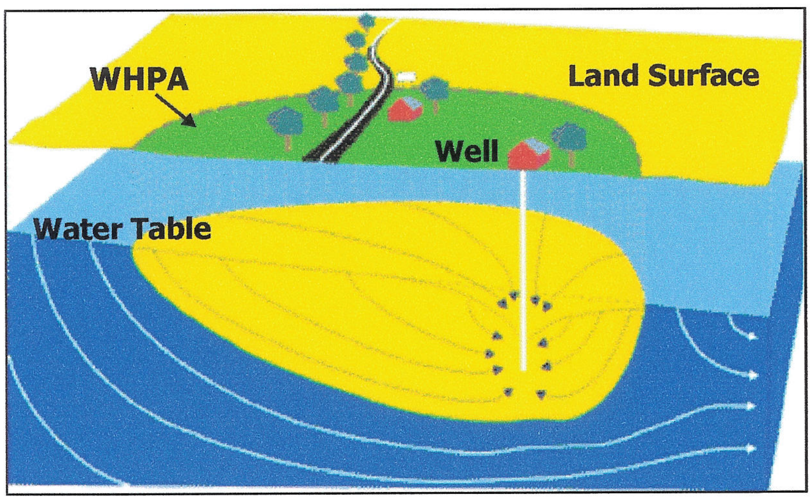
# SOURCE WATER ASSESSMENT

## FOR THE TOWN OF THURMONT
## FREDERICK COUNTY, MD

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MDE

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# SUMMARY

The Water Supply Program has conducted a Source Water Assessment for the Town of Thurmont. 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 sources of Thurmont's water supply are unconfined fractured-rock aquifers. Thurmont is currently using four of the six wells comprising its water system. The Source Water Assessment area was delineated using hydrogeologic mapping and fracture trace analysis.

Potential point sources of contamination within the assessment area were identified from field inspections and contaminant inventory databases. The Maryland Office of Planning's 1997 land use map for Frederick County was used to identify non-point sources of contamination.

The susceptibility analysis is based on the existing water quality data for the Town of Thurmont's water system, the presence of potential sources of contamination in the assessment area, well integrity, and the inherent vulnerability of the aquifer. The combination of these factors cause Thurmont's wells to be susceptible to contamination by nitrate, radon, volatile organic compounds, synthetic organic compounds, and (well No. 3 only) microbiological contaminants.

## INTRODUCTION

The Town of Thurmont is located approximately 15 miles north of the City of Frederick, in Frederick County. Thurmont's water supply system serves a population of 4091 and has 1984 service connections. Thurmont presently obtains its water supply from four wells (Nos. 2, 3, 4, and 7), and has a fifth well (No. 8) which will be put into service in the near future (Figure 1). A sixth standby well (No. 5) may eventually be used again if supply needs warrant putting it back into service. Thurmont abandoned the use of Well No. 5 due to petroleum contamination in 1983.

## WELL INFORMATION

A review of the well completion reports and sanitary surveys of Thurmont's water system indicate that Well Nos. 5, 7, and 8 meet the State's well construction standards and that Well Nos. 2, 3, and 4 were installed prior to the 1973 Regulations went into effect. Table 1 contains a summary of the well construction data.

| PLANT | SOURCE NAME | PERMIT | TOTAL DEPTH | CASING DEPTH | AQUIFER |
|---|---|---|---|---|---|
| 02 | THURMONT 2 | n/a | 192 | 73 | FREDERICK LIMESTONE |
| 03 | THURMONT 3 | FR690518 | 105 | 29 | FREDERICK LIMESTONE |
| 03 | THURMONT 4 | FR720327 | 294 | 70 | FREDERICK LIMESTONE |
| 04 | THURMONT 5 | FR738626 | 400 | 32 | FREDERICK LIMESTONE |
| 05 | THURMONT 7 | FR738820 | 197 | 73 | GETTYSBURG SHALE |
| 06 | THURMONT 8 | FR940883 | 160 | 130 | GETTYSBURG SHALE |

**Table 1. Town of Thurmont Well Information.**

The four production wells (2, 3, 4, and 7) are currently used at average rates of 120, 275, 400, and 300 gallons per minute (gpm) respectively. Well No. 8 has an approximate rated capacity of 300 gpm, but is currently only permitted for a maximum of 162 gpm and has a similar pump capacity. The capacity of Well 5 is 240 gpm.

## HYDROGEOLOGY

Thurmont's wells draw water from two distinct aquifers, the Frederick Limestone and the Gettysburg Shale (Table 1). The western portion of Thurmont is underlain by the

Frederick Limestone, a dark-gray, thin-bedded clayey limestone (Nutter, 1973). This formation is a prolific aquifer due to solution-enlarged fractures and channels that readily transport water. The eastern side of Thurmont is underlain by the Gettysburg Shale, which consists chiefly of westward-dipping beds of red shale and siltstone and some sandstone (Meyer and Beall, 1958). The well log of No. 7 shows that limestone sections were encountered in the well at various depths.

Seventy-two hour pump tests were conducted for both the Frederick Limestone and Gettysburg Shale as required for the Ground Water Appropriation and Use Permit (GAP). Based on the pumping tests the transmissivities of the Frederick Limestone and Gettysburg Shale were found to be 547 $ft^2$/day and 720 $ft^2$/day respectively.

## SOURCE WATER ASSESSMENT AREA DELINEATION

For ground water systems, a Wellhead Protection Area (WHPA) is considered the source water assessment area for the system. A WHPA was originally delineated in 1995 for Well Nos. 2, 3, 4, 7, and 8 using hydrogeologic mapping and fracture trace analysis. The source water assessment area was modified from the original WHPA to include a Zone 1 for Well 5 and Zone 3 for Well 3.

Hydrogeologic mapping identifies the physical and hydrologic features that control ground water flow (EPA, 1991). In Thurmont, hydrogeologic mapping was used to identify geologic formation boundaries and watershed boundaries. In this setting, it is assumed that ground water divides coincide with watersheds.

Fracture traces are surface expressions of vertical, closely spaced joints and fractures in the bedrock below. Highly developed fracture systems in bedrock aquifers readily transmit water; thus fracture trace analysis is commonly used to locate high yield wells in fractured bedrock aquifers. A well intercepting a fracture, or fracture zone, will demonstrate a drawdown pattern that is greatest along the trace of the fracture(s). Earth Data, Inc. mapped fracture traces near Thurmont's wells in February 1995 using aerial photographs (Fig. 2). Fracture traces were not mapped around Well No. 2 because the well is located in a highly developed area where any fracture trace would be difficult to identify.

### *Delineation Zones*

Zone 1: The Zone 1 WHPA is an area around a well that is considered most vulnerable to contamination. A one-year time of travel (TOT) is the criterion defined for Zone 1 for wells in unconfined Coastal Plain aquifers in MDE's Source Water Assessment Plan. Because TOT cannot be precisely modeled in a heterogeneous aquifer such as this one, a buffer zone surrounding the fracture traces is considered Zone 1 for Thurmont's WHPA. Three Zone 1 WHPAs were delineated and encompass the fracture traces around well Nos. 3, 4, 5, 7, and 8 (Fig. 2). Since fracture traces could not be mapped around Well No. 2, the fourth Zone 1 WHPA is a

500 foot radius circle around this well. This radius is slightly larger than one obtained by using a volumetric flow equation with a 1-year TOT.

Zone 2: The Zone 2 WHPA is a larger area around a well through which any contaminant present could ultimately reach the well. The Zone 2 WHPA for Thurmont's wells is the combination of watershed boundaries and geologic boundaries surrounding all the wells. The western boundary of the WHPA is the contact between the Frederick Limestone and the Harper's Formation. The other boundaries are roughly the watershed of the wells.

Zone 3: The Zone 3 WHPA is the area between the 10 year TOT boundary and ultimate recharge area to a well. The likelihood that a contaminant in this area would reach the well depends on many factors including, but not limited to, soil attenuation and travel times from the recharge area to the stream and eventually downstream to the well. In this case Zone 3 is the ultimate recharge area for Well No. 3, which was determined to be under the direct influence of surface water in 1994. A dye trace investigation (Steinfort, 1993) indicated that a small portion of the water captured by Well No. 3 is directly from Hunting Creek. The Hunting Creek watershed is mapped as Zone 3 (Fig. 3).

## POTENTIAL SOURCES OF CONTAMINATION

Several potential point sources of contamination were identified during the original mapping of Thurmont's WHPA. The list of point sources has been revised in this report based on field inspections by MDE employees, updated databases, and an interview with the Town of Thurmont's operator Mr. Gary Dingle on November 3, 1999. Several commercial or industrial establishments that have Underground Storage Tanks (USTs), Leaking Underground Storage Tanks (LUSTs), or are classified as Controlled Hazardous Substance Generators (CHS) are identified on Figure 2. Miscellaneous potential contaminant sites include pesticide dealers, buildings with chemical storage, and maintenance facilities for vehicles and machinery. Table 2 lists the facilities identified and their potential sources of contaminants. This is based on generalized categories and often the potential contaminant depends on the specific chemicals and processes being used at the facility. The potential contaminants for an activity may not be limited to those listed. Potential contaminants are grouped as Volatile Organic Compounds (VOC), Synthetic Organic Compounds (SOC), and Heavy Metals (HM).

Two incidents of ground water contamination are known to exist within the WHPA. MDE is overseeing the cleanup of petroleum contaminated ground water due to a LUST at the Exxon station. Well No. 5 was shut down in 1983 due to high levels of benzene and other gasoline byproducts associated with the Exxon LUST. MDE's Oil Control Program reports that the Exxon is continuing its remediation efforts at the LUST site and are currently expanding their treatment system to increase the effectiveness of the contaminant removal.

Well Nos. 7 and 8 have been contaminated with Trichloroethylene (TCE) from an unidentified source. A MDE inspector examined the Keilholtz Trucking, Moore Business Forms, Thurmont Shoe, NVR Wood Products, and a former dryer cleaning business (now a residence) for possible ground water discharge points in the WHPA as the source of the TCE contamination. A source was not identified; however, during the inspection it was noted by several local businesspeople that a former dry cleaning operator had used farmland near Well Nos. 7 and 8 to dispose of waste. The site has been referred to MDE's Brownfields Assessment Division for further investigation. Funding for the project is currently being investigated. The pertinent information in this report has been forwarded to Brownfields staff.

At the State Highway Administration complex a 2,000 gallon diesel tank was removed. This tank was observed to have a small pinhole. A monitoring well was installed, but no contaminants have been detected. Several other UST sites within the WHPA have had their tanks either removed or permanently sealed with no reported problems.

| ID | Type | Site Name | Address | Potential Contaminant |
|---|---|---|---|---|
| 1 | UST | Sheetz | 428 N Church St. | VOC |
| 2 | UST | Direct to You Gas | Corner Church and Emmitsburg Sts | VOC |
| 3 | UST | Amoco | 227 N Church St | VOC |
| 4 | UST | Delauter Contractors | 122 Park Ln | VOC |
| 5 | UST | Keilholtz trucking Service | 300 Eyler Rd | VOC |
| 6 | UST | Thurmont Shoe Company | | VOC |
| 7 | UST | Texaco | | VOC |
| 8 | LUST | Mountaingate Exxon | | VOC |
| 9 | LUST | State Highway Administration | | VOC |
| 10 | CHS | Bogley Chevrolet | 111 Frederick Rd | VOC,SOC,HM |
| 11 | CHS | Mountaingate Exxon | | VOC,SOC,HM |
| 12 | CHS | State Highway Administration | | VOC,SOC,HM |
| 13 | CHS | Beards Trash Service | 14627 Roddy Rd | VOC,SOC,HM |
| 14 | CHS | Gelwicks Trash Service | | VOC,SOC,HM |
| 15 | CHS | Moore Business Forms | Carroll St Ext | VOC,SOC,HM |
| 16 | CHS | Thurmont Shoe Company | | VOC,SOC,HM |
| 17 | CHS | Nu Look Cleaners | Thurmont Shop Center | VOC |
| 18 | CHS | Lawyers Thurmont Express | Lombard St | VOC |
| 19 | CHS | Orchard Village Dry Cleaners | 209 Tippin Drive | VOC |
| 20 | MISC | Thurmont Cooperative | 36 Walnut St | SOC |
| 21 | MISC | Firemans Activity Bldg | | VOC,M,HM |
| 22 | MISC | Electric Substation | | VOC,SOC,HM |
| 23 | MISC | Electric Substation | | VOC,SOC,HM |
| 24 | MISC | NVR Wood Products | Carroll St Ext | SOC,VOC |
| 25 | MISC | Mountaingate Service Center | | VOC,SOC,HM |

**Table 2. Potential Contaminant Point Sources within Thurmont WHPA. (See figure 2 for locations).**

Based on the Maryland Office of Planning's 1997 Land Use map, the land use within WHPA Zones 1 and 2 is split evenly between residential, commercial and agricultural, and forest (Chart 1). WHPA Zone 3 is predominantly forested with small pockets of residential, commercial, and agricultural areas (Fig 3.). Table 3 outlines the distribution of land use within the WHPA Zone 3.

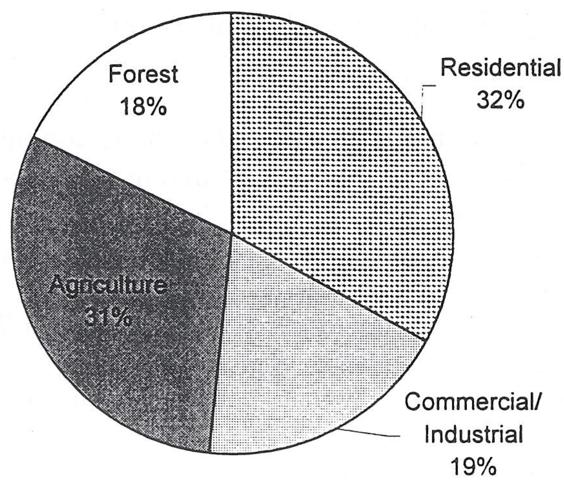



**Chart 1. Land Use Summary for WHPA Zones 1 and 2**

A review of the Maryland Office of Planning's Frederick County Sewer map shows that 72% of the land area in WHPA Zones 1 and 2 is in the sewer service area (Fig. 4). The remaining 28% of land area that is not currently sewered is predominantly agricultural (160 acres), with smaller areas of residential (57 acres), commercial (33 acres), and forested land (48 acres).

Within WHPA Zone 3, 94% of the land is not sewered. The large majority of the unsewered area is forested (87%) and agricultural (9%), with only 3% being low-density residential.

| Land Use | Total Area (Acres) | Percentage of Total WHPA |
|---|---|---|
| Low Density Residential | 166 | 2 |
| Medium Density Residential | 156 | 2 |
| Commercial | 54 | 1 |
| Open Urban Land | 14 | 0 |
| Cropland | 496 | 7 |
| Pasture | 79 | 1 |
| Orchards/Vineyards/ Horticulture | 95 | 1 |
| Forest | 6041 | 85 |
| Water | 42 | 1 |

**Table 3. Land Use Summary for Thurmont WHPA Zone 3.**

## WATER QUALITY DATA

Water Quality data was reviewed from the Water Supply Program's database for Safe Drinking Water Act contaminants. All data reported is from the finished (treated) water unless otherwise noted. The treatment currently in use in Thurmont includes disinfection, ion exchange for softening, filtration for microorganism removal (well Nos. 3 and 4 only), and aeration for organics removal (well No. 7 and 8 only).

A review of the monitoring data since 1993 for Thurmont's finished water indicates that the system's water supply meets drinking water standards with a few exceptions. Of the inorganic compounds tested, Nitrate was the only contaminant detected (Table 4). Radon-222 was the only radiological contaminant present at a level of concern (Table 4). Volatile organic compounds have been detected in Well Nos. 2, 5, 7, and 8 (Table 5). Microbiological contaminants were present in Well No. 3 in samples collected in1992 (Table 6). No synthetic organic compounds were detected above 50% of the Maximum Contaminant Level (MCL) in three sets of samples since May 1994.

### *Inorganic Compounds (IOCS)*

The MCL for Nitrate is 10 ppm. Nitrate was detected at 5.9 ppm in Well 2 in September of 1993, but has not been detected above 50% of the MCL since (Table 4a). Nitrate has been detected at levels below the 50% MCL threshold in Well Nos. 3, 4, and 7 as well.

### *Radionuclides*

There is currently no MCL for Radon-222, however EPA has proposed a MCL of 300 pCi/L or an alternate of 4000 pCi/L. MDE is currently evaluating which MCL to adopt into State regulations. Radon-222 has been detected at levels commonly associated with the bedrock aquifers of the Piedmont in all of Thurmont's production wells (Table 4).

### *Volatile Organic Compounds*

VOCs have been detected in Well No. 2 since 1993 (Table 5a). Trichlorobenzene and p-Dichlorobenzene were both detected above 50% of their respective MCLs in November 1993, but neither has been detected since. Trichloroethylene (TCE) was detected only once in January of 1995 well below the MCL. As previously mentioned TCE has been detected in the raw water of well 7, and treatment for this contaminant is in place. Raw water samples were collected in June 1999 (Table 5b) and are indicative of the TCE levels found in wells 7 and 8.

### *Microbiological Contaminants*

Well 3 is classified as a "Ground Water Under the Direct Influence of Surface Water" (GWUDI) source as defined in COMAR and the Surface Water Treatment Rule. During the evaluation of this well for surface water influence, raw water bacteriological samples were collected that showed the presence of fecal coliform contamination (Table 6). Turbidity was not higher than 3 NTUs. All of Thurmont's remaining wells were tested and were negative for fecal coliform.

| CONT ID | CONTAMINANT NAME | MCL | SAMPLE DATE | RESULT |
|---|---|---|---|---|
| 1040 | NITRATE | 10 (ppm) | 14-Sep-93 | 5.9 (ppm) |
| 1040 | NITRATE | 10 | 12-Nov-93 | 3.9 |
| 1040 | NITRATE | 10 | 08-Mar-94 | 3.4 |
| 1040 | NITRATE | 10 | 12-Apr-94 | 4.2 |
| 1040 | NITRATE | 10 | 04-Jan-95 | 3.6 |
| 1040 | NITRATE | 10 | 07-Aug-96 | 2.4 |
| 1040 | NITRATE | 10 | 26-Mar-97 | 2.7 |
| 1040 | NITRATE | 10 | 21-Sep-98 | 3.5 |
| 1040 | NITRATE | 10 | 24-Nov-98 | 4.1 |
| 4004 | RADON-222 | 300 (pCi/L)** | 09-Apr-97 | 130 (pCi/L) |

**Table 4a. IOC and Radiological results for Thurmont Plant 2 (Well 2) finished water since Sep. 1993.**

| CONT ID | CONTAMINANT NAME | MCL | SAMPLE DATE | RESULT |
|---|---|---|---|---|
| 1040 | NITRATE | 10 (ppm) | 14-Sep-93 | 4.4 (ppm) |
| 1040 | NITRATE | 10 | 12-Nov-93 | 3.3 |
| 1040 | NITRATE | 10 | 07-Mar-94 | 3.2 |
| 1040 | NITRATE | 10 | 08-Mar-94 | 2 |
| 1040 | NITRATE | 10 | 12-Apr-94 | 3.6 |
| 1040 | NITRATE | 10 | 28-Feb-95 | 2.6 |
| 1040 | NITRATE | 10 | 07-Aug-96 | 1.8 |
| 1040 | NITRATE | 10 | 26-Mar-97 | 2.1 |
| 1040 | NITRATE | 10 | 21-Sep-98 | 2.5 |
| 4004 | RADON-222 | 300 (pCi/L)** | 16-May-94 | 805 (pCi/L) |
| 4004 | RADON-222 | 300 | 09-Apr-97 | 640 |

**Table 4b. IOC and Radiological results for Thurmont Plant 3 (Wells 3 and 4) finished water since Sep. 1993.**

| CONT ID | CONTAMINANT NAME | MCL | SAMPLE DATE | RESULT* |
|---|---|---|---|---|
| 1040 | NITRATE | 10 (ppm) | 14-Sep-93 | 4.6 (ppm) |
| 1040 | NITRATE | 10 | 12-Nov-93 | 3.6 |
| 1040 | NITRATE | 10 | 08-Mar-94 | 3.5 |
| 1040 | NITRATE | 10 | 13-Apr-94 | 4.3 |
| 1040 | NITRATE | 10 | 04-Jan-95 | 3.3 |
| 1040 | NITRATE | 10 | 24-Oct-95 | 3.5 |
| 1040 | NITRATE | 10 | 07-Aug-96 | 2.1 |
| 1040 | NITRATE | 10 | 26-Mar-97 | 2.7 |
| 1040 | NITRATE | 10 | 24-Nov-98 | 3 |
| 4004 | RADON-222 | 300 (pCi/L)** | 16-May-94 | -10 (pCi/L) |
| 4004 | RADON-222 | 300 | 09-Dec-96 | 325 |
| 4004 | RADON-222 | 300 | 09-Apr-97 | -20 |

*Negative values for results indicate the contaminant is not present above the detection limit (negative value) for the analysis method.
**Lowest of proposed Radon-222 MCLs.

**Table 4c. IOC and Radiological results for Thurmont Plant 5 (Well 7) finished water since Sep. 1993.**

| CONT ID | CONTAMINANT NAME | MCL (PPB) | SAMPLE DATE | RESULT (PPB)* |
|---|---|---|---|---|
| 2969 | p-DICHLOROBENZENE | 75 | 12-Nov-93 | 44 |
| 2969 | p-DICHLOROBENZENE | 75 | 08-Mar-94 | -0.5 |
| 2969 | p-DICHLOROBENZENE | 75 | 04-Jan-95 | -0.5 |
| 2969 | p-DICHLOROBENZENE | 75 | 03-Apr-95 | -0.5 |
| 2969 | p-DICHLOROBENZENE | 75 | 05-Jul-95 | -0.5 |
| 2969 | p-DICHLOROBENZENE | 75 | 02-Oct-95 | -0.5 |
| 2969 | p-DICHLOROBENZENE | 75 | 09-Apr-97 | -0.5 |
| 2969 | p-DICHLOROBENZENE | 75 | 21-Sep-98 | -0.5 |
| 2378 | 1,2,4-TRICHLOROBENZENE | 70 | 12-Nov-93 | 50 |
| 2378 | 1,2,4-TRICHLOROBENZENE | 70 | 08-Mar-94 | -0.5 |
| 2378 | 1,2,4-TRICHLOROBENZENE | 70 | 04-Jan-95 | -0.5 |
| 2378 | 1,2,4-TRICHLOROBENZENE | 70 | 03-Apr-95 | -0.5 |
| 2378 | 1,2,4-TRICHLOROBENZENE | 70 | 05-Jul-95 | -0.5 |
| 2378 | 1,2,4-TRICHLOROBENZENE | 70 | 02-Oct-95 | -0.5 |
| 2378 | 1,2,4-TRICHLOROBENZENE | 70 | 09-Apr-97 | -0.5 |
| 2378 | 1,2,4-TRICHLOROBENZENE | 70 | 21-Sep-98 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 12-Nov-93 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 08-Mar-94 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 04-Jan-95 | 1 |
| 2984 | TRICHLOROETHYLENE | 5 | 03-Apr-95 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 05-Jul-95 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 02-Oct-95 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 09-Apr-97 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 21-Sep-98 | -0.5 |

**Table 5a. VOC results for Thurmont Plant 2 (Well 2) since November 1993.**

| CONT ID | CONTAMINANT NAME | MCL (PPB) | SAMPLE DATE | RESULT (PPB)* |
|---|---|---|---|---|
| 2984 | TRICHLOROETHYLENE | 5 | 09-Mar-90 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 07-Jun-90 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 05-Sep-90 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 16-Oct-90 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 26-Feb-91 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 29-Jun-94 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 04-Jan-95 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 26-Mar-96 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 09-Apr-97 | -0.5 |
| 2984 | TRICHLOROETHYLENE | 5 | 14-Jun-99 | 22.4 (R) |
| 2984 | TRICHLOROETHYLENE | 5 | 29-Jun-99 | 30.9 (R) |
| 2984 | TRICHLOROETHYLENE | 5 | 29-Jun-99 | -0.5 |

(R) Denotes raw water data.
*Negative values for results indicate the contaminant is not present above the detection limit (negative value) for the analysis method.

**Table 5b. VOC results for Thurmont Plant 5 (Well 7) since November 1993.**

| SAMPLE CONDITIONS | SAMPLE DATE | TEMPERATURE (°C) | PH | TURBIDITY (NTU) | TOTAL COLIFORM (COLONIES/100ML | FECAL COLIFORM (COLONIES/100 ML) |
|---|---|---|---|---|---|---|
| WET WEATHER | 24-Feb-92 | 13.1 | 7.7 | 3 | 1.1 | -1.1 |
| WET WEATHER | 25-Feb-92 | 7.7 | 7 | 1.8 | 3.6 | -1.1 |
| WET WEATHER | 26-Feb-92 | 13.5 | 7.2 | 1.8 | -2 | -2 |
| WET WEATHER | 27-Feb-92 | 13.7 | 7.4 | 1.8 | 8 | -2 |
| WET WEATHER | 02-Nov-92 | 12.9 | 7 | 0.7 | -2 | -2 |
| WET WEATHER | 03-Nov-92 | 13.3 | 7.1 | 0.52 | 1600 | 17 |
| WET WEATHER | 04-Nov-92 | 12.9 | 7.1 | 0.26 | 1600 | 17 |
| WET WEATHER | 05-Nov-92 | 13.4 | 7.1 | 0.9 | 300 | 4 |
| DRY | 18-Nov-91 | | 7.5 | 0.25 | -2 | -2 |
| DRY | 13-Oct-92 | 10 | 7 | 0.15 | 4 | -2 |

**Table 6. Ground Water Under the Direct Influence of Surface Water Monitoring Data for Thurmont Well No. 3.**

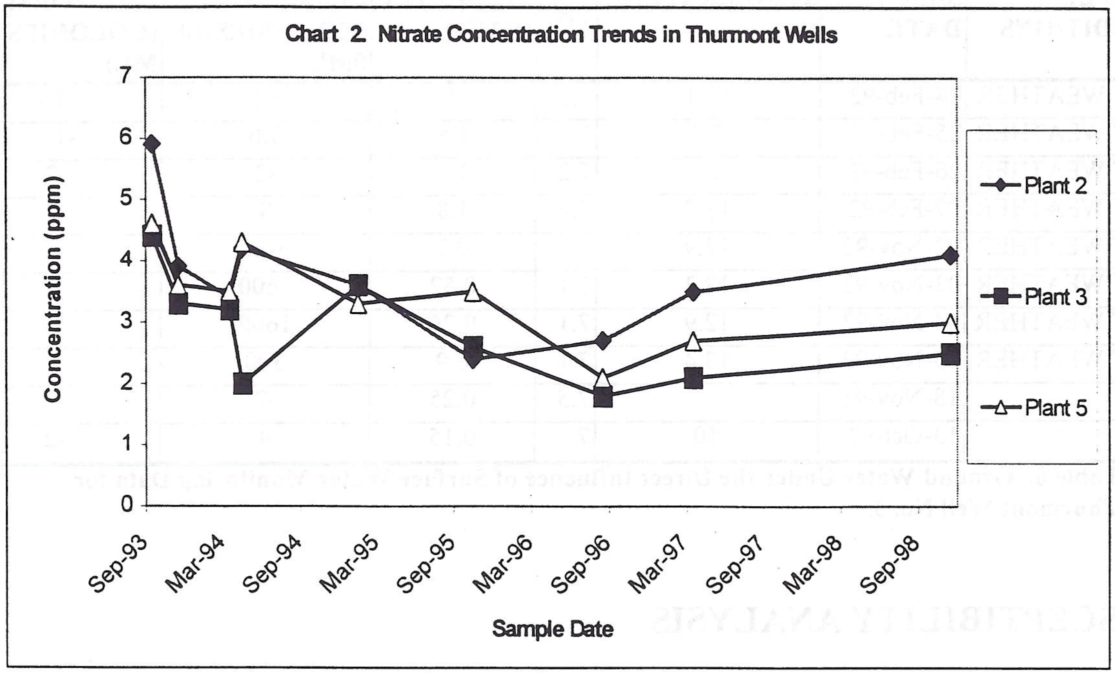
## SUSCEPTIBILITY ANALYSIS

Thurmont's wells draw water from unconfined fractured rock aquifers, and are therefore vulnerable to any activity on the land surface that occurs within the WHPA. In order to determine susceptibility to each group of contaminants the following criteria were considered: 1) the presence of potential contaminant sources within the WHPA, 2) water quality data and 3) the aquifer conditions.

### *Inorganic Compounds*

Nitrate is present in all of Thurmont's wells below the MCL. Sources of nitrate can generally be traced back to land use. Fertilization of agricultural fields and residential lawns, and septic systems are two non-point sources that are generally associated with nitrate loading in ground water. Nitrate is also found in precipitation throughout Maryland, which is the primary recharge of unconfined aquifers, due to reactions with atmospheric nitrogen (Bolton, 1996). Agricultural land makes up 31% (Table 3a) and non-sewered residential and commercial areas make up approximately 7% of WHPA Zones 1 and 2 based on 1997 land use. Trends in nitrate concentration in Thurmont's wells show that they peaked in 1993, were on a decline until 1996 and have been slowly on the rise since (Chart 2).

The fluctuations in nitrate concentration may be attributable to many factors including residential development, changes in agricultural practices, and seasonal variations in nitrate concentration in ground water recharge. Samples are collected annually, however they have not been consistently collected during the same time of year (Table 4). Currently, it appears that nitrate concentration is on the rise in Thurmont's water supply. Due to this and the numerous potential sources of nitrate the water supply is considered susceptible to this contaminant.




***Radionuclides***

Radon is present in Thurmont's water supply, however determining the susceptibility of the wells to this contaminant is difficult due to many factors. An MCL for radon has not been adopted yet for Maryland. The US EPA has proposed two MCLs, 300 pCi/L and 4000pCi/L, for drinking water. The higher concentration is allowable if the state adopts a cooperative program to reduce concentrations of radon in indoor air, which is the primary health concern. The source of radon in ground water can be traced back to the natural occurrence of uranium in rocks. Radon is prevalent in ground water throughout the Piedmont region of Maryland due to radioactive decay of uranium bearing minerals in the bedrock (Bolton, 1996). However, large amounts of radon may be ingested with water without any health effects. The health effects and risks of radon in drinking water are reviewed in Cross, Harley, and Hoffman (1985). The EPA also has information on proposed regulations for radon in indoor air and drinking water on their web site (http://www.epa.gov/OGWDW/radon.html). Currently, it appears that Thurmont's water supply is susceptible to radon due to the natural occurrence of this contaminant in aquifer material. However, the consequences of this are unknown at this time.

***Volatile Organic Compounds***

The wells are susceptible to VOCs due to several potential contaminant sources identified within the WHPA that could potentially impact these wells. Validating their susceptibility is the presence of TCE, and benzene byproducts in Well Nos. 2, 5, 7, and 8. The source of contamination in Well No. 5 has been identified and remediation efforts are ongoing. No specific source of VOCs has been linked to the contamination of Well Nos. 7 and 8.

*Microbiological Contaminants*

The presence of fecal coliform in Well No. 3 indicates its susceptibility to pathogenic microorganisms. Pathogenic protozoa, viruses, and bacteria normally associated with surface water can contaminate this well due to its direct connection with Hunting Creek. Sources of these pathogens are generally improperly treated wastewater, waste material from mammals, and urban runoff in developed areas. Within WHPA Zones 1 and 2, there is no large discharge of wastewater. A small percentage of this area has individual septic systems, which may provide a source of fecal contamination if they fail. The watershed of Hunting Creek (Zone 3) is primarily forested (Fig. 3), which protects Hunting Creek from major fecal contamination. However, in town closer to Well No. 3 runoff from developed areas is a potential source of contaminants to the Creek. As a GWUDI source, Well No. 3 is susceptible to pathogens. However, there is little threat of major contamination based on the land use of the WHPA.

*Synthetic Organic Compounds*

Determining the susceptibility of Thurmont's wells to SOCs is not straightforward because these contaminants have not been detected in routine monitoring samples over a 5 year period. However, several potential sources of SOCs are present within the Thurmont WHPA (Table 2). This, together with the fact that the wells pull from unconfined fractured rock aquifers, causes the water supply to be susceptible to SOCs. Continued monitoring of these contaminants is important to ensure the safety of the water supply.

## MANAGEMENT OF THE WHPA

With the information contained in this report, the Town of Thurmont is in a position to protect its water supply by staying aware of the area delineated for wellhead protection, keeping track of potential contaminant sources, and evaluating future development and land planning. Specific management recommendations for consideration are listed below:

### *Form a Local Planning Team*

- Thurmont should form a local planning team to begin to implement the Town's 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 planning agencies, local business, developers, farmers 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 Thurmont should be consistent with the level of resources available for implementation. By consulting with other jurisdictions involved in this process, Thurmont can benefit from lessons learned by others. There are at least two other nearby municipalities actively involved in wellhead protection (Walkersville and Middletown). MDE remains available to assist in anyway we can help the process.

### *Public Awareness and Outreach*

- Conducting education outreach to the facilities listed in Table 2. Important topics include: (a) in ground storage of materials in tanks and piping, (b) waste streams that may go into dry wells, septic tanks or other ground water discharge points, (c) reporting of spills, (d) material and chemical storage, and (e) monitoring well installation.

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

- Road signs at the WHPA boundaries is 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*

- Thurmont should monitor Well No. 5 for organic compounds that had previously contaminated the well if it intends to use it to accommodate future growth.

- Continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.

*Planning/ New Development*

- Review the State's model wellhead protection zoning ordinances for potential adoption. Compare the wellhead protection boundaries with the Town limits to determine how to coordinate with Frederick County Department of Planning. Frederick County Planning has a draft ordinance for wellhead protection; MDE recommends that communities within the County encourage this Department to adopt the ordinance.

- Evaluate the areas most likely to be prone to forming sinkholes. Manage stormwater runoff and review new development including storage of chemicals to keep away from sinkholes. Carroll County is developing educational guidance on sinkhole formation and mitigation measures, which may be useful to Thurmont.

*Land Acquisition/Easements*

- The availability of loans for purchase of and or easements for the purpose of protecting water supplies is available from MDE. Loans are offered at zero percent interest and zero points.

*Contingency Plan*

- Thurmont 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*

- Thurmont should conduct its own detailed field survey of the WHPA to ensure that there are no other potential sources of contamination.

- Consider regular inspections of certain high risk facilities.

- Mr. Gary Dingle, the operator of Thurmont's water system, stated that his biggest concern is that the source of TCE present in Well Nos. 7 and 8 has never been identified. Treatment to remove TCE is in place and has been effective, as shown by the finished water quality data. However, this is a valid concern particularly because without removal or control of the source contaminant levels may rise beyond the capability of the treatment system. We are aware that Thurmont has been in contact Mr. William Burris of the State's Waste Management Administration to assist and cooperate in their proposed Brownfields project. We encourage the Town to support this investigation to determine the best way to protect Well Nos. 7 and 8 from further contamination.

***Changes in Use***

- Thurmont should notify MDE if well No. 5 is put back into service. Drilling a new well outside the current WHPA would modify the area, therefore Thurmont should contact the Water Supply Program if a new well is being proposed.

# 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 pp.

Cross, F.T., N.H. Harley, and W. Hofmann, 1985, Health effects and risks from $^{222}Rn$ in drinking water: Health Physics, vol. 48, no.5, p. 649-670.

Earth Data Incorporated, 1995, MDE Wellhead Protection Fracture Trace Study: Delineation of Wellhead Protection Areas using Fracture Trace Analysis for Thurmont, Maryland, 13 pp.

MDE, Public Drinking Water Program, 1996, A Wellhead Protection Plan for the Town of Thurmont, 10 p.

MDE, Water Supply Program, 1999, Maryland's Source Water Assessment Plan, 36 p.

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

Nutter, L.J., 1973, Hydrogeology of the Carbonate Rocks, Frederick and Hagerstown Valleys, Maryland: Maryland Geological Survey Report of Investigations No. 19, 70 pp.

Steinfort, Duvall et al., 1993, Findings of an Investigation of Surface Water Influence from Hunting Creek on Thurmont's Municipal Wells 3 and 4, as Determined Using Flourometric Methods and Streamflow Discharge, MDE Compliance Monitoring Division and Water Quality Monitoring Program Internal Report, 10 pp.

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 Nos. FR69G021 and FR88G004
Public Water Supply Inspection Reports
MDE Water Supply Program Oracle® Database

MDE Waste Management Sites Database
Department of Natural Resources Digital Orthophoto Quarter Quadrangles for Blue Ridge Summit SE and Catoctin Furnace NE
USGS Topographic 7.5 Minute Quadrangles Blue Ridge Summit and Catoctin Furnace
Maryland Office of Planning 1997 Frederick County Land Use Map
Maryland Office of Planning 1996 Frederick County Sewer Map

**FIGURES**

(found in pocket)

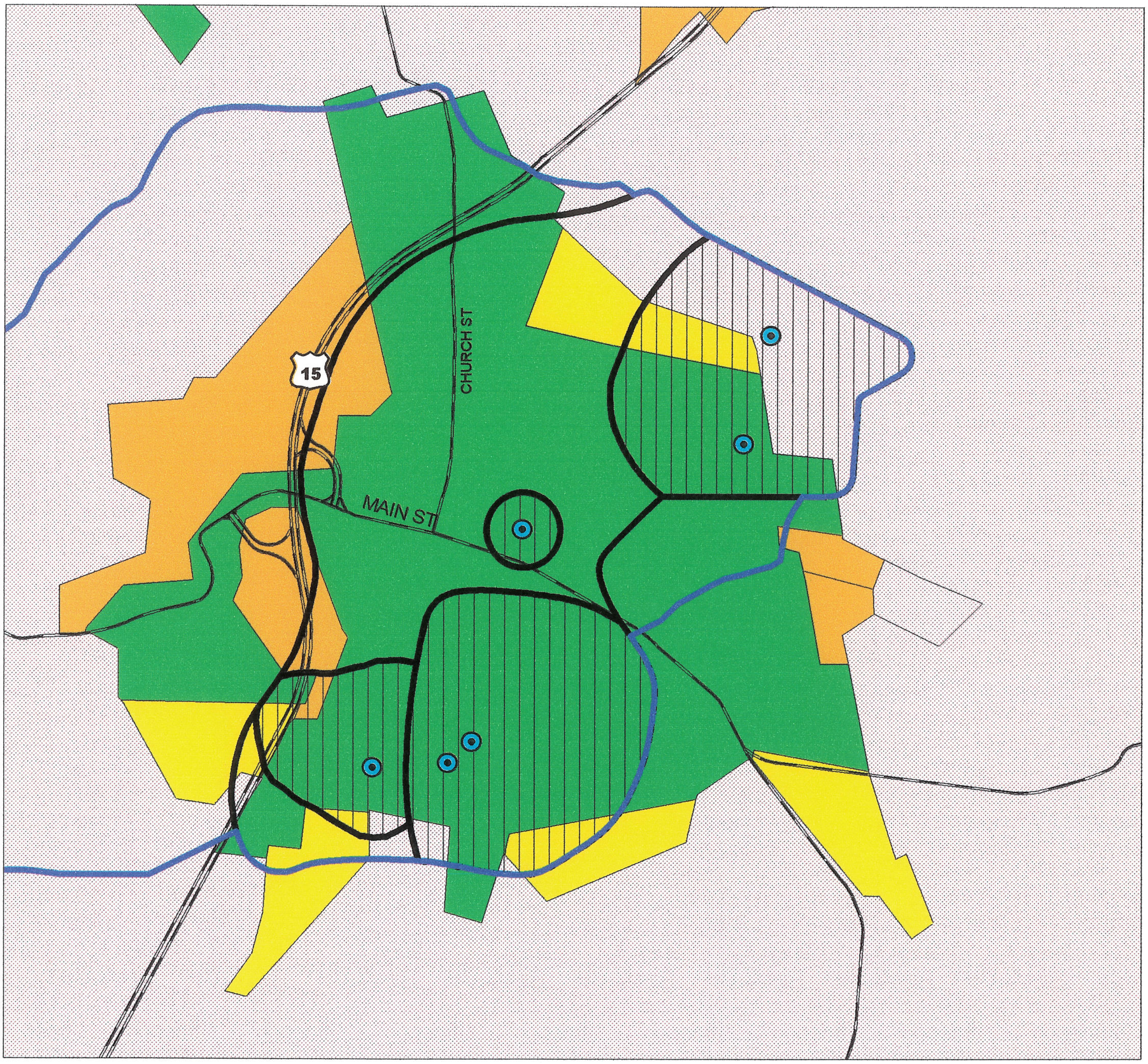
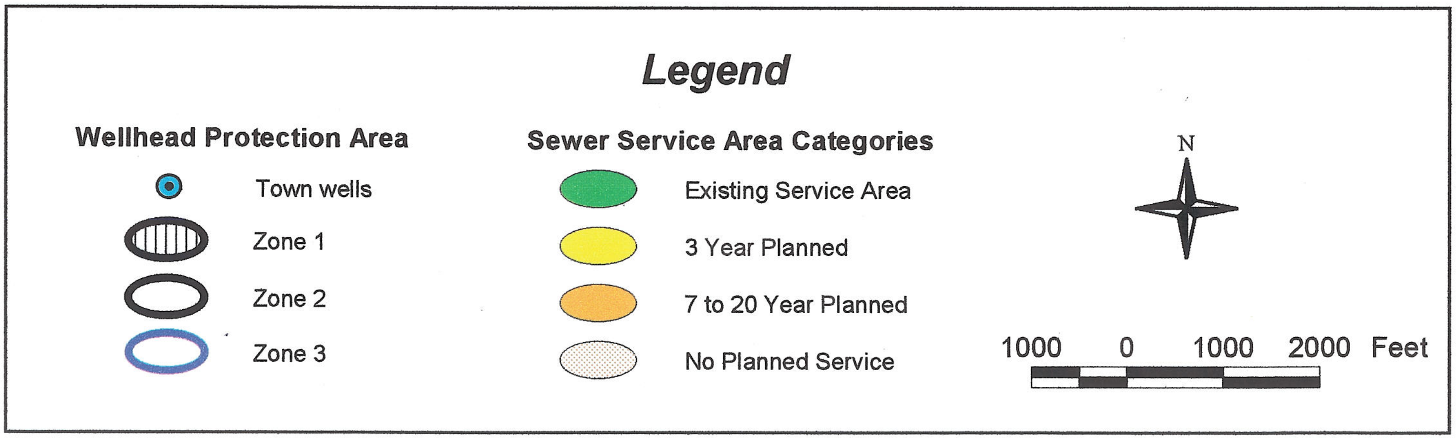



***Figure 4. Sewer Service Area Map of Thurmont Wellhead Protection Area***



## *Figure 2. Thurmont Wellhead Protection Area with Potential Contamination Sites*

### *Legend*

- Town wells
- Fracture Trace

**Wellhead Protection Area**

- Zone 1
- Zone 2
- Zone 3

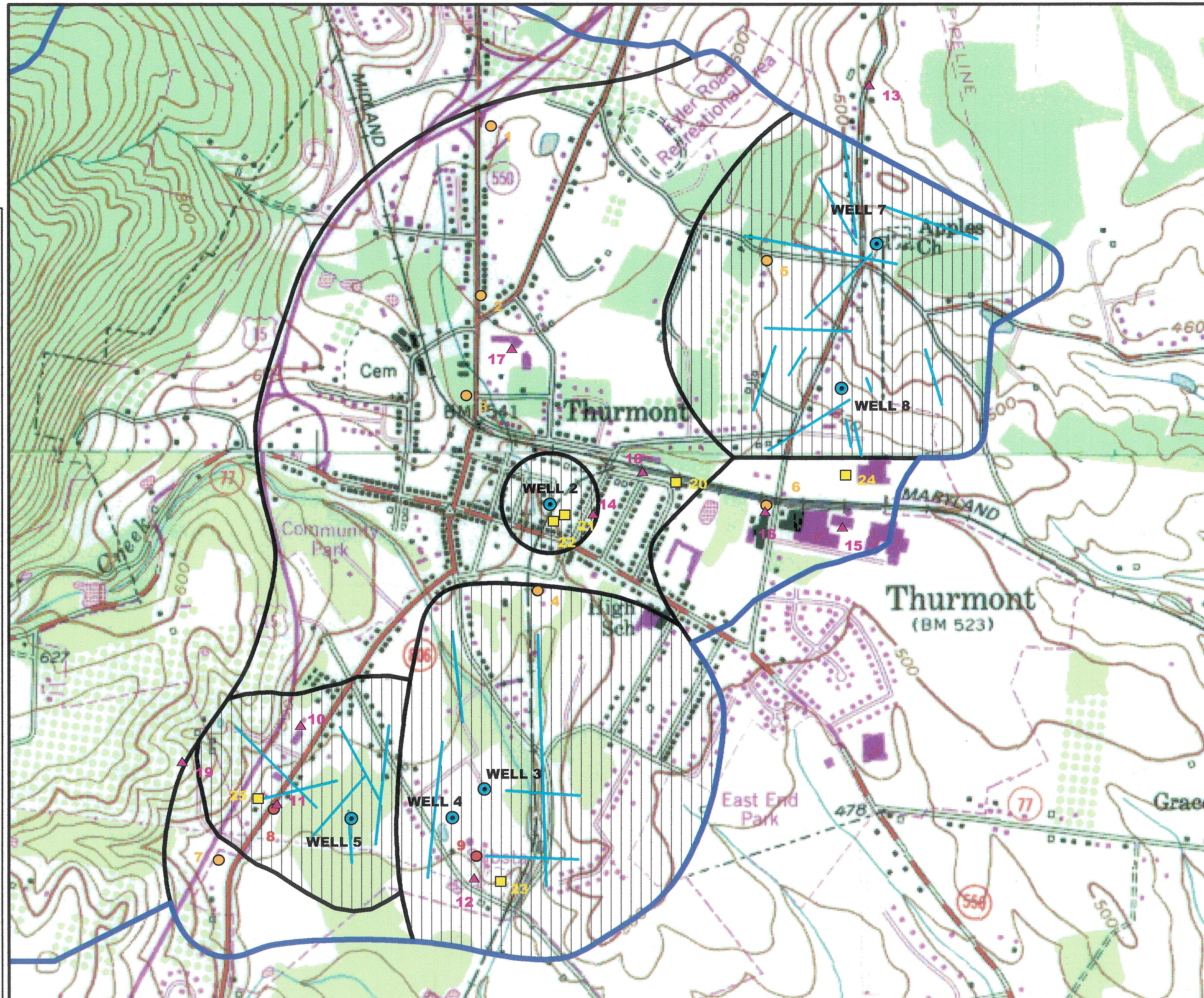
**Potential Contamination Sites**

- 1 Underground Storage Tank (UST)
- 8 Leaking UST
- 10 Hazardous Waster Generators
- 20 Miscellaneous

500 0 500 1000 Feet

N

Base Map: USGS Topographic 7.5 Minute Quadrangles - Blue Ridge Summit,Catoctin Furnace



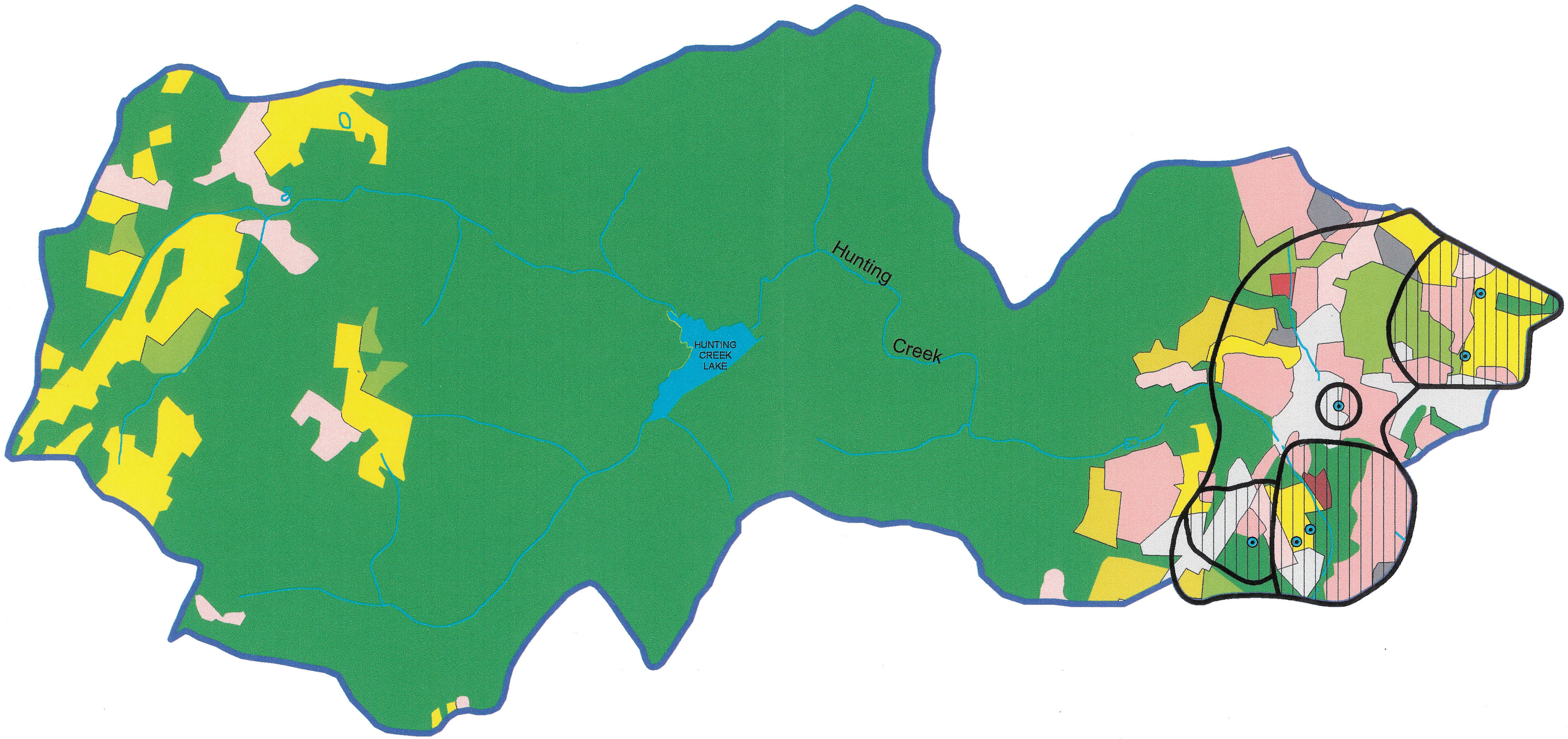



***Figure 3. Land Use Map of Thurmont Wellhead Protection Area***

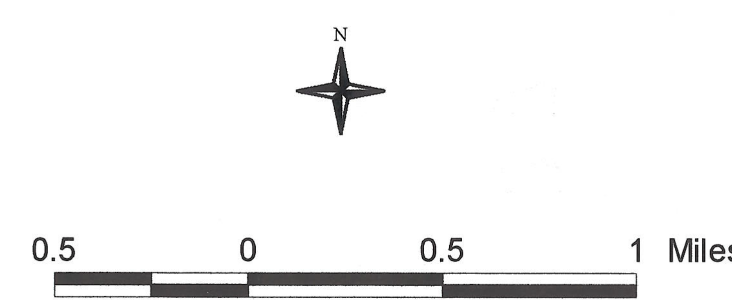
***Legend***

**Wellhead Protection Area**

- Town Wells
- Zone 1
- Zone 2
- Zone 3

**Land Use Categories**

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Industrial
- Open Urban Land
- Cropland
- Pasture
- Orchards
- Forest
- Water




Source: MD Office of Planning 1997 Land Use