SOURCE WATER ASSESSMENT

Eight Ground Water Community Water Systems

For Allegany County, Maryland

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SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for the eight community water systems in Allegany County using ground water. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of areas that contribute water to each source, 2) identification of potential sources of contamination within the areas, and 3) determination of the susceptibility of each water supply to contamination. Recommendations for protecting the drinking water supplies conclude this report.

The ground water sources of the community water systems in this report are unconfined fractured-rock aquifers of the Appalachian Plateaus, and Valley and Ridge physiographic provinces. The eight community water systems included in this report are currently using 27 wells and 7 springs that draw from the Conemaugh, Mauch Chunk, Greenbrier, Pocono, Jennings, Oriskany, and Rose Hill Formations respectively. The Source Water Protection areas were delineated by the WSP using EPA approved methods specifically designed for these sources.

Potential point sources of contamination were identified within the assessment areas from field inspections, and contaminant inventory databases. The Maryland Office of Planning's 2002 Land Use and Sewerage Coverage Maps for Allegany and Garrett Counties were used to identify potential non-point sources of contamination. Well and spring information and water quality data were also reviewed. Sources drawing from unconfined aquifers are generally vulnerable to any activity on the land surface that occurs within the respective source water protection areas. Therefore, managing these areas to minimize the risk to the aquifers and continued routine monitoring of contaminants is essential in assuring a safe drinking water supply. Figures showing land use, sewer service, potential contaminant sources within and near the Source Water Protection areas, and aerial photographs of well and spring locations are enclosed at the end of the report.

The susceptibility analysis is based on a review of the existing water quality data for each water system, the presence of potential sources of contamination in the individual assessment areas, well and spring integrity, and aquifer characteristics. It was determined that two of the water systems are susceptible to volatile organic compounds, and four systems are susceptible to microbiological contaminants. Five of the systems are susceptible to naturally occurring iron and/or manganese. Should the EPA adopt a drinking water standard for radon-222, three systems may also be susceptible to this naturally occurring contaminant. The eight systems in this report were determined not susceptible to regulated inorganic compounds including nitrate, and synthetic organic compounds.

INTRODUCTION

The Water Supply Program has conducted Source Water Assessments for the eight community water systems in Allegany County using ground water for their drinking water source. Allegany County is located in the northwestern part of the State and is bounded by Pennsylvania to the north, the Potomac River and West Virginia to the south and southeast, Washington County to the east, and Garrett County to the west (Figure 1). Based on July 2001 data, the total population of Allegany County is 69,300 persons (MD Assoc. of Counties, 2001/2002). The eight community systems serve an estimated population of 6778 residents with 2916 service connections (Table 11), while the remaining residents in the county obtain their water supply from surface water sources, and individual wells and springs. The systems include the residential communities of Barrelville, Midlothian, Mount Savage, and Reckley Spring, the LaVale water system serving both residential and commercial customers, operated by a local governmental agency known as the LaVale Sanitary Commission, a privately owned mobile home park, a privately owned school, and the State owned Green Ridge Boys Camp. Five of these community systems are considered "small systems," defined in Maryland's Source Water Assessment Plan (MDE, 1999) as a water system that has a ground water appropriation permit of less than 10,000 gallons average daily use. Reckley Spring does not have a water appropriation permit to date, but is also considered a "small" community water system based on its estimated population served. The other three systems use an average of greater than 10,000 gallons per day (gpd), and are therefore referred to as "large" community water systems (MDE, 1999).

The eight community systems obtain their water supply from wells and/or springs in unconfined fractured rock aquifers (Table 1). Note that two-thirds of the water used by the LaVale water system is purchased and supplied by the City of Cumberland's Surface Water Treatment Plant. Four production wells and two springs supply the remaining one-third of their water supply. As shown in Figure 1, Allegany County lies within two physiographic provinces. Three of the water systems are in the Appalachian Plateaus province (also referred to as the Allegheny Plateaus in Maryland), and the remaining five systems are in the Valley and Ridge province (Figure 1). From east to west, the Valley and Ridge province extends from South Mountain in Washington County to Dans Mountain in Allegany County. The Allegheny Plateaus extend westward from Dans Mountain throughout Garrett County. Two SWAP regions were identified for this assessment based on the two physiographic provinces and their respective geologic formations.

SOURCE INFORMATION

Source information for each system was obtained from the Water Supply Program's database, site visits, well completion reports, sanitary survey inspection reports, and published reports. A total of twenty-seven wells and seven springs are used by the eight systems assessed in this report. Fifteen of the wells were drilled after 1973 and should comply with Maryland's well construction regulations for grouting and casing. A review of the available well completion report data indicates that two other wells drilled in 1970 and 1972 were also grouted around their respective casings. Ten wells that were drilled prior to 1973 when current regulations went into effect may not meet the current construction standards. Well completion report data was not available for eight of the wells. Table 1 contains a summary of the source information for each of the community water systems assessed in this report. It must be noted that Mount Savage Plants 4 and 5 are now inactive. Plants 1, 2, 3, and 6 only are used to supply this water system. The Winebrenner Run Surface Water Plant 1 at Midlothian is also inactive. The system now uses ground water only from two wells treated at Plant 2 for their drinking water supply. The remaining community water systems from this report also use one plant only to treat their ground water prior to distribution (Table 5). As shown in Table 1, the Mount Savage Robison Well 1 and Walsh Meadows Well, and the Rocky Gap Mobile Home Park Well 2 were all deepened from their original completion depths.

Based on site surveys, the supply wells are generally in good to fair condition. Some of the older wells should have a two-piece well cap installed to prevent contamination from insects through unscreened vents and electrical conduits. Additionally, the casings of the older wells should be inspected for possible integrity issues. In addition to unused Well 5 at LaVale, and the unused, collapsed Robison Well 1A at Mount Savage that were both field located, the Public Drinking Water Information System (PDWIS) database indicates another unused well at LaVale, and six additional unused wells at the Mount Savage water systems respectively. Unused wells that are not exercised regularly, have no pumps, or that are no longer connected to the system may provide a direct pathway for ground water contamination to the aquifers. These wells should be properly abandoned and sealed by a licensed well driller according to the current State regulations.

The casings of LaVale Wells 1 – 3 terminate at or near ground surface, and all of the LaVale wells are within 100 feet or less of Braddock Run (Figures 2c & 3c). Wells cased at or below ground surface are more likely to be subject to flooding during heavy rains. This may allow contaminated surface water to enter through or around the casings and ultimately reach the aquifer. The age of these wells is unknown, and there is no record of their construction. However, Wells 1 – 4 are located inside well houses, which may help to protect them from storm water runoff. The two wells used by the Midlothian water system are also inside enclosed block-wall structures (Appendix A). The Barrelville Wells are located about 80 feet northeast of an unnamed stream (Figures 2d & 3d). Well 1 is located inside a well house with casing extending through its roof to about 10 feet above ground surface (Appendix A). Well 2 is located outside, and its casing extends only to about 8 inches above ground surface. The age of Well 1 is unknown, and Well 2 was drilled in 1954 with a completion report indicating no record of a grout seal around its casing. Similarly, the Castle Hill and Lancaster wells located inside well houses at Mount Savage were drilled in 1957, and 1963, and the age of two others is unknown (Table 1). All of these wells may have integrity issues due to their age and construction, and therefore could be more susceptible to contamination. Also, the Mount Savage Old Row and Lancaster Wells are located within about 40 feet of unnamed streams that drain into Jennings Run (Figure 3b).

LaVale's Laber Spring 1 is located in a springhouse on an adjacent homeowners property to the northwest of the LaVale Water Treatment Plant (Figure 2c & Appendix A). The spring could not be accessed during the site visit due to a dispute with the homeowner over the Sanitary Commission's attempts to gain control of the property in the area of the spring. According to a Maryland Geological Survey Investigation (Otton & Hilleary, 1985), its most recent improvements are a spring pit with protective cover. Attempts to locate Laber Spring 2 during the site survey on 2/17/05 were unsuccessful. It is possible that the spring was buried during the construction of a storm water management pond serving new commercial development to the north of MD Alternate Route 40. The location of the spring was determined from the LaVale system operator's recollection of its whereabouts (Figure 2c).

Nine production wells, and four springs at four active plants supply water to the Mount Savage Water System (Table 1 & Figure 2b). With two exceptions, the water collected from these wells and springs is fed into cisterns of varying capacities at each plant prior to distribution. The water pumped from the Old Row and Lancaster Wells is pumped directly into the Main Line distribution without first going to the Plant 2 cistern. All of the wells and springs are low yielding (approximately 6-8 gallons per minute), and therefore quantity issues are common during low flow conditions. The spring water is collected in underground concrete vaults (Appendix A) or wooden enclosed collection boxes constructed with roofs. The collection boxes and vaults have lids (or roofs) to help prevent the entrance of surface drainage or debris from entering the spring basins. However, they are not fully sealed to protect the sources from all surficial contaminants and pests. Also, contaminants from storm water runoff could get into the vault through cracks in the concrete walls (Appendix A). Additionally, there is no drainage ditches upgradient of any of the springs to re-direct surface water away from the sources.

Ground water from Reckley Spring is collected in a 5000-gallon underground concrete collection box with access hatch (Appendix A). The water used by the residents connected to the system flows into the treatment plant where it is disinfected prior to distribution (Figure 2e). The remaining spring water bypasses the treatment plant and flows into an overflow collection trough used by passers-by to collect raw untreated water directly from the spring source (Appendix A). A culvert was constructed to the west of Brice Hollow Road to re-direct surface water away from the spring. However, it may not be adequate to prevent sediment and runoff from a nearby mud bog from entering the spring during heavy storm conditions (Appendix A). The spring overflow is screened, and the spillway is caged thereby helping to prevent contamination from flowing back into the plant. The overflow also has a gravel bed drain apron to prevent soil erosion from its discharge (Appendix A).

Daily use, and month of maximum use averages reported from 1994 - 2004 indicate that the LaVale, Midlothian, and Mount Savage "large" community water systems are all within the allocated Water Appropriation Permit limits.

HYDROGEOLOGY

About 79% of the Allegany County land area lies within the Valley and Ridge physiographic province and the remaining 21% is in the Appalachian Plateaus province (Figure 1). The two provinces are similar in that all of the rock types are sedimentary, and the formations have been folded, uplifted, or plunged forming synclines and anticlines (Schmidt Jr., 1993). Ridges and valleys are formed as a result of the degree of weathering of the sedimentary rocks. Sandstones are fairly resistant to weathering and typically form the ridges while shales, siltstones, and limestones are generally nonresistant, and typically outcrop in the valleys. The differences in the two provinces are that the folds are much tighter in the Valley and Ridge province, thereby forming narrower ridges and valleys, whereas they are gentler and broader in the Appalachian Plateaus region. Also, some formations throughout the Valley and Ridge province are faulted, which is not a common structural feature in the Appalachian Plateaus province (Schmidt, Jr. 1993).

Appalachian Plateaus Province

The ridge that forms the summits of Dans, Piney, and Little Allegheny Mountains in Western Allegany County is known as the Allegheny front. This ridge is the eastern boundary of the Appalachian Plateaus Province in Maryland (Figure 1). The rock units in this region are folded into broad anticlines and synclines that trend northeast to southwest, and that are deeply dissected in some areas (Bolton, 1996). In Allegany County, the province is underlain by rock formations of Mississippian, Pennsylvanian, and Permian age (Geologic Map of Allegany County, 1956). The rock types are sedimentary in nature, and consist of sandstones, siltstones, shales, conglomerates, limestone, and coal. The province has steeply dipping beds on the eastern flank, and horizontal beds near its center (Slaughter & Darling, 1962). Most of the rocks are well consolidated with low porosity. Ground water moves through secondary openings such as solution cavities, channels, fractures, and bedding planes and is usually in the direction of the slope of the hydraulic gradient (Slaughter & Darling, 1962). A thin layer of weathered rock and soil known as regolith overlies the bedrock. In general, the ground water table is in the regolith material in the valleys, and in the hard bedrock in the ridges (Bolton, 1996).

The wells and springs for the three community systems in this physiographic province (Figure 1) draw water from the Conemaugh Formation of Pennsylvanian age The Conemaugh Formation is composed of interbedded clayey limestone, claystone, shale, siltstone, and coal. The Formation overlies the top of the Upper Freeport Coal, and is under the base of the Pittsburgh Coal (Geologic Map of Allegany County, 1956).

Valley and Ridge Province

The Valley and Ridge Province extends from the Allegheny Front eastward throughout the remainder of Allegany County to South Mountain in Washington County (Figure 1). The province is divided into two sub-regions. The western sub-region includes the remaining areas of Allegany County of interest in this report, and extends eastward to Hancock in Washington County. The eastern sub-region extends further east from Hancock to South Mountain, and is known as the Hagerstown Valley that is part of a regional geomorphic feature known as the Great Valley (Bolton, 1996). The western sub-region consists of a series of closely spaced ridges and narrow valleys whose rock structure consists of anticlines and synclines that trend northeast to southwest. The ridges were formed from folded and faulted clastic (fragmented) and carbonate rocks of Ordivician to Mississippian age. As in the rocks of the Appalachian Plateau region, ground water flows primarily by secondary porosity through secondary openings such as solution cavities, channels, fractures, and bedding planes and is usually in the direction of the slope of the hydraulic gradient.

The wells and springs for the five remaining community systems in this physiographic province (Figure 1) draw water from the Mauch Chunk, Greenbrier, and Pocono Formations of Mississippian age, the Jennings Formation and Oriskany Group of Devonian age, and the Rose Hill Formation of Silurian age respectively. From youngest to oldest, the Mauch Chunk Formation is a reddish shale or mudstone and red, brown, or gray crossbedded, weathered sandstone. The Greenbrier formation is a gray crossbedded to interbedded limestone with reddish shale, mudstone, and sandstone. The Pocono Formation is composed of gray, white, tan, and brown crossbedded and locally conglomeratic sandstone with interbedded gray and reddish-brown shale, mudstone, and siltstone. The Jennings Formation includes dark-gray to black platy shale at the base, olive-gray platy shales, and interbedded siltstones in the middle, and interbedded siltstones, and conglomeratic sandstones at the top. The Oriskany Formation consists of highly calcareous, fossiliferous cherty siltstone in the lower part, and calcareous, fossiliferous, coarse-grained, locally conglomeratic sandstone in the upper part. And lastly, the Rose Hill Formation is composed of olive-gray to pink shale with interbedded, thin sandstone layers (Geologic Map of Allegany County, 1956).

The source of ground water in Allegany County is from precipitation from rainfall or snowmelt that infiltrates into the subsurface. The availability of ground water in the sedimentary bedrock depends on the lithology of the rock, the permeability of the substrate, and the presence or absence of secondary openings from fracturing and weathering. An aquifer is defined as any water-bearing formation of permeable material that will yield water in a usable quantity to a well or spring (Heath, 1983). Ground water flow in this region is predicated by the geology. The various spring types common in these two physiographic provinces exemplifies this point. A spring is a concentrated discharge of ground water issuing from a defined opening at the land surface (Otton & Hilleary, 1985). As depicted in Appendix B, springs may occur at the contact between two different rock types of differing permeabilities, or where ground water moving through fractures and joints in the rock emerges at a major fracture zone intercepting the land surface. In the Valley and Ridge province, water moving downward through a permeable formation may encounter a less permeable fault plane that intersects the land, thus redirecting the ground water flow onto the surface. Shallow ground water flow along steep mountainsides may reach the surface at a change in slope, referred to as a scree spring. And finally, springs may occur in limestone formations where percolating ground water causes the dissolution of carbonate minerals that enlarge fractures, joint openings, and bedding planes thus increasing the storage and movement of ground water through the aquifer. When these fractures, joints, and bedding planes reach the ground surface, a spring is formed (Otton & Hilleary, 1985).

Source Water Assessment Area Delineations

For ground water systems, a Source Water Protection Area (SWPA) is considered to be the assessment area for the system. The SWPAs for the eight community water systems in this report were delineated by MDE based on the methodology described in Maryland's Source Water Assessment Plan (MDE, 1999). Ground water flow in unconfined consolidated clastic rock aquifers is complex and cannot be accurately modeled by a homogeneous analytical model. Consistent with the recommended delineations in the Maryland Plan, "large" water systems were delineated by hydrogeologic mapping of the watershed drainage area that contributes ground water to the supply wells or springs. The delineation area accounted for ground water drainage divides from natural streams, topography, significant land features, and a conservative calculation of total ground water recharge during a drought. The Midlothian, Mount Savage, and LaVale SWPAs were delineated by this method.

The Midlothian SWPA is bullet-head shaped, and has an area of 247.2 acres (Figure 3a). Two areas were delineated for the Mount Savage water system since they have numerous sources located in separate watersheds. Area 1 located near the center of the community is arrowhead shaped and has a total area of 234.8 acres. Area 2 to the northeast is irregularly shaped with an area of 116.7 acres (Figure 3b). The LaVale Zone 1 SWPA is also irregularly shaped and has a total area of 742.2 acres (Figure 3c). Note that Laber Spring 2 is at the contact between the Mauch Chunk Formation and the Greenbrier Formation. The source of the spring water comes from the younger Mauch Chunk Formation that outcrops to the west and at a higher elevation than the underlying Greenbrier Formation (Appendix B). A second zone was delineated for the LaVale system since it is suspected that the two Laber springs, and Wells 1-3 are ground water under the direct influence of surface water (GWUDI). A detailed tracer/dye study was not conducted to confirm if and what surface water body is responsible for the persistent total and fecal coliform detections at these sources (Table 8). It is assumed that Braddock Run is the most likely transporter of bacteria since it is the closest and largest surface water body in proximity to the impacted sources (Figure 3c). Therefore, the entire Braddock Run watershed was delineated as a Zone 2 SWPA to take into account all potential contaminants that could discharge into Braddock Run and ultimately reach their affected springs and wells (Figure 3c). LaVale currently filters their water prior to distribution to remove disease-causing microorganisms such as *Giardia* or *Cryptosporidium*, and other particulates that may be present in surface water (Table 5). The LaVale Zone 2 SWPA is 5202.7 acres.

In addition to the above, the annual average recharge needed to supply the sources was also calculated for each of the "large" systems. A drought condition recharge value of 400 gpd per acre (or approximately 5.4 inches per year) was used to estimate the total ground water contribution area required to supply each source. The current Water Appropriation Permits for Midlothian, Mount Savage, and LaVale is for average daily withdrawals of 50,000, 41,000, and 500,000 gallons respectively (Table 1). The total ground water contribution areas were calculated from the following equation:

Recharge Area (acre) = Average Use (gpd) / Drought Condition Recharge (gpd/acre)

From the above equation, the total ground water contributing areas during a drought are approximately 125 acres at Midlothian, 102.5 acres at Mount Savage, and 1250 acres at LaVale respectively. The delineated SWPAs of 247.2 acres at Midlothian, and Mount Savage's 234.8 acres for Area 1, and 116.7 acres for Area 2 are therefore more than adequate to meet the average daily ground water usage during a drought. The LaVale Zone 1 SWPA is 742.2 acres, which is only 59.4% of the 1250 acres recharge necessary to support the system's permitted daily average demand of 500,000 gpd during drought conditions. This may explain why LaVale Wells 1-4 operate at 24 hours per day, and that two-thirds of the water used by the LaVale water system must be supplied by the City of Cumberland in order to meet their daily demand. The SWPA for Midlothian indicates a generalized ground water flow direction toward the southeast (Figure 3a). Ground water flow at the Mount Savage SWPA 1 is inferred to be toward the northeast, and SWPA 2 is toward the south (Figure 3b). The three generalized ground water flow directions inferred for the LaVale Zone 1 SWPA are toward the southeast, southwest, and northeast respectively (Figure 3c).

Reckley Spring is located at the contact between the permeable Oriskany Sandstone and the less permeable (and younger) Romney Shale both of Devonian Age. A geologic cross-section of the area near the spring indicates that the younger, less resistant Romney Shale weathered through time thereby forming Brice Hollow between the two more resistant sandstone ridges; Collier Mountain to the northwest, and Martin Mountain to the southeast (Appendix B). Brice Hollow is within a folded syncline between the Collier and Martin Mountain ridges. The weathering of the overlying Romney shale exposed the older Oriskany Sandstone at the two synclinal contacts, one to the northwest side along Collier Mountain, and one to the southeast side along Martin Mountain. The source of the spring water comes from ground water flowing through the permeable Oriskany Sandstone exposed at the ground surface of the two contacts; one on the Collier Mountain side, and one on the Martin Mountain side both trending from northeast to southwest (Figure 3e). Brice Hollow Run flows to the southwest along the eroded Romney Shale "cap" Formation between the two mountains. The delineated Reckley Spring SWPA includes the Oriskany Sandstone Formation at its contacts with the Romney Shale Formation along Collier and Martin Mountains extended in the upgradient direction to the northeast (Figure 3e).

The Reckley Spring system does not have a State Water Appropriation and Use Permit. Based on a residential population estimate of 78, and an average useage per person of 80 gallons per day (gpd), the daily average withdrawal is estimated to be 6300 gpd, with a month of maximum use average withdrawal of about 10,500 gpd. Based on flow measurements conducted from 1990-1992 by the MD Geological Survey, Reckley Spring discharges at a maximum rate of 40 gallons per minute (gpm), or 57,600 gpd (Bolton, 1996). Using the recharge area calculation from above, the total ground water contributing areas during a drought is approximately 144 acres. The delineated SWPA for Reckley Spring oriented in the upgradient direction is about 250 acres, which will provide an available recharge of 100,000 gpd, and is therefore more than adequate to meet the average daily ground water usage during a drought. The SWPA for Reckley Spring indicates a generalized ground water flow direction toward the southwest from Collier and Martin Mountains respectively (Figure 3e).

As defined in Maryland's SWAP, source water protection areas for "small" public water systems using an average of less than 10,000 gallons per day (gpd), in unconfined fractured-rock aquifers is a fixed radius of 1,000 feet around each well. The radius is based on calculating the land area needed to provide a yield of 10,000 gpd assuming a 400 gpd per acre recharge rate (drought year recharge conditions) and a safety factor. This methodology was used for delineating the Barrelville, Rocky Gap Mobile Home Park, New Dominion School, and Green Ridge Boys Camp SWPAs. Each community water system uses multiple wells that are closely spaced, and that withdrawal from the same aquifer at their respective locations. Since the delineated radial areas around each system's wells overlap, they were combined to form one larger SWPA at each "small" community water system (Figures 3d, 3f, 3g, & 3h). These protection areas are 75.5, 79.7, 90.9, and 76.2 acres respectively.

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, controlled hazardous substance generators, landfills, mining discharge permitted sites, and known ground water contamination sites. These sites are generally associated with commercial or industrial facilities that use or store chemical substances that may, if inappropriately handled, contaminate ground water via a discrete point location. Non-point sources of contamination are associated with certain types of land use practices such as the use of pesticides, application of fertilizers, animal wastes, sludge, or septic systems all that may lead to ground water contamination over a larger area.

The WSP met with the Mount Savage, LaVale, and New Dominion School operators on February 17 2005 to discuss water quality concerns, and to observe the integrity of their sources. Also, field surveys of the eight community water systems in this report were completed from February 17 –19, 2005 in order to collect data regarding the locations and integrity of the wells and springs using Global Positioning System (GPS) equipment. Windshield surveys were also conducted using this GPS equipment to locate and map potential sources of contamination within and near the SWPAs.

Point Sources

A review of MDE contaminant databases as well as the field surveys revealed some potential point sources of contamination within and near the Midlothian, Mount Savage, LaVale, and Green Ridge Boys Camp SWPAs respectively. Facilities that have underground storage tanks (USTs), those classified as controlled hazardous substance generators (CHS), sites with mining surface water discharge permits (MSWDP), and sanitary waste landfill sites (SWLF) with known or possible ground water contamination issues are located within or near the LaVale SWPA Zones 1 and 2 (Figure 3c). MSWDP sites are also located near the Midlothian SWPA (Figure 3a). Heating oil and gasoline USTs are in use at the Green Ridge Boys Camp property (Figure 3h). Additionally, miscellaneous sites (MISC) such as auto-body and repair shops, former gas stations, an animal hospital, a lumber company, and other related facilities that handle, use, or store chemicals are shown on Figures 3b and 3c. The Hoffman Tunnel, which continually discharges large quantities of abandoned mine ground water into Braddock Run, is also listed as a miscellaneous site (Appendix A & Figure 3c). Abandoned mine drainage poses a potential contamination threat to the Midlothian, Mount Savage, LaVale, and Barrelville sources as shown on the topographic maps for these systems (Figures 3a-3d). Table 2 lists the facilities identified and their potential types of contaminants. The contaminants are based on generalized categories and often the potential contaminant depends on the specific chemicals and processes being used or which had been used at the facility. The potential contaminants are not limited to those listed. Potential contaminants are grouped as Volatile Organic Compounds (VOC), Synthetic Organic Compounds (SOC), Metals (M), Heavy Metals (HM), Nitrate/Nitrite (NN), and Microbiological Pathogens (MP).

Inspections of facilities located within and near the SWPAs are to be completed by MDE staff to determine the potential of any unpermitted ground water discharges (e.g. open floor drains) to the unconfined aquifers. No violations have been reported to date.

Ten mining surface water discharge permits were issued to coal companies located within or near the Midlothian and LaVale Zone 2 SWPAs, respectively. The facilities are shown on Figures 3a, and 3c and listed in Table 2. Database summaries of these permits are found in Appendix C. The reader may contact the MDE Mining Program for detailed information regarding these permits.

The MDE Oil Control Program reported two open cases within or near the Midlothian and Green Ridge Boys Camp SWPAs respectively. A brief summary of these cases can be found in Appendix D. The issues discussed are minor, and should not pose any ground water threats to the sources. The reader may contact the Oil Control Program for additional information.

Three landfills have been identified as having known or potential ground water contamination concerns within or near the LaVale Zone 2 source water protection area. The sites are listed in Table 2, and the locations are mapped in Figure 3c. The three sites are all located on former coal strip-mined areas. The Hoffman and Vale Summit I landfills are now inactive. However, contaminated ground water from the Hoffman Landfill may still be draining into Hoffman Tunnel which discharges into Braddock Run. The Mountainview Landfill is the only commercial municipal landfill currently operating in Maryland. Appendix E provides general site information and fact sheets for each of these sites. The reader may contact the specific programs within the MDE Waste and

Water Management Administrations for additional information on any of the potential contaminant sites described in this report.

Other sources that may potentially contaminate the ground water supplies include unregulated residential heating oil USTs, stormwater and sediment runoff into springs and unsealed wells, surface water overflows during flooding events, and roads that go through the SWPAs. Roads are a concern in the event of chemical or petroleum spills, and runoff from the over-application of deicing compounds used for snow removal.

Non-Point Sources

The Maryland Office of Planning's 2002 digital land use map for Allegany County was used to determine the predominant types of land use in the SWPAs (Figures 4a-4h). The breakdown of land use types is shown on Tables 3a-3i. Note that forested land makes up the largest percentage of the source water protection areas for the eight systems in this report. Residential areas make up the second largest portion of land use in five of the SWPAs, whereas commercial, pasture, and open urban lands are second most in three other delineated protection areas (Tables 3b-3i).

Agricultural land use such as croplands, pasture, feeding operations, and orchards is commonly associated with nitrate loading of ground water and also represents a potential source of SOCs depending on farming practices and use of pesticides. During the field survey, it was observed that the Mount Savage Robison Spring and Wells are located in a cow pasture. Residential septic systems may present a source of nitrate or microbial pathogens. Additionally, residential areas may be a source of nitrate or SOCs depending on gardening and lawn care practices.

The Maryland Office of Planning's 2002 Allegany County Sewerage coverage map indicates that the Midlothian, Reckley Spring, Rocky Gap Mobile Home Park, and New Dominion School systems are in areas of the county with no planned sewer service. The remaining four systems have portions of their SWPAs in existing service areas (including areas under construction) and areas in the final planning stages (Figures 5a-5d). The breakdown of sewerage coverages in the Mount Savage, LaVale, Barrelville, and Green Ridge Boys Camp SWPAs are shown on Tables 4a-4e. Areas with no planned sewer service are primarily in forested, agricultural, or open urban lands when compared with the 2002 designated land use maps (Figures 4a-4h & 5a-5d). Also note that 68.5% of the LaVale Zone 2 SWPA is in existing or planned service areas, while Zone 1 has public sewerage in only 14.5% of its total area (Tables 4b-4c). This is because 93.5% of the Zone 1 SWPA is in forested areas on the mountain ridges to the northeast and southwest of its sources (Figures 3c & 4c).

Residential areas may be a source of nitrate loading to ground water through private septic systems. Commercial or industrial land uses without sewer service present a potential source of all types of contaminants if byproducts and wastes are not disposed of properly. Note that the Green Ridge Boys Camp has a surface water permit to discharge 8,000 gpd of treated wastewater from its treatment plant to a nearby stream.

Since their wells were determined not to be under the direct influence of surface water, these discharges should not impact the water quality of this system.

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, these assessments will describe the sources of such a contaminant and, if possible, locate the specific sources which are the cause of the elevated contaminant level. The data reported is from finished (treated) water unless otherwise noted. All of the systems in this report have water treatment. The methods currently used at each of the water treatment plants are summarized in Table 5.

A review of the monitoring data since 1993 indicates that the eight water supplies in this report meet the current drinking water standards with a few exceptions as detailed in the following paragraphs (Table 6). Tables 7a-7d provide a list of all detections above 50% of the respective or proposed MCLs. Results exceeding an MCL are shown in bold.

Inorganic Compounds (IOCs)

A review of the available data shows that arsenic and nitrate were the only IOCs detected above 50% of their respective MCLs (Table 7a). Arsenic was detected above the MCL in one raw water sample only in 2003 from the Barrelville Well 2 (Table 7a). It has not been detected again in three subsequent sampling events, nor has it ever been detected before from four previous data sets. The arsenic standard was lowered from 0.050 parts per million (ppm) to 0.010 ppm by the USEPA. Nitrate was detected above 50% of the MCL of 10 ppm in single samples collected at Midlothian, and Mount Savage Plant 1 in 2001 and 2004 respectively (Table 7a). The Midlothian sample appears to be anomalous, since nitrate was not detected in five previous, and four subsequent data sets. The most recent sample at Mount Savage Plant 1 also appears to be an anomaly since nitrate averaged 2.2 ppm from seven previous sampling events at this plant. Nitrate has also been consistently below the 5-ppm threshold at Mount Savage's other plants. Iron and manganese were detected at or above their secondary MCLs from single samples taken at the Barrelville, Midlothian, Mount Savage Plant 6, and Green Ridge Boys Camp systems respectively (Table 7b). No other regulated IOCs were detected at levels of concern for the eight community water systems.

Radionuclides

There is currently no MCL for Radon-222, however EPA has proposed an MCL of 300 picocuries per Liter (pCi/L) or an alternate of 4000 pCi/L for community water systems if the State has a program to address the more significant risk from radon in indoor air. Since an MCL has not been finalized, this report considers the lowest proposed MCL of 300 pCi/L in an effort to be more conservative and protective of public health. Radon-222 has been detected at levels above 50% of this more conservative proposed MCL in three of the seven community systems from this report that has tested for this contaminant (Table 7c). At four other systems, radon was either detected at levels well below the more conservative proposed MCL threshold, or not detected. Radon levels ranged between 45 – 855 pCi/L from the available sampling data. Midlothian has no data for radon-222. However, they have results for the other radionuclides. No other radiological contaminants were detected at levels of concern for the eight community water systems in this report.

Volatile Organic Compounds (VOCs)

No VOCs were detected at levels above 50% of their respective MCLs for any of the community water systems in this report. Three systems had VOCs detected at very low levels well below their respective MCLs. Total xylenes were detected at 1.6 parts per billion (ppb) from the latest VOC sample reported at LaVale in August 2004. However, there have never been any VOCs detected from 10 previous sampling events for this system. The MCL for total xylenes is 10,000 ppb. Reckley Spring had one detect each of total xylenes at 3 ppb in 1991 and trichloroethene (TCE) at 1 ppb in 1995, but these compounds have not been detected again in from 6 subsequent samples. The MCL for TCE is 5 ppb. Methylene chloride was detected in 1991, and again in 1995 at 1 ppb, but has not been detected again in five subsequent sampling events at Reckley Spring. The MCL for this compound is 5 ppb. The spring also had three detects of 1,1,1-trichloroethane at 0.8, 15, and 0.8 ppb, the first in1991 and the remaining two in 1995 respectively. It has not been detected again in five subsequent sampling events. The MCL for this VOC is 200 ppb. Green Ridge Boys Camp had one toluene detection of 1.1 ppb in 1999, but has not had any subsequent VOC detects from 7 rounds of sampling.

Disinfecton byproducts known as trihalomethanes (THMs) were detected periodically at low levels in sampling data at LaVale, Mount Savage, New Dominion School, Reckley Spring, and Green Ridge Boys Camp respectively. No THMs were detected from available sampling data for the remaining three systems in this report. The average sum totals of the four trihalomethanes (TTHM) detected ranged from 1.3 to 5.7 ppb for the five affected systems. The current MCL for TTHMs is 80 ppb. Disinfection byproducts are the result of a reaction between chlorine used for disinfection and organic material in the water supply. No VOCs were detected from available sampling data at Barrelville, Midlothian, and Rocky Gap Mobile Home Park respectively.

Synthetic Organic Compounds (SOCs)

Di(2-ethylhexyl phthalate) was the only SOC detected at levels above 50% of its MCL of 6 ppb (Table 7d). It was also detected at low levels in sampling results of seven of the eight systems in this report. However, phthalate was also detected in the laboratory blank samples accompanying all of these data sets, and therefore the results are not interpreted to represent actual water quality.

Dalapon was detected at 0.57 ppb from one set of available sampling data in 1999 at Reckley Spring, well below its respective MCL of 200 ppb. It was not detected again from the latest set of sampling conducted in 2002. Dalapon has been reported in many samples at very low levels across the state, and its reported detections may be an artifact of the testing procedure.

Silvex (also called 2,4,5-TP) was detected at 0.08 ppb from the latest set of sampling data in 1999 at Mount Savage Plants 4 and 5 (now inactive), and at 0.08 ppb in 2002 at Reckley Spring. The MCL for this SOC is 50 ppb. Reckley Spring also had one low-level detect of 2,4-D at 0.21 ppb from the same 2002 data set. The MCL for 2,4-D is 70 ppb. No other SOCs were detected from available sampling results for the eight community water systems.

Microbiological Contaminants

Raw water samples were collected and tested for bacteria to determine whether the sources are ground water under the influence of surface water (GWUDI). The seven springs, and ten production wells used by four of the community water systems were initially classified as high risk to surface water influence. The protocol for high risk GWUDI sampling requires two sets of rainfall event sampling to be collected as soon as possible after a minimum of 0.5 inches of rainfall in 24 hours has occurred, and two dry weather samples collected at least one month apart. A set is one sample per day for four consecutive days with a minimum of one month between each precipitation event. Five supply wells from three systems were initially classified as moderate risk to surface water influence. This sampling protocol requires one raw water sample to be collected as soon as possible after a minimum of 0.5 inches of rainfall in 24 hours has occurred. The remaining twelve production wells from four systems were initially classified as low risk to surface water influence, which requires one raw water bacteriological sample to be collected from each well at any time. The actual coliform concentrations in each sample were determined in the analyses (Table 8).

Based on the results shown on Table 8, LaVale Wells 1-3 and Laber Springs 1 and 2 are suspected to be GWUDI. As discussed earlier, a detailed tracer/dye study was not conducted to confirm if and what surface water body is responsible for the persistent total and fecal coliform detections at these sources. But it is believed that Braddock Run is the most likely bacteria transporter since it is the closest and largest surface water body in proximity to these sources (Figure 3c). The LaVale Sanitary Commission installed a filtration system at their plant for the control of disease-causing microorganisms such as *Giardia lamblia*, *Cryptosporidium*, *Legionella*, heterotrophic bacteria, turbidity, and other particulates (Table 5). It is also likely that the Mount Savage Crow and Robison Springs, the Castle Hill Well, and the Thurigh Well are also GWUDI based on field observations of these sources, the surrounding areas, and available test results (Table 8). Note from the Potential Sources of Contamination section that the Mount Savage Robison Spring and Wells are located in a cow pasture. No data is currently available to evaluate the Mount Savage Castle Hill Spring (Plant 1), Upper Crow Well (Plant 2), Robison Well 2 (Plant 3), and Walsh Meadows Spring (Plant 6).

Barrelville Well 1 was determined not to be GWUDI in 2004 despite the persistent positive coliform results in raw water samples (Table 8). Total coliform bacteria are ubiquitous in the natural environment and are indicators of a break in the integrity of the water source. Bacteria can enter a well or spring in a number of ways. Examples include a damaged well casing, an improperly sealed well cap that allows insect or rodent intrusion, a damaged or improperly sealed electrical conduit, a damaged or improperly installed pitless adapter, cracked piping, the absence of a grout seal around the well casing that may allow surface water influence, or an improperly screened air vent. Other examples include spring collection boxes that are not completely sealed, or that do not have adequate gasket seals around overflow pipes, access hatches, and lids, or that do not have an impermeable clay layer around its perimeter. The Mount Savage Robison Well 1 and the Lancaster and Walsh Meadows Wells, and Reckley Spring are other examples of "sensitive" sources that may not be GWUDI. Other sources determined not GWUDI based on field observations and test results include Barrelville Well 2, the Midlothian Wells, the Mount Savage Brick Row, and Old Row Wells, New Dominion School Well 3, and the Green Ridge Boys Camp and Rocky Gap Mobile Home Park Wells respectively. Reckley Spring was also determined not GWUDI based on the evaluation that the source of the spring water comes from ground water flowing through the permeable Oriskany Sandstone at its contact with the Romney Shale, and not from Brice Hollow Run (Appendix B & Figure 3e). The absence of fecal coliform in all of the wet weather results further supports this conclusion (Table 8).

The community systems also have monthly routine bacteriological samples that are collected as required by the Safe Drinking Water Act. Since all of the systems disinfect their water at their respective treatment plants prior to distribution, the finished water data is not indicative of the quality of raw water directly from the sources. Total coliform bacteria are not pathogenic, but are used as an indicator organism for other disease-causing microorganisms. Five systems had positive total coliform results in at least one sample, but several repeat samples were found to be free of total coliforms (Table 9). Since May 2002, none of these systems had any positive coliform detects in finished water. The remaining three community systems in this report have not had any positive total or fecal coliform results from any of the routine samples collected monthly since 1997 (Table 9).

SUSCEPTIBILITY ANALYSIS

The sources that supply the eight community systems in this report obtain water from unconfined fractured rock aquifers. Wells and springs drawing from unconfined aquifers are generally vulnerable to any activity on the land surface that occurs within the respective SWPAs. Therefore, managing these areas to minimize the risk to the aquifers and continued routine monitoring of contaminants is essential in assuring a safe drinking water supply. The susceptibility analysis of the water supplies to each group of contaminants has been completed based on the following criteria: (1) available water quality data, (2) presence of potential contaminant sources in and near the SWPAs, (3) aquifer characteristics, (4) source integrity, and (5) the likelihood of change to the natural conditions. Since the aquifer characteristics of the two physiographic provinces in Allegany County are analogous, it was unnecessary to conduct a separate susceptibility analysis for each SWAP region. Table 10 summarizes the susceptibility of the eight systems covered in this report to each group of contaminants.

Inorganic Compounds

Nitrate is not present in the ground water supplies of the eight community systems at levels of concern. Two single samples reported above the 50% MCL threshold of 10 ppm at Midlothian, and Mount Savage Plant 1 appear to be anomalous, since nitrate was neither detected in previous or subsequent data sets, or prior samples averaged well below levels of concern (Table 7a). Excluding these two samples, the average nitrate levels from the eight systems ranged from 0 to 2.5 ppm. Sources of nitrate can generally be traced back to land use. Fertilizer applied to agricultural fields, residential lawns, animal waste in pasturelands, and effluent from residential and commercial on-site septic systems are all non-point sources of nitrate in ground water. As shown in Tables 3a-3i, the predominant land use within the source water assessment areas is forested, which may account for the low nitrate levels in ground water for these systems. Though non-point sources of nitrate exist within the SWPAs of the eight systems as illustrated in the various land use and sewerage coverage maps and tables, they do not appear to pose a threat to the water supplies based on available sampling data. Therefore, the eight community systems are **not** susceptible to contamination by nitrate (Table 10).

Arsenic is a naturally occurring element that was detected in one raw water sample from Barrelville Well 2 at 0.018 ppm (Table 7a). EPA lowered the MCL for arsenic from 0.050 ppm to 0.010 ppm on February 22, 2002. It was not detected again in three subsequent sampling events, nor has it ever been detected before from four previous data sets at this well. It also has not been detected in available sampling data from the seven other systems in this report. The single arsenic detect at Barrelville Well 2 is considered an anomaly. Therefore, the community systems in this report are **not** susceptible to this contaminant (Table 10).

Iron and manganese are naturally occurring elements that were detected in aquifer material at or above the secondary standard from single samples collected at Barrelville, Midlothian, Mount Savage Plant 6, and Green Ridge Boys Camp respectively (Table 7b). The secondary MCLs are 0.3 ppm for iron, and 0.05 ppm for manganese. Treatment is currently in-place at Midlothian, Green Ridge Boys Camp, and LaVale to remove iron and manganese from raw water (Table 5). Excessive iron levels can cause taste, color, and odor problems in drinking water as well as iron bacteria build-up around well casings.

Past and present mining activities near the Midlothian, Mount Savage, LaVale, and Barrelville SWPAs do not appear to have impacted the sources of these water supplies since metals and heavy metals have not been detected from available sampling data at levels of concern. The low levels of other inorganic constituents detected in the wells and springs likely represent the naturally occurring levels present in the aquifers from dissolving minerals in the bedrock. Therefore, the eight water supplies in this report are **not** susceptible to any of the regulated inorganic compounds based on available water quality data (Table 10).

Radionuclides

An MCL for radon-222 has not yet been adopted. However, the U.S. EPA has proposed an MCL of 300 pCi/L or an alternative of 4000 pCi/L for drinking water if the State has a program to reduce the more significant risk from radon in indoor air, which is the primary health concern. Radon is present in three systems from this report at levels above 50% of the more conservative proposed MCL of 300 pCi/L (Table 7c). At four other systems, radon was either detected at levels well below the more conservative proposed MCL threshold, or not detected. Midlothian was the only system from this report with no radon data, but they do have results for the other radionuclides.

The source of radon and other radiological contaminants in ground water can be traced back to the natural occurrence of uranium in rocks. Radon may be prevalent in the ground water of consolidated clastic rock aquifers due to the radioactive decay of uranium bearing minerals in the bedrock. The EPA has information on proposed regulations for radon in indoor air and drinking water on their web site (http://www.epa.gov/safewater/radon.html).

Based on limited available sampling data, the LaVale, Mount Savage Plants 1, 4, 5, and 6, and Reckley Spring water systems **may be** susceptible to radon-222 if the more conservative MCL of 300 pCi/L is adopted (Table 10). No other radiological contaminants were detected at levels of concern for any of the community systems in this report based on available sampling data. Therefore, the eight water systems are **not** susceptible to other radiological contaminants other than radon-222.

Volatile Organic Compounds

The only volatile organic compounds that have been regularly detected at low levels from the available sampling data in five of the systems are the disinfection by-products known as trihalomethanes (THMs). THMs are the result of a reaction between chlorine used for disinfection and organic material in the water supply. The average sum totals of the four trihalomethanes (TTHM) detected ranged from 1.3 to 5.7 ppb for the five affected systems. These levels are typical of levels measured at other ground water systems in Maryland. The MCL for TTHMs is 80 ppb. No THMS were detected from the latest rounds of sampling at New Dominion School, Reckley Spring, and Green Ridge Boys Camp respectively.

Xylenes were detected at low levels in 1995 at Reckley Spring, and in 2004 at LaVale from one set of sampling data at each system. Xylenes are by-products of gasoline, paints, inks, and detergents. Toluene was detected at very low levels from a single set of sampling results in1999 at Green Ridge Boys Camp. Toluene is a gasoline additive, and a manufacturing solvent. It was not detected again in 7 subsequent sampling events. Reckley spring also had three low-level detects of 1,1,1-trichloroethane at 0.8, 15, and 0.8 ppb in 1991 and 1995, one detect of trichloroethene (TCE) at 1 ppb in 1995, and two detects of methylene chloride in 1991, and again in 1995 at 1 ppb. TCE and 1,1,1-trichloroethane are used as metal degreasers, and are also found in textiles, adhesives, aerosols, paints, and inks. Methylene chloride is used as a paint stripper, metal degreaser, or propellant. These compounds were detected at levels well below their respective MCLs, and have not been detected again in more recent rounds of sampling at the spring. Potential VOC point sources were identified within and near the LaVale SWPAs (Figure 3c), but no obvious sources were observed within the Reckley Spring SWPA (Figure 3e). However, these springs are located near roadways that are a concern in the event of a chemical or petroleum spill that could occur within their respective SWPAs. Due to the vulnerable nature of springs, and the low-level detects in sampling results coupled with the potential contaminant sources at LaVale, the Reckley Spring and LaVale water systems **are** susceptible to VOC contamination. The remaining six systems are **not** susceptible to VOCs based on the available water quality data, and/or the absence of potential contaminant sources within their respective source water protection areas (Table 10).

Synthetic Organic Compounds

The sources of SOCs to ground water include point and non-point sources. Non-point sources include pesticides, and herbicides applied to agricultural fields, and residential lawns. Even though three systems have cropland making up small percentages of the land use in their respective SWPAs (Tables 3b, 3d, & 3f), the fact that SOCs have not been detected at levels of concern in these water supplies indicates that chemicals are not being over applied to these areas.

The only contaminants detected in this group were di (2-ethylhexyl) phthalate, dalapon, silvex, and 2,4-D (see Water Quality section). All phthalate detects were also detected in laboratory blank samples, and therefore do not represent actual water quality. Dalapon was detected once from one set of available sampling results at Reckley Spring at 0.57 ppb, well below its MCL of 200 ppb. Dalapon is a herbicide used on orchards, beans, lawns, and road/railway lines. As stated previously in the Water Quality Section, dalapon has been reported in many samples at very low levels across the state, and its reported detections may be an artifact of the testing procedure. Silvex, and 2,4-D were also detected at 0.08 ppb, and 0.21 ppb from the latest set of sampling data in 2002 at Reckley Spring. The MCLs for these SOCs are 50 ppb and 70 ppb respectively, and therefore these detects are well below levels of concern. Based on the available water quality data and review of the current land uses within the SWPAs, the eight systems in this report were determined **not** susceptible to SOC contamination (Table 10).

Microbiological Contaminants

Based on the raw water bacteriological data shown on Table 8, field observations of source integrity, and the surrounding protection areas, the following sources are likely to be under the direct influence of surface water: LaVale Laber Springs 1 and 2 and Wells 1-3, Mount Savage Crow and Robison Springs and the Castle Hill and Thurigh Wells. These sources **are** susceptible to any microbiological contaminant present at the surface including *Giardia* and *Cryptosporidium* (Table 10).

"Sensitive" sources that are likely not GWUDI but **are** susceptible to coliform contamination by the various means described in the Water Quality Section are as follows: Barrelville Well 1, Reckley Spring, Mount Savage Robison Well 1, and the Mount Savage Lancaster, and Walsh Meadows Wells (Table 10).

The sources determined not GWUDI based on raw water data include: Barrelville Well 2, the Midlothian Wells, the Mount Savage Brick Row and Old Row Wells, New Dominion School Well 3, the Green Ridge Boys Camp and Rocky Gap Mobile Home Park Wells, and Reckley Spring. With the exception of Reckley Spring, these sources are **not** susceptible to any microbiological contaminant present at the surface including *Giardia,* and *Cryptosporidium* (Table 10).

Sources that could not be evaluated for surface water influence due to the absence of raw water data include: the Mount Savage Castle Hill and Walsh Meadows Springs, and the Mount Savage Upper Crow Well, and Robison Well 2.

MANAGEMENT OF THE SOURCE WATER ASSESSMENT AREA

With the information contained in this report, the individual community water system owners as well as the Allegany County government have a basis for protecting the drinking water supplies for ground water users. Staying aware of the areas delineated for source water protection, keeping track of potential contaminant sources, and evaluating future development and land planning are examples of management practices that will protect the water supplies. Specific management recommendations for consideration are listed below. The following recommendations are intended for 1) a countywide source water protection effort, and 2) for individual water systems.

RECOMMENDATIONS FOR COUNTY AGENCIES:

Form a Local Planning Team

- A local planning team should be formed to begin to implement a source water protection plan. The team should represent all the interests in the community, such as the water suppliers, home association officers, the County Health Department, local planning agencies, local businesses, developers, farmers, and residents within and near source water protection areas. The team should work to reach a consensus on how to protect the water supplies.
- A management strategy adopted by the county should be consistent with the level of resources available for implementation. Funding is available through MDE for source water protection programs.

Public Awareness and Outreach

- Conducting education outreach to the facilities listed in Table 2. Important topics include: (a) minimizing the risk of contamination from in-ground material storage in tanks and piping, (b) inspection of all waste streams that may go into dry wells, septic tanks or other ground water discharge points, (c) reporting chemical and petroleum spills, and (d) proper material and chemical storage practices.

- Road signs at the boundaries of source water protection areas are an effective way of keeping the relationship of land use and water quality in the public eye, and help in the event of spill notification and response.

Planning/ New Development

- Allegany County should adopt a local land use ordinance in cooperation with its Planning Services Division to protect water quality within the designated source water protection areas. The Maryland Model Wellhead Protection Ordinance may be used as a template.
- Plans for new commercial development should consider the placement of water supply wells a priority for such facilities as gas stations, and other users of hazardous materials. Additionally, ensuring the adequacy of the sources to supply water for these facilities in the long term will ensure that additional wells in less desirable locations are not necessary.

Land Acquisition/Easements

- The availability of loans for purchasing land or easements for the purpose of protecting designated source water protection areas is available from MDE. Loans are offered at zero percent interest and zero points.

Contingency Plan

- Develop a spill response plan in concert with the Fire Department and other emergency response personnel.

RECOMMENDATIONS FOR INDIVIDUAL SYSTEMS:

Public Awareness and Outreach

- The Executive Summaries of this report should be listed in the Consumer Confidence Reports for each water system, and should also indicate that this report is available to the general public by contacting the water supplier, the local library, or MDE.

Planning/New Development

- MDE recommends that the community water system owners encourage Allegany County to adopt a source water protection ordinance.
- The water suppliers should inform the Allegany County Health and Planning Departments of any concerns about future development or zoning changes for properties that are within the designated SWPAs.
- The water suppliers should be aware of their SWPA limits and evaluate the possible effects to the quality of the ground water prior to building or making any changes.

Monitoring

- Systems should continue to monitor for contaminants that have been previously detected to ensure public health protection.
- Systems should continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.

- Annual raw water sampling for microbiological contaminants is a good way to check the integrity of each source type.
- Mount Savage has not yet to completed GWUDI testing for the Castle Hill Spring, Upper Crow Well, Robison Well 2, and Walsh Meadows Spring to assess their susceptibility to surface water influence. This testing is required under EPA guidelines of the Surface Water Treatment Rule, and should be completed and results submitted to the MDE Water Supply Program as soon as possible.

Contingency Plan

- All system owners should have a Contingency Plan for their 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.

Contaminant Source Inventory Updates/ Inspections

- Water system owners should conduct their own field survey of their source water protection area(s) to ensure that there are no additional potential sources of contamination. Updated records of new development within the respective SWPAs should be maintained.
- Periodic inspections and a regular maintenance program of the supply wells and springs will ensure their integrity and protect the aquifers from contamination.

Source Improvements

- Wells and springs that do not meet current construction standards should be upgraded to protect them from contamination associated with poor or outdated construction.

  1. The ten wells that were drilled prior to 1973 on Table 1 (except for the Green Ridge Boys Camp & Rocky Gap Mobile Home Park Well's 1) should be upgraded to current standards, or replaced.
  2. The casings of LaVale Wells 1-3, and Barrelville Well 2 should be extended to prevent surface water from entering the wells.
  3. The unused wells at LaVale and Mount Savage that are not connected to their respective distribution systems and have no planned future use should be properly abandoned and sealed by a certified well driller according to current State well construction standards.
  4. A diversion ditch upgradient of each spring should be constructed to prevent surface water flow into the collection boxes.
  5. Rehabilitating the springs may eliminate the risk of surface water influence. An example springhead design is shown in Appendix B. The installation or replacement of gasket seals around overflow pipes, access hatches, and lids may reduce the likelihood of contamination by coliform organisms.
  6. The LaVale Sanitary Commission needs to resolve the dispute with the adjacent homeowner and purchase the property in the area of Laber Spring 1, and locate Laber Spring 2 so that necessary upgrades and periodic inspections can be made.
  7. Mount Savage should consider implementing a filtration system prior to disinfection at the treatment plants of the supply springs and wells that have

persistent coliform issues and that are likely GWUDI. Disinfection and filtration can achieve the minimum mandatory removals and/or inactivation of 99.9 percent *Giardia* cysts and 99.99 percent enteric viruses (USEPA 1990). The seven most common filtration systems are 1) conventional treatment and direct filtration, 2) direct filtration using gravity and pressure filters, 3) slow sand filtration, 4) package plants, 5) diatomaceous earth filtration, 6) membrane filters, and 7) cartridge filters. Due to high operational costs and limited available staff, the Mount Savage Community may want to pursue a connection with the City of Frostburg as an alternative to filtration.

Changes in Use

- Water system owners are required to notify the MDE Water Supply Program if new wells are to be added or if they wish to increase their water useage. Drilling a new well outside the current source water protection area would modify the area; therefore the Water Supply Program should be contacted if a new well is being proposed.

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OTHER SOURCES OF DATA

Water Appropriation and Use Permits
Public Water Supply Sanitary Survey Inspection Reports
MDE Water Supply Program Oracle® Database
MDE Waste Management Sites Database
MDE Environmental Permits Database
MD Dept. of Natural Resources Digital Orthophoto Quads
MD Dept. of Planning 2002 Digital Land Use Maps
MD Dept. of Planning 2002 Digital Sewerage Coverage Maps
ADC® Digital Maps for Allegany & Garrett Counties
USGS Topographic 7.5-Minute Series Quadrangles