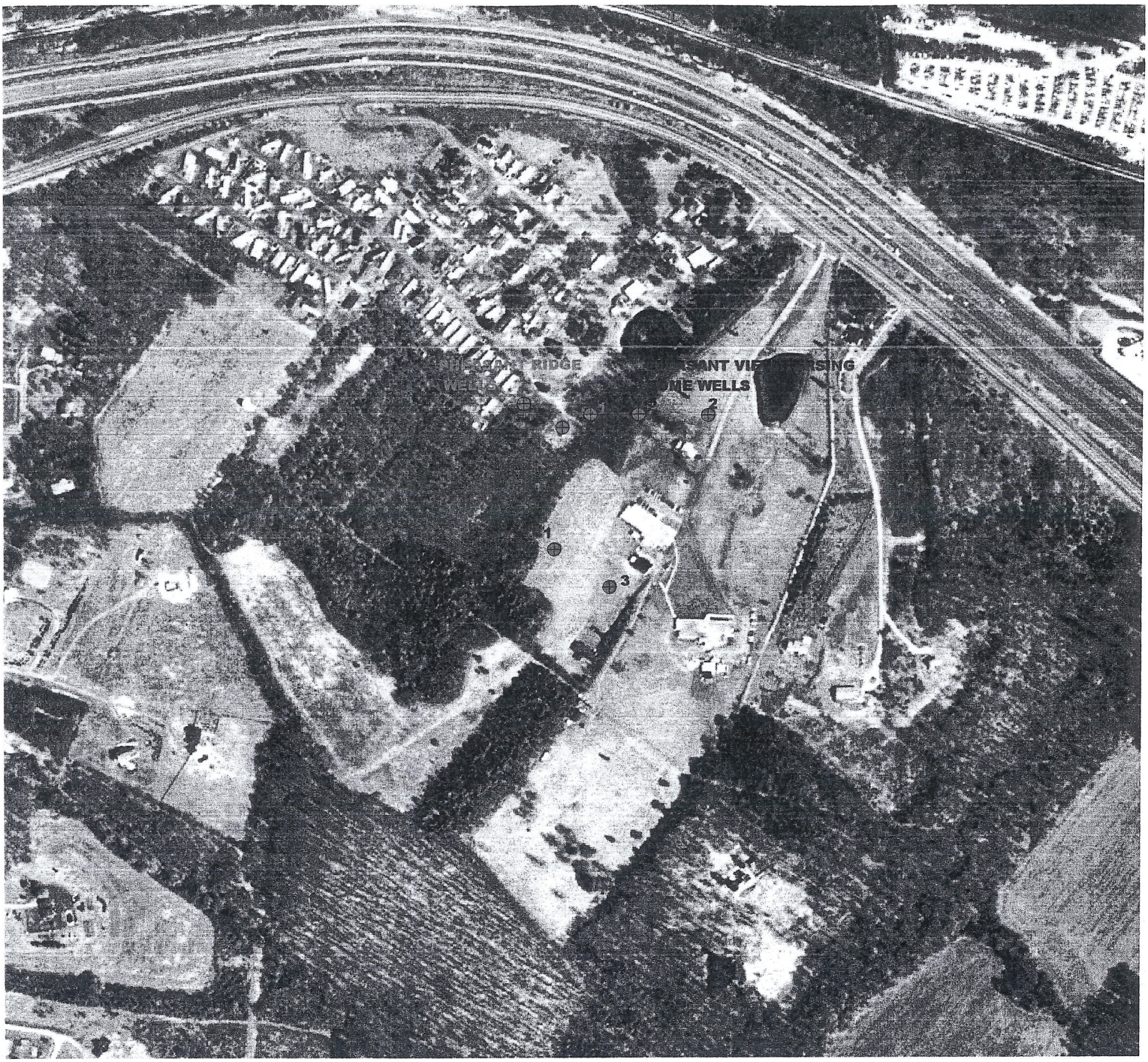
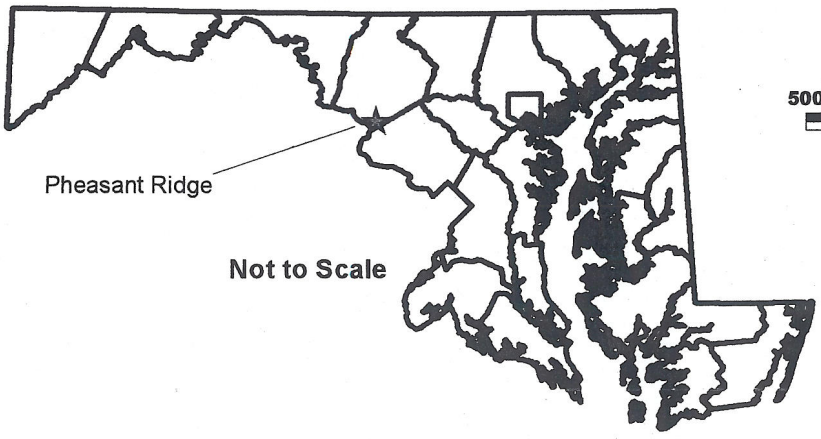


Figure 1. Location Map for the Pheasant Ridge Wells.



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Source; DNR DOQQ Damascus NE 4-3-95

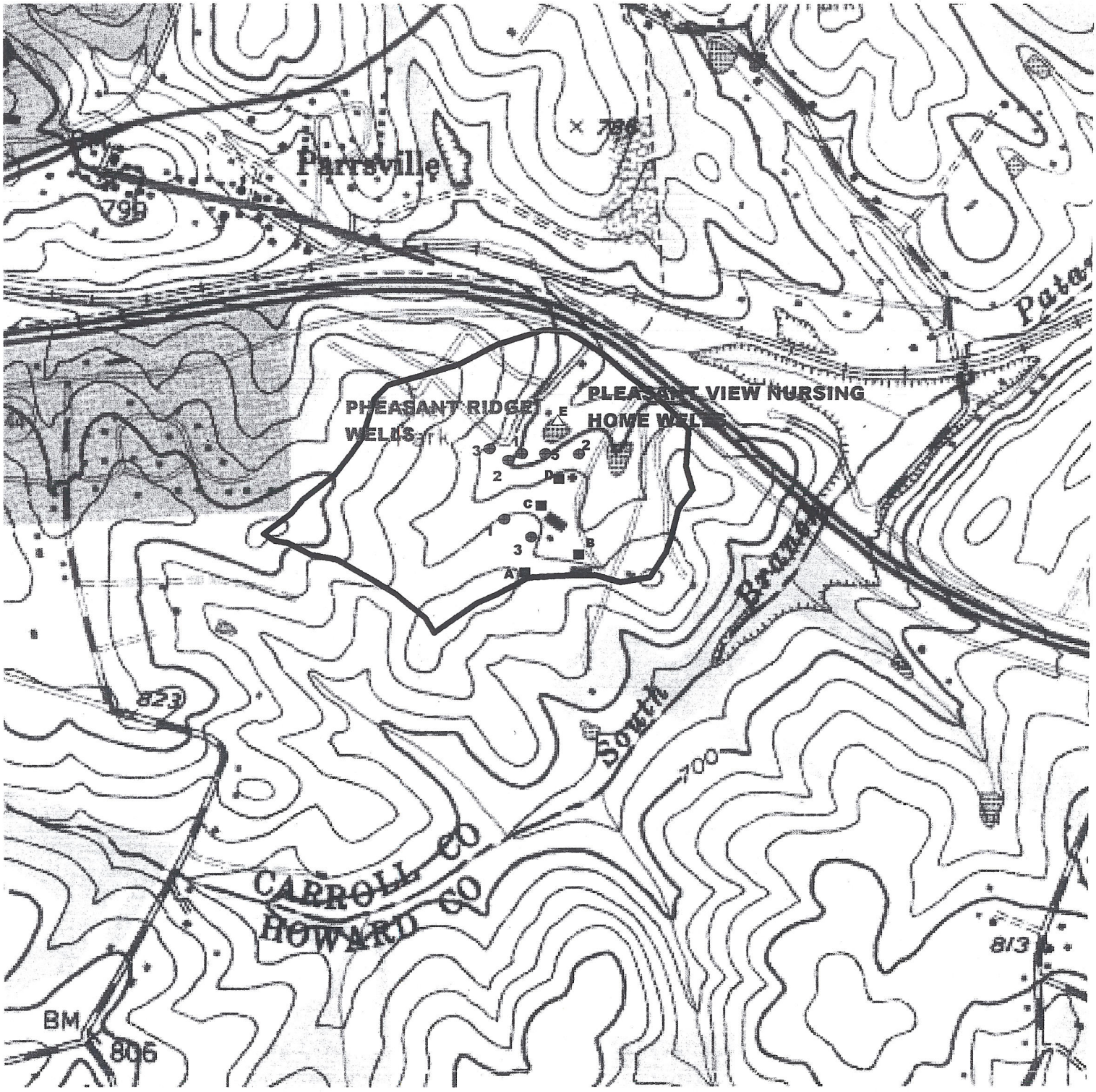

Figure 2. Pheasant Ridge Wellhead Protection Area with Potential Contaminant Sites

LEGEND

- ■ Onsite Septic
- △ Surface Water Discharge
- ⬭ Wellhead Protection Area
- ● Supply Wells

600 0 600 1200 Feet

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Base Map: USGS Topographic 7.5 Minute Quadrangles - Walkersville and Winfield

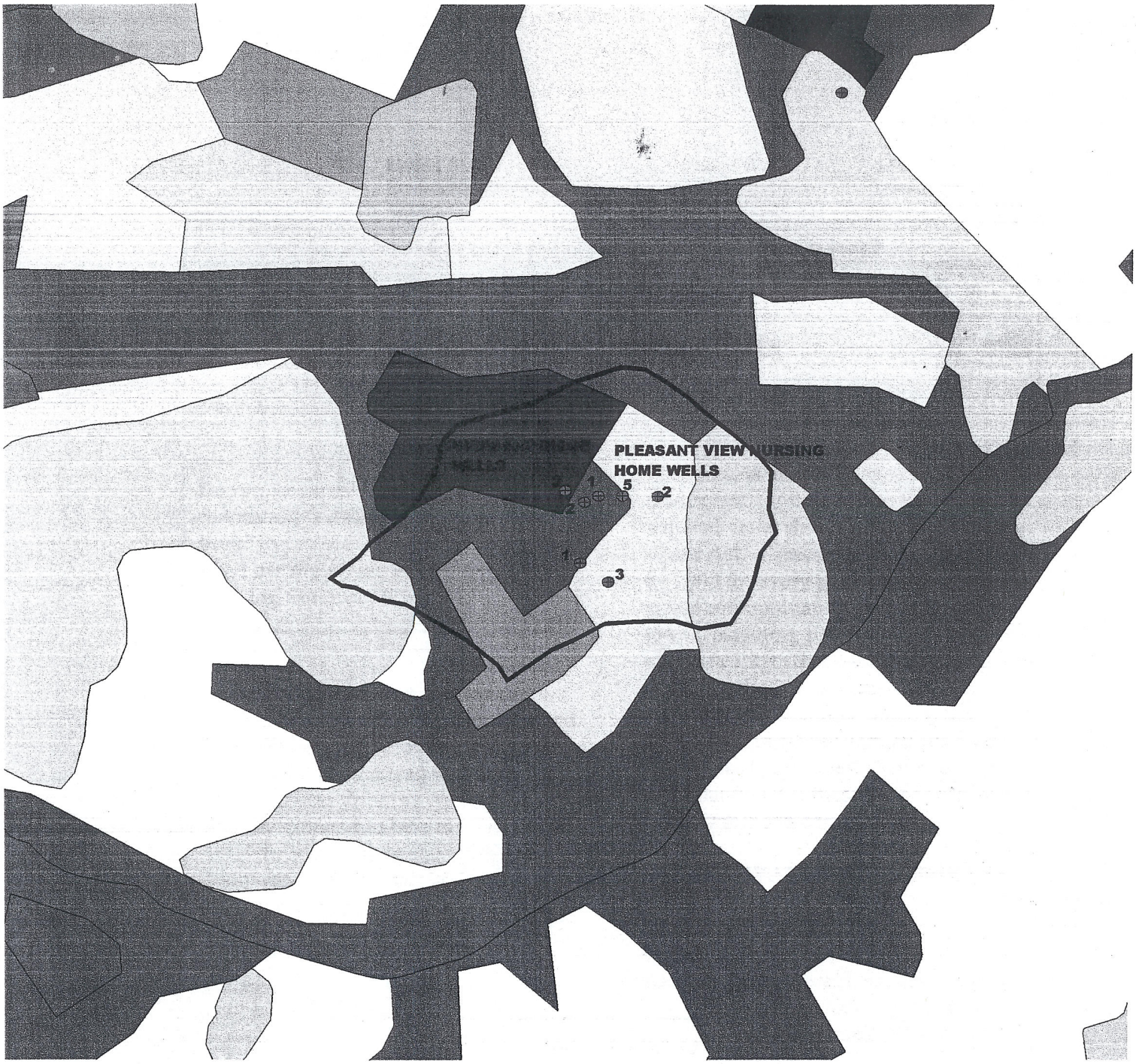

Figure 3. Land Use Map of the Pheasant Ridge Wellhead Protection Area

LEGEND

Land Use Categories

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Industrial
- Open Urban Land
- Cropland
- Pasture
- Orchards
- Forest
- Wellhead Protection Area
- Supply Well

1200 0 1200 Feet

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Source: Maryland Office of Planning
1997 Land Use Map for Carroll
and Howard Counties

United States Environmental Protection Agency | Office of Water (4606) | EPA 816-F-00-025 May 2000

Community Involvement in Drinking Water Source Assessments

Do you know where your community's drinking water comes from?
What are the major threats to your drinking water quality?

Community members and civic or youth groups can help answer these questions and use the information to protect their drinking water sources. By working with their state's program to assess drinking water sources, community groups can help to identify potential threats to the quality of their drinking water. They can also help local officials develop and implement a plan of action to prevent water quality problems.

Your state is now required to assess all the ground water and surface water sources that supply water to public water systems, and you can be involved in the process. These assessments will identify the major potential sources of contamination to drinking water supplies, and will determine how susceptible the water systems are to contamination. The results will be provided to the public to help communities plan for protection activities.

This fact sheet explains the four steps of source water assessments and how communities can participate in the assessment process. It then describes how communities can utilize assessment information to protect their local sources of drinking water.

Each state is moving forward to implement assessments of its public water systems, as required under the federal Safe Drinking Water Act. Assessments must be completed by 2003 for every public water system--for major metropolitan areas and the smallest towns, including schools, restaurants and other public facilities that have wells or surface water supplies. Assessments will not be conducted for drinking water systems that have less than fifteen service connections or that regularly serve less than twenty-five individuals, since these are not considered public water systems.

SOURCE WATER ASSESSMENTS

The source water assessment programs created by states differ since they are tailored to each state's water resources and drinking water priorities. However, each assessment must include four major elements:

- delineating (or mapping) the source water assessment area
- conducting an inventory of potential sources of contamination in the delineated area

- determining the susceptibility of the water supply to those contamination sources
- releasing the results of the determinations to the public

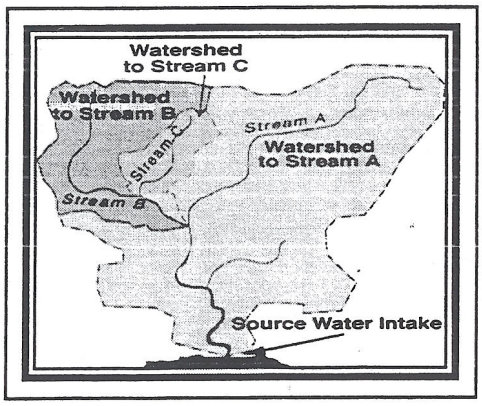
These steps are described in more detail below, with information on how citizens and organizations can join in the assessment process.

STEP 1: DELINEATE THE SOURCE WATER ASSESSMENT AREA

For each ground water well or surface water intake that supplies public drinking water, the land area that could contribute water and pollutants to the water supply must be delineated or mapped. Significant potential sources of contamination will then be identified in this delineated area during Step 2 of the assessment process.

For ground water supplies, states commonly use information about the flow of underground water to delineate source water assessment boundaries. This results in a map of land areas where, if pollutants are spilled or discharged on the surface, they could filter through the soil to the ground water and be drawn into a particular well. Some states may use a simpler mapping approach, by drawing a circle of a certain radius around the well.

For a community that uses surface water from a stream, river, lake or reservoir, the land area in the watershed upstream of the intake is identified on the map. A watershed boundary is drawn using a topographic map, and includes the land areas where rain or melted snow flows over or through the ground and eventually enters the water source upstream of the water system's intake.



Some states plan to divide the watershed area into segments--areas closest to the intake where most types of contamination sources can impact the water supply, and other more distant areas. The entire watershed up to the state's boundaries is required to be delineated, but the inventory of potential pollution sources may be more detailed in segments that are closer to the intake.

After the state has completed its assessment for a water system, the community may decide to undertake protection efforts for targeted sources of contamination. An initial step could be to expand upon the state's delineation process. Particularly for smaller ground water systems, where states may not have the resources to conduct a detailed delineation, additional scientific methods can be used to more accurately delineate the area that contributes ground water to the well.

Community members can seek assistance from the environmental sciences, geology or engineering departments of local colleges, or from environmental consulting firms to assist in creating more detailed delineations. Sometimes these services are provided by professors, graduate students or local firms for a reduced fee or none at all. In addition, local water resource information is often available from other sources such as the federal Natural Resource Conservation Service, the United

States Geological Survey, and the state's Cooperative Extension Service.

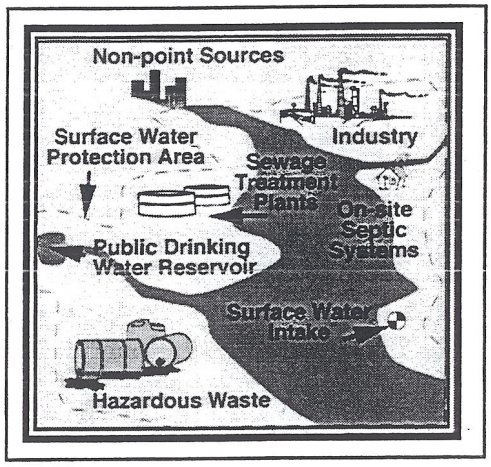
STEP 2: CONDUCT AN INVENTORY OF POTENTIAL SOURCES OF CONTAMINATION

Community groups can become especially involved in the second step of an assessment--identifying potential sources of pollutants that could contaminate the water supply. This inventory usually results in a list and a map of facilities and activities within the delineated area that may release contaminants into the ground water supply (for wells) or the watershed of the river or lake (for surface water sources).

Some examples of the many different types of potential pollutant sources include landfills, underground or above-ground fuel storage tanks, residential or commercial septic systems, storm water runoff from streets and lawns, farms that apply pesticides and fertilizers, and sludge disposal sites.

Some states are asking communities to conduct the inventory themselves, in order to obtain detailed information about potential contaminant sources. Others will use computer databases and focus the inventory on land uses and activities that are currently mapped or regulated. Although this approach may not address sources of contaminants that are not currently regulated, such as smaller livestock areas or auto salvage yards, the database inventories could include industries and sewage treatment plants that discharge wastewater, hazardous waste sites, mining operations, particular land use categories (such as industrial, agricultural and urban areas), and various facilities that have environmental permits.

Community groups such as watershed organizations, local environmental committees or scout troops can enhance the



state's assessment by conducting site-specific inventories of potential pollutant sources that may not be on state databases or maps. Local inventories may provide information on abandoned dump sites, businesses with septic tanks or floor drains such as dry cleaners or car repair shops, pesticide mixing and storage areas, golf courses, and other land uses that may release pollutants to ground water or surface water. Community groups can coordinate their local inventory with the state's assessment process or can enhance a completed assessment with a more detailed inventory.

A helpful document to aid community groups is EPA's "Drinking Water Contaminant Source Index," which is a list of potential contaminant sources and the pollutants they can release. You can find this publication at www.epa.gov/safewater/swp/sources1.html on the EPA web site.

STEP 3 - DETERMINE THE SUSCEPTIBILITY OF THE WATER SUPPLY TO CONTAMINATION

For the susceptibility analysis, the state combines the inventory results with other relevant information to decide how likely will a water supply become contaminated by identified potential sources of contamination. This critical step makes the assessments useful for communities, since it provides information that local decision-makers may use to

prioritize approaches for protecting the drinking water supply. Local information provided to the state by local community groups about contaminant sources, water resource characteristics or environmental management practices may be used in the susceptibility determination process. Some states prioritize the potential for contamination from identified potential contamination sources or specific chemicals that could pollute the water. Other states assign susceptibility rankings of high, medium or low to the water sources.

STEP 4: RELEASE THE ASSESSMENT RESULTS TO THE PUBLIC

After a state completes the assessment of a particular water system, it will summarize the information for the public. Such summaries help communities understand the potential threats to their water supplies and identify priority needs for protecting the water from contamination. States will make the assessment summaries available to the public in a variety of ways. Some states plan to convene public workshops, while others will have copies available in public libraries and from local government offices or water suppliers. Many also plan to post the assessment summaries on the Internet. The results of the assessments will also be included in the annual water quality reports that community water systems are required to prepare for their customers. Community groups can convene local meetings to discuss the results and begin the process of protecting the drinking water source.

SOURCE WATER PROTECTION

Whether using the state's assessment or expanding it into a more detailed local assessment, communities can use information gathered through the assessment process to create a broader source water protection program. Community groups and local officials, working in cooperation with local, regional and state government agencies can plan how to manage identified potential contamination sources and prevent new contaminant threats in the source water assessment area.

Communities use a wide array of different source water protection methods to prevent contamination of their drinking water supplies. One management option involves regulations, such as prohibiting or restricting land uses that may release contaminants in critical source water areas. Along with regulations, many communities hold local events and distribute information to educate and encourage citizens and businesses to recycle used oil, limit their use of pesticides, participate in watershed cleanup activities and a multitude of other prevention activities. Another aspect of a source water protection program can be the purchase of land or creation of conservation easements to serve as a protection zone near the drinking water source. For an effective protection program, communities should consider using a variety of prevention measures.

For further information on your state's Source Water Assessment Program and how to participate, contact the agency in your state that is managing the program. Look at the EPA web page at www.epa.gov/safewater/protect.html or call the EPA Safe Drinking Water Hotline at **1-800-426-4791** to find more information and state contacts. The web page also lists other organizations that may be active with source water assessments and protection in your area. Your local water supplier may also have more information about opportunities to become involved in the source water assessment process. You can call the phone number on your water bill or contact your local health department for information on your water supplier.