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SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for forty small systems in Frederick County. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to the source, 2) identification of potential sources of contamination, and 3) determination of the susceptibility of the water supply to contamination. Recommendations for protecting the drinking water supply conclude this report.

The sources of water supply wells in Frederick County are unconfined fractured-rock aquifers. The forty small water systems included in this report are currently using sixty-two wells that draw from various bedrock formations throughout the county. The individual rock formations have hydrologic characteristics that allow them to be grouped into four separate hydro-geologic regions. The Source Water Assessment areas were delineated by the WSP using U.S. EPA approved methods specifically designed for wells in fractured-rock aquifers.

Potential point sources of contamination within the assessment areas were identified from field inspections and contaminant inventory databases. The more common potential sources of contamination identified are underground storage tanks and controlled hazardous substance generators commonly associated with commercial areas. The Maryland Office of Planning's 1997 land use map for Frederick County was used to identify non-point sources of contamination. The most common type of land use that presents a potential for contamination is agricultural cropland. Figures showing land use, potential contaminant sources within Source Water Assessment areas, and aerial photographs of well 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 integrity, and the inherent vulnerability of the aquifer. It was determined that some small water systems are susceptible to contamination by nitrate, radon, volatile organic compounds, synthetic organic compounds, and microbiological contaminants. Some small systems may be susceptible to one contaminant, while others are susceptible to one or more groups of contaminants.

EXECUTIVE SUMMARY

AMELANO MANOR

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for forty small systems in Frederick County, including the Amelano Manor community supply. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to the source, 2) identification of potential sources of contamination, and 3) determination of the susceptibility of the water supply to contamination. Recommendations for protecting the drinking water supply conclude this report.

The sources of water supply wells in Frederick County are unconfined fractured-rock aquifers. The Amelano Manor water system, located in the Triassic Valley Region of central Frederick County, is currently using one well that draws from the New Oxford formation. The Source Water Assessment area was delineated by the WSP using U.S. EPA's approved methods specifically designed for this source.

No specific point sources of contamination were identified within the assessment area 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. Figures showing land use with the Source Water Assessment area and an aerial photograph of the area are enclosed at the end of the report.

The susceptibility analysis is based on a review of the existing water quality data for the water system, the presence of potential sources of contamination in the individual assessment areas, well integrity, and the inherent vulnerability of the aquifer. It was determined that the Amelano Manor water supply is susceptible to contamination by nitrate and radon. This water supply is not susceptible to volatile organic compounds, synthetic organic compounds, and microbiological contaminants.

EXECUTIVE SUMMARY

LIBERTYTOWN APARTMENTS

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for forty small systems in Frederick County, including the Libertytown Apartments community supply. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to the source, 2) identification of potential sources of contamination, and 3) determination of the susceptibility of the water supply to contamination. Recommendations for protecting the drinking water supply conclude this report.

The sources of water supply wells in Frederick County are unconfined fractured-rock aquifers. The Libertytown Apartments water system, located in the Piedmont Metamorphics Region of eastern Frederick County, is currently using two wells that draw water from the Libertytown Metarhyolite formation. The Source Water Assessment area was delineated by the WSP using U.S. EPA's approved methods specifically designed for each source.

Point sources of contamination were identified within the assessment area 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. Figures showing land use and potential sources of contamination within the Source Water Assessment area and an aerial photograph of the area are enclosed at the end of the report.

The susceptibility analysis is based on a review of the existing water quality data for the water system, the presence of potential sources of contamination in the individual assessment areas, well integrity, and the inherent vulnerability of the aquifer. It was determined that the Libertytown Apartments water supply is susceptible to contamination by nitrate, radon, volatile organic compounds, and viruses. This water supply is not susceptible to synthetic organic compounds. The water supply was considered susceptible to surface water microorganisms, however, this was corrected by improvements to the construction of the two wells.

EXECUTIVE SUMMARY

GILBERTS MOBILE HOME PARK

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for forty small systems in Frederick County, including the Gilberts Mobile Home Park community water supply. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to the source, 2) identification of potential sources of contamination, and 3) determination of the susceptibility of the water supply to contamination. Recommendations for protecting the drinking water supply conclude this report.

The sources of water supply wells in Frederick County are unconfined fractured-rock aquifers. The Gilberts Mobile Home Park water system, located in the Triassic Valley Region of southwestern Frederick County, is currently using two wells that draw water from the New Oxford formation. The Source Water Assessment area was delineated by the WSP using U.S. EPA's approved methods specifically designed for each source.

Point sources of contamination were identified within the assessment area 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. Figures showing land use and potential sources of contamination within the Source Water Assessment area and an aerial photograph of the area are enclosed at the end of the report.

The susceptibility analysis is based on a review of the existing water quality data for the water system, the presence of potential sources of contamination in the individual assessment areas, well integrity, and the inherent vulnerability of the aquifer. It was determined that the Gilberts Mobile Home Park water supply is susceptible to contamination by nitrate, radon, volatile organic compounds, and synthetic organic compounds. The susceptibility of the water supply to microbiological contaminants cannot be determined at this time due to insufficient data.

EXECUTIVE SUMMARY

POLINGS MOBILE HOME ESTATES

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for forty small systems in Frederick County, including the Polings Mobile Home Estates community water supply. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to the source, 2) identification of potential sources of contamination, and 3) determination of the susceptibility of the water supply to contamination. Recommendations for protecting the drinking water supply conclude this report.

The sources of water supply wells in Frederick County are unconfined fractured-rock aquifers. The Polings Mobile Home Estates water system, located in the Blue Ridge Region of southwestern Frederick County, is currently using four wells that draw water from the Loudoun formation. The Source Water Assessment area was delineated by the WSP using U.S. EPA's approved methods specifically designed for each source.

No specific point sources of contamination were identified within the assessment area 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. Figures showing land use and potential sources of contamination within the Source Water Assessment area and an aerial photograph of the area are enclosed at the end of the report.

The susceptibility analysis is based on a review of the existing water quality data for the water system, the presence of potential sources of contamination in the individual assessment areas, well integrity, and the inherent vulnerability of the aquifer. It was determined that the Polings Mobile Home Estates water supply is susceptible to contamination by radon and nitrate. This water supply is not susceptible to volatile organic compounds, and synthetic organic compounds. The susceptibility of the water supply to microbiological contaminants cannot be determined at this time due to insufficient data.

EXECUTIVE SUMMARY

SPRING VIEW MOBILE HOME PARK

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for forty small systems in Frederick County, including the Spring View Mobile Home Park community water supply. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to the source, 2) identification of potential sources of contamination, and 3) determination of the susceptibility of the water supply to contamination. Recommendations for protecting the drinking water supply conclude this report.

The sources of water supply wells in Frederick County are unconfined fractured-rock aquifers. The Spring View Mobile Home Park water system, located in the Triassic Valley Region of southwestern Frederick County, is currently using one well that draws water from the New Oxford formation. The Source Water Assessment area was delineated by the WSP using U.S. EPA's approved methods specifically designed for this source.

Point sources of contamination were identified within the assessment area 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. Figures showing land use and potential sources of contamination within the Source Water Assessment area and an aerial photograph of the area are enclosed at the end of the report.

The susceptibility analysis is based on a review of the existing water quality data for the water system, the presence of potential sources of contamination in the individual assessment areas, well integrity, and the inherent vulnerability of the aquifer. It was determined that the Spring View Mobile Home Park water supply is susceptible to contamination by nitrate, radon, volatile organic compounds, and synthetic organic compounds. The susceptibility of the water supply to microbiological contaminants cannot be determined at this time due to insufficient data.

INTRODUCTION

The Water Supply Program has conducted a Source Water Assessment for 40 small water systems in Frederick County. Frederick County is in the western portion of the State, and has a total population 187,900 (Md. Assoc. of Counties, 1999). As defined in Maryland's Source Water Assessment Plan (SWAP), "small systems" are community and non-transient non-community water systems that have a ground water appropriation permit of less than 10,000 gallons average daily use. Small systems in Frederick County obtain their water supply from unconfined fractured rock aquifers, for which a one thousand foot radial source water assessment area is defined in Maryland's SWAP. Four SWAP regions were identified for the assessment based on physiographic provinces and geologic formations. An inventory of potential contaminant sources and a susceptibility analysis was completed for each of the four SWAP regions.

WELL INFORMATION

Well 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 60 wells are used by the 40 systems assessed in this report. Thirty-two of the wells were drilled after 1973 and should comply with Maryland's well construction regulations. The remaining 28 wells drilled prior to 1973, when regulations went into effect, may not meet the current construction standards. Table 1 contains a summary of well information for each of the small systems.

Based on several site visits, a common shortcoming in well integrity is an insecure sanitary well cap. Wells constructed within the last 20 years also commonly have an old style well cap which present a possible route of contamination through unscreened vents and electrical holes. Both of these situations can be easily remedied with the installation of a new sanitary well cap to prevent contamination. Another common threat to wells observed during field inspections is their location. Wells in several sites were located near or within a storm water runoff ditch or swale subjecting them to flooding during heavy rains. Space available for wells is understandably limited in shopping centers, however several sites had wells located in the parking lot, with no protective barriers, which subjects them to contaminants in storm water runoff, and also to physical harm from cars.

HYDROGEOLOGY

The majority of Frederick County (east of Catoctin Mountain) lies within the Piedmont physiographic province and the remaining westernmost portion of the County is in the Blue Ridge province. The Piedmont is characterized by gently rolling hills and valleys. The Blue Ridge province encompasses Catoctin Mountain, the Middletown Valley and South Mountain.

For the purposes of this report the County was separated into four SWAP regions (Figure 1). These regions represent areas where ground water flow is distinct based on the

geologic formations that comprise the aquifers, and the physiographic provinces which characterize the land at the surface. Wells in Frederick County obtain water from unconfined, fractured-rock aquifers. Flow in these aquifers is primarily through secondary porosity, i.e. fractures, joints, and bedding plane contacts. Although the bedrock in Frederick County is very heterogeneous in composition, four basic sequences have been grouped based on lithology, age, and structure (Duigon and Dine, 1987). These four groups also have similarities in ground water flow and thus the SWAP regions defined here follow roughly the same boundaries. For a more detailed description of the geologic setting and physiographic provinces of Frederick County the reader is referred to Duigon and Dine, 1987.

Blue Ridge Region

The Blue Ridge region is composed of the crystalline bedrock formations that form the core of the mountains in the western portion of the County. Ground water is mostly stored in the overburden soil and the saprolite (weathered rock) in this region. Fractures may be well developed in some areas, but in most of this region is it difficult to find large capacity wells due to the crystalline nature of the rock.

Triassics Valley Region

The Triassics Valley region comprises the western half of Frederick Valley, underlain by a sequence of consolidated sedimentary rocks, which are the youngest formations in the County. In this region, the sandstone and conglomerate aquifers may have some primary porosity, but ground water flow is still dominated by secondary porosity. Ground water flows along bedding planes and is stored in fractures in this region. There is also a varying thickness of unconsolidated sediment overlying the bedrock that serves as storage for these aquifers.

Carbonate Valleys Region

The Carbonate Valleys Region is a non-contiguous region that is based on the surface exposure of the carbonate rock formations throughout Frederick Valley and within the Piedmont province of the County. In this region ground water flow is dominated by solution-enlarged fractures and bedding planes and karst terrain features such as sinkholes and losing streams. Soil cover and overburden is generally thin or non-existent, due to dissolution of the minerals that make up the rock, causing ground water to infiltrate rapidly from the surface to the water table. Availability of ground water in this region is highly variable, but the highest producing wells are likely to be found in this region due to flow through conduits formed through solution-enlarged fractures.

Piedmont Metamorphics Region

The Piedmont Metamorphics Region is the remainder of the Piedmont province, which is underlain by a structurally complex sequence of metasedimentary and metavolcanic bedrock. The flow of ground water in this region is similar to that of the Blue Ridge region due to the highly crystalline nature of the bedrock, and the overburden material that has formed overlying the bedrock. The Piedmont region

aquifers tend to be most highly fractured and the depth to the water table is shallower in the lowland valleys than on hilltops. Therefore, ground water is most readily available in stream valleys and swales and the largest producing wells are generally located in the lowlands of this region.

SOURCE WATER ASSESSMENT AREA DELINEATION

As defined in Maryland's SWAP, the source water assessment area for 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 the well. This 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 conditons) and a safety factor. The same source water assessment area applies to carbonate rock aquifers, unless the source has been determined to be ground water under the direct influence of surface water (GWUDI). GWUDI sources would require a more detailed study to delineate their source water assessment area. The McDonalds of New Market well is the only well covered in this report that has been determined GWUDI. A larger area for this system has not been delineated because the system is currently working to connect to another public supply. Most of the non-transient non-community systems have yet to be evaluated. If a system contained in this report is found to be GWUDI, the source water assessment for that system will be revised.

POTENTIAL SOURCES OF CONTAMINATION

Potential sources of contamination are classified as either point or non-point sources. Examples of point sources of contamination are leaking underground storage tanks, landfills, discharge permits, large scale feeding operations, and CERCLA sites. These sites are generally associated with commercial or industrial facilities that use chemical substances that may, if inappropriately handled, contaminate ground water via a discrete point location. Non-point sources of contamination are associated with certain types of land use practices such as use of pesticides, application of fertilizers or animal wastes, or septic systems that may lead to ground water contamination over a larger area.

Point Sources

Potential point sources of contamination have been identified within the Source Water Assessment Areas of 26 systems. Table 2 lists the potential contaminant sites identified and their associated contaminants and Figures 2b-2o show their locations. The point sources listed are identified from MDE contaminant databases and field inspections conducted by MDE employees. Several commercial or industrial establishments that have Underground Storage Tanks (USTs), Ground Water Discharge Permits (GWDP), or are classified as Controlled Hazardous Substance Generators (CHS) are listed in Table 2. Wastewater treatment plants with National Pollutant Discharge Elimination System (NPDES) permits are generally considered potential point sources for surface water or GWUDI sources only. They are however, included in this report due to the fact that most of the systems have not yet been evaluated to determine if they are GWUDI. Miscellaneous (MISC) potential

contaminant sites include maintenance facilities for vehicles and cemeteries. The contaminants associated with the types of facilities are based on generalized categories and often the potential contaminant depends on the specific chemicals and processes being used at the individual facility. The potential contaminants for an activity may not be limited to those listed in Table 2. Potential contaminants are grouped as Volatile Organic Compounds (VOC), Synthetic Organic Compounds (SOC), Heavy Metals (HM), Metals (M), Nitrate/Nitrite (NN), and Microbiological Pathogens (MP).

Non-Point Sources

The Maryland Office of Planning's 1997 Land Use map for Frederick County was used to determine the predominant types of land use in each SWAP region (Fig. 3). The land use of Frederick County is approximately 56% agricultural, 30% forested, and 9% residential with a variety of commercial and open space land uses making up the remaining 4%. The proportions change significantly when separated by SWAP regions as illustrated in Figures 4a-4d. Agricultural land use 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. Residential areas may present a source of nitrate due to septic systems or lawn care practices.

The Maryland Office of Planning's 1996 Frederick County Sewer map shows that 4.5% of the County is in the existing sewer service area, 8.2 % is planned for sewer service within 3 to 20 years, and 87.3% of the County is not planned for sewer service (Figure 5). Low-density residential areas are generally outside the existing sewer service area and may be a source of nitrate loading to ground water through septic systems. Commercial or industrial land use area outside the existing sewer service present a potential source of all types of contaminants if byproducts and wastes are not disposed of properly.

Other potential non-point sources that are not specifically identified but are commonly found in source water assessment areas include on site septic systems, stormwater drainage ditches, and stormwater management ponds.

WATER QUALITY DATA

Water Quality data was reviewed from the Water Supply Program's database for Safe Drinking Water Act (SDWA) contaminants. All data reported is from the finished (treated) water unless otherwise noted. There are four systems (Midland Glass Company, Horizon Business Center, Burdette Brothers Pontiac, Inc., and Reichs Ford Sanitary Landfill) that are currently providing only bottled water for human consumption and are therefore not subject to SDWA monitoring requirements except for bacteria and nitrate. The treatment methods currently in use in the 40 systems included in this report range from disinfection, corrosion control, removal of iron, particulates and organics, to no treatment. Table 3 summarizes the treatment methods utilized by each system.

A review of the monitoring data since 1993 indicates that the water supply for these 40 systems meets drinking water standards with a few exceptions (Table 4). Tables 5a-5e provide a list of all detections above 50% of the Maximum Contaminant Level (MCL), which is the threshold defined in Maryland's SWAP for reporting water quality results. If an MCL was exceeded the result is in bold. Among the inorganic compounds tested, nitrate was the predominant contaminant detected. Radon-222 was the only radiological contaminant present at a level of concern. Volatile organic compounds have been detected in the water supply at Libertytown Elementary School, Horizon Business Center, and Mountain Manor Treatment Center. No synthetic organic compounds, other than one commonly associated with laboratory blanks, were detected above 50% of the Maximum Contaminant Level (MCL) in any of the small systems.

Inorganic Compounds (IOCs)

Nitrate was detected above the threshold level of 5 parts per million (ppm) in 12 of the 37 water systems (Table 5a). Furthermore, nitrate was detected repeatedly above 5 ppm in 10 of the 12 systems.

Cadmium, barium, nickel, beryllium, and thallium were the other inorganic contaminants detected above the reporting threshold. Each of these contaminants was not detected in more than one system, and with the exception of thallium, detection was not repeated.

Radionuclides

There is currently no MCL for Radon-222, however EPA has proposed an MCL of 300 pCi/L or an alternate of 4000 pCi/L for community water systems if the State has a program to address the more significant risk from radon in indoor air. Non-transient non-community systems are not currently regulated for radionuclides, although data is available for several NTNC systems. The EPA received many comments in response to their proposed rule, and promulgation may be delayed. Radon-222 has been detected at levels commonly associated with the bedrock aquifers of the Piedmont in 21 of the 27 systems that have tested for this contaminant (Table 5b). Thirteen systems have no data available for this contaminant.

Volatile Organic Compounds (VOCs)

VOCs have been detected above the 50% MCL threshold in six of the 40 systems (Table 5c). At Mountain Manor Treatment Center, Benzene has been detected at levels between 3 and 16 ppb in 4 of 22 samples collected. Trichloroethylene and tetrachlorethylene have been detected in 3 samples collected during 1995 at Horizon Business Center. VOCs have not been monitored at Horizon Business Center since 1995 due to their bottled water status.

Methylene Chloride was detected once in four public school systems in May 1993 (Table 5c). Between four and eight VOC samples have been collected for these systems since the initial detection, and the contaminant has not been detected again.

It is likely that this was a laboratory or sampling error due to the time frame in which these samples were collected and levels at which the contaminant was detected.

Synthetic Organic Compounds (SOCs)

The only SOC detected above the 50% threshold was Di(2-Ethylhexyl)Phthalate (Table 5d). This contaminant is commonly found in laboratory blank samples. The contaminant was detected once in three systems, and has not been found in repeat samples collected.

Microbiological Contaminants

The New Market McDonald's well 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 5e). GWUDI evaluation samples collected for Libertown Apartments and Amelano Manor were negative for fecal coliform bacteria (Table 5e). The remaining 37 systems have not yet been evaluated for GWUDI, and therefore do not have raw water bacteriological data.

All of the systems do, however, have either monthly or quarterly routine bacteriological samples that were collected as required by the Safe Drinking Water Act (Table 6). These samples are generally collected from finished (treated) water, which may not be indicative of the source water conditions. Twenty-three of the systems have had no positive routine bacteriological samples in all samples collected since 1996. Fifteen systems had positive coliform bacteria results and five systems have had positive bacteria results in more than one routine sample. These samples may be representative of raw water for the four systems that do not have disinfection treatment. The remaining 11 systems either disinfect with chlorine or UV-radiation.

SUSCEPTIBILITY ANALYSIS

The wells serving the small water systems included in this report all draw water from unconfined fractured rock aquifers. Wells in unconfined aquifers are generally vulnerable to any activity on the land surface that occurs within the source water assessment area. However, this vulnerability will vary based on the hydro-geologic regions defined in this report. For example, five of the wells draw water from limestone formations which are generally more vulnerable to activity on the land surface due to thin soil cover and development of karst features. The susceptibility analysis is conducted in two distinct parts. First, the susceptibility for each of the SWAP regions is discussed. Secondly, the susceptibility analysis of the individual water supplies to each group of contaminants has been completed based on the following criteria: 1) the presence of potential contaminant sources within the WHPA, 2) water quality data, 3) well integrity 4) the aquifer conditions and their SWAP region.

In the Blue Ridge, Triassic Valley, and Piedmont regions, if a well is constructed properly with the casing extended to competent rock and with sufficient grout, the

saprolite serves as a natural filter and protective barrier. Properly constructed wells with no potential sources of contamination in their SWAA should be well protected from contamination. Land use in the Blue Ridge Region is the least threatening to wells due to the large amount of well-protected forested areas. However, localized land use will play a role in a developed area. In the Triassic Valley and Piedmont regions agricultural land use presents the most common threat of contamination - overuse of fertilizer that leads to nitrate loading in ground water. A common threat in all regions is stormwater runoff. Wells in fractured-rock aquifers, and especially in the Piedmont Region, are commonly sited in low-lying areas where ground water is likely to be available. This may lead to flooding during heavy rains.

Due to the hydro-geologic characteristics of carbonate-rock aquifers, wells in the Carbonate Valley Region are likely to be very vulnerable to activity at the surface. The dissolution of minerals generally leaves a very small overburden to filter and store water as it travels from the surface to the water table, and therefore contamination at the surface can reach a well in this region in a matter of days. Thus, it is important to site wells carefully and avoid potential sources of contamination that may be in the immediate vicinity of a well in this region.

Inorganic Compounds

Nitrate is present in the wells of 12 systems at 5 ppm or greater (Table 5a). Furthermore, thirty-eight systems have nitrate results available, and all have had nitrate present between 1 and 5 ppm in at least one sample. The MCL for nitrate is 10 ppm. Sources of nitrate can generally be traced back to land use. Fertilization of agricultural fields and residential lawns, and residential septic systems are all sources of nitrate loading in ground water. Eleven of the twelve systems that have had repeated nitrate levels above 5 ppm are in the Triassic Valley and Piedmont Metamorphic SWAP regions. Given that agricultural land use in these regions are 81% and 59% respectively, it is likely that agriculture is a large source of nitrate to wells in these regions. Exceptions to this are the source water assessment areas for Green Valley and New Market Shopping Centers, which are currently predominantly low-density residential land use. In these cases, the likely source of nitrate would be residential septic systems or lawn fertilization. It should be noted that land use has changed from agricultural in 1990 to residential in 1997 in the New Market shopping center area, so it is likely that both land use types may have contributed to elevated nitrate levels. Another source of nitrate to ground water is precipitation due to reactions with atmospheric nitrogen (Bolton, 1996). Precipitation is the primary recharge of unconfined aquifers. However, the amount of nitrate contributed from precipitation is relatively small compared to land use practices.

Due to the levels and persistence of nitrate found, the vulnerability of the fractured rock aquifers to land activity, and the presence of nitrate sources in the source water assessment areas, all water systems in this report are susceptible to this contaminant.

Radionuclides

Radon is present in 26 of 27 water systems that have tested for this contaminant. Twenty-one water systems have radon levels above 50% of the MCL of 300 pCi/L. Determining the susceptibility of the wells to this contaminant is difficult due to many factors: 1) An MCL for radon has not been adopted yet for Maryland, the U.S. EPA is proposing an MCL between 300 and 4000 pCi/L for drinking water. Also, the State is considering adopting a cooperative program to reduce concentrations of radon in indoor air, which is the primary health concern. 2) 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 the Committee on Health Risks of Exposure to Radon BEIRVI (1999) report. The EPA also has information on proposed regulations for radon in indoor air and drinking water on their web site (<http://www.epa.gov/safewater/radon.html>). 3) 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 Frederick County due to radioactive decay of uranium bearing minerals in the bedrock (Bolton, 1996). All of the aquifers used by the systems in this report have had radon detects, however localized conditions may vary considerably. Based on an MCL of 300 pCi/L, it appears that the following water supplies are susceptible to radon due to the natural occurrence of this contaminant in aquifer material: Amelano Manor, Libertytown Apartments, Gilberts Mobile Home Park, Polings Mobile Home Estates, Spring View Mobile Home Park, Green Valley Elementary, T.E.C. Building Partnership Jefferson Pike Business Park, Lehigh Portland Cement Company, Lewistown Elementary, Liberty Elementary, Long Fence Co., Mountain Manor Treatment Center, New Market Shopping Center, New Midway Elementary, Sabillasville Elementary, Urbana Elementary, Yellow Springs Elementary, Hyatt Industrial Park #2, Children's Center for Discovery, and New Life Christian School.

If the higher MCL of 4000 pCi/L is adopted only the following systems from the above list will be susceptible to radon: Polings Mobile Home Estates, T.E.C. Building Partnership, Liberty Elementary, New Market Shopping Center, Hyatt Industrial Park #2, and Children's Center for Discovery.

The following systems have radon results that are less than 50% of the MCL and are therefore not susceptible to this contaminant: Ausherman Construction Co., Valley Elementary, Dan Dee Motel, Burdette Brothers Pontiac, and Jefferson School. The Hyatt Center General Partnership had a result of 120 pCi/L, which is very close to the 150 pCi/L limit. Therefore, the data for this water supply is insufficient to determine its susceptibility to radon.

The following systems do not have radon results available and their susceptibility to this contaminant cannot be determined at this time: Hyatt Park #1, Kemptown Elementary, Wolfsville Elementary, Horizon Business Center, Dandelion Christian Day Care, Midland Glass Company, Reichs Ford Sanitary Landfill, Green Valley Plaza, Green Valley Center, Frederick Trading Company, Stups Garage & Used Cars, Wicks Lumber, McDonalds of New Market.

Volatile Organic Compounds

Several incidents of ground water contamination by VOCs are known to exist within the source water assessment areas for systems included in this report. The Citgo/7-Eleven UST site near the Liberty Elementary School (Fig. 2b) is currently being investigated for leaks due to the detection of Methyl Tertiary Butyl Ether (MTBE) in the school's wells. The Libertytown Apartments wells have also been tested, and MTBE was not detected. No other contaminants associated with a leaking underground storage tank have been detected. A LUST site exists nearby in Libertytown, but is not within the source water assessment area for the public supplies. Cleanup of this LUST site, which has affected domestic wells, is currently underway (Appendix A).

Underground storage tanks at the Green Valley Garage were recently removed due to contamination of several domestic wells nearby (Appendix B). This site is within the source water assessment area for three systems in Green Valley (Fig. 2h). The Children's Center for Discovery, which is the closest well to the LUST site, did not have a VOC detected in 6 samples collected between 1990 and 1997. The most recent VOC sample collected in March 2000 had MTBE at 0.6 ppb, a level which is well below the MDE action level of 10 ppb. However, since the ground water contamination has occurred recently, the system will be put on quarterly monitoring to ensure that contaminants do not rise above levels of concern.

Mountain Manor Treatment Center, the Midland Glass Company, and Horizon Business Center are 3 systems that currently serve bottled water to their customers due to VOC contamination in their wells. A source of contamination has not been directly identified in each of the cases.

The predominant sources of VOCs are point sources of contamination outlined in Table 2. The majority of the systems that have potential VOC sources within their source water assessment area have not had any VOC detections in monitoring samples (Table 4). However due to the vulnerable nature of unconfined aquifers coupled with a potential source, the following systems are susceptible to VOCs: Gilberts Mobile Home Park, Spring View Mobile Home Park, Ausherman Construction, Hyatt Park #1, T.E.C. Building Partnership, Jefferson Pike Business Park, Kemptown Elementary, Lewistown Elementary, New Market Shopping Center, Urbana Elementary, Valley Elementary, Hyatt Industrial Park #2, Hyatt Center Gen. Partnership, Burdette Brothers Pontia, Inc., New Life Christian School, Reichs Ford Sanitary Landfill, Green Valley Plaza, Green Valley Center, Stups Garage & Used Cars, and McDonalds of New Market.

Mountain Manor Treatment Center and Horizon Business Center have had VOC detections above 50 % of the MCL and (Table 5c) are especially susceptible to contamination. These two systems are currently serving bottled water at their facilities and should monitor the water supply for VOCs before putting it back into service.

The following systems do not have potential sources within their source water assessment area are not susceptible to VOCs: Amelano Manor, Polings Mobile Home Estates, Green Valley Elementary, Lehigh Portland Cement Co., Long Fence Co., New Midway Elementary, Sabillasville Elementary, Wolfsville Elementary, Yellow Springs Elementary, Jefferson School, Dandelion Christian Day Care, Frederick Trading Company, and Wicks Lumber.

Synthetic Organic Compounds

Determining the susceptibility of the small water systems in this report to SOCs is not straightforward because these contaminants have not been detected in the water supply. The only contaminant in this group detected above 50% of the MCL was di(2-ethylhexyl) phthalate which can be attributed to its presence in the laboratory environment. Furthermore, sources of SOCs include point (Table 2) and non-point sources such as pesticide application. Several potential point sources of SOCs have been identified within source water assessment areas (Figures 2g, 2h, 2k, 2l, 2m, 2n, 2o). A potential SOC source coupled with the fact that the wells pull from unconfined fractured rock aquifers, causes the following systems to be susceptible to SOCs: Spring View Mobile Home Park, Gilberts Mobile Home Park, Jefferson Pike Business Park, New Life Christian School, Ausherman Construction, New Market Shopping Center, McDonalds of New Market, Horizon Business Center, Reichs Ford Sanitary Landfill, and Kemptown Elementary. Continued monitoring of SOCs is important to ensure the safety of the water supply.

The remaining systems have not had SOC detections and do not have a potential point source of SOC contamination in their water supply and are therefore not susceptible to SOCs. Some of these systems may have cropland as a predominant land use in their source water assessment areas. However, because SOCs have not been detected, it is unlikely that agricultural practices in these areas are presenting a source of SOCs. The systems that have been determined to not be susceptible to SOCs are: Amelano Manor, Libertytown Apartments, Polings Mobile Home Estates, Green Valley Elementary, Hyatt Park #1, T.E.C. Building Partnership, Lehigh Portland Cement Company, Lewistown Elementary, Liberty Elementary, Long Fence Co., Mountain Manor Treatment Center, New Midway Elementary, Sabillasville Elementary, Urbana Elementary, Valley Elementary, Wolfsville Elementary, Yellow Springs Elementary, Hyatt Industrial Park #2, Childrens Center for Discovery, Hyatt Center General Partnership, Dan Dee Motel, Burdette Brothers Pontiac, Jefferson School, Dandelion Christian Day Care, Midland Glass Company, Green Valley Plaza, Green Valley Center, Frederick Trading Company, Stups Garage & Used Cars, and Wicks Lumber.

Microbiological Contaminants

Sources of microbiological pathogens in surface water are improperly treated wastewater (discharge to surface water or failing septic systems), waste material from mammals, and urban runoff in developed areas. Ground water is generally thought to be not susceptible to contamination by pathogenic microorganisms due to the natural filtration ability of soil and aquifer material. The exceptions to this are 1)

wells that are classified as "Ground water under the direct influence of surface water" (GWUDI) and 2) wells that may be sensitive to viruses due to a short travel time of water from the source of viral contamination to the well.

The McDonalds of New Market well has been classified as GWUDI and is therefore susceptible to pathogens such as *Giardia*, *Cryptosporidium*, and viruses that are normally associated with surface water.

Fourteen systems, for which raw water data is not available, have had positive total coliform samples in routine bacteriological testing of finished water (Table 6). We cannot assume, however, that the source water is also contaminated with total coliform. Storage tanks and distribution systems may also become contaminated with total coliform bacteria even if raw water is free of bacteria. At this time, sufficient data is not available to determine the susceptibility of these sources to microbial pathogens. This report will be revised if raw water data collected in order to determine the GWUDI status of wells indicates that they are susceptible to microbial contamination. The following systems, that have had repeated coliform bacteria detections will be considered "high risk" when evaluated for GWUDI and therefore be required to complete more extensive raw water sampling to determine their susceptibility: T.E.C. Building Partnership, Long Fence Co., Burdette Brothers Inc., Midland Glass Co., and Reichs Ford Sanitary Landfill.

Burdette Brothers. Inc., is also certified as a bottled water system. This may be due to repeated Total Coliform Rule violations between 1993 and 1998.

Amelano Manor has raw water bacteriological data available that shows that this water supply is not susceptible to microbiological contaminants.

Raw water bacteriological data collected during the GWUDI evaluation of the wells serving the Libertytown Apartments water supply showed no fecal coliform and therefore it was concluded that this water supply is not susceptible to protozoa. The consistent presence of total coliform bacteria in the raw water does indicate that this water supply may be susceptible to viral contamination. In June, 2000 a significant rainstorm caused flooding at the Apartment complex which subjected Well No. 2 to contamination from runoff. Increased turbidity and bacteria samples, along with cloudy water complaints from tenants indicated that the floodwaters had entered the well, and a boil water advisory was posted for residents. The boil water advisory was lifted after four days when subsequent bacteriological and turbidity samples showed that the surface water had been flushed from the well and the distribution system. The casing of this well was almost at ground level at the time of the storm and has since been raised to 2 feet above ground level to prevent floodwaters from entering the well again. Additionally, the casing of Well No. 1 was also raised to protect it from similar problems.

MANAGEMENT OF THE SOURCE WATER ASSESSMENT AREA

With the information contained in this report, the individual water system owners as well as the Frederick County government have a basis for protecting the drinking water supplies for ground water users. Staying aware of the area 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 supply. Specific management recommendations for consideration are listed below. The following recommendations are intended for 1) a county-wide 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 assessment 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. There are at least two other nearby municipalities actively involved in wellhead protection (Walkersville and Middletown) that may act as models for implementation on a countywide basis. MDE remains available to assist in to help the process. Funding is available for wellhead protection programs.

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.
- Road signs at the boundaries of source water assessment 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

- Frederick County Planning started work on a draft ordinance for wellhead protection; MDE recommends that the County work to finalize and adopt an ordinance for protecting wellhead protection areas.
- Enforce existing Frederick County Ordinance for underground storage tanks.

- Compare the wellhead protection boundaries with town limits to determine how to coordinate with municipal planning departments.
- 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 has developed an educational guidance on sinkhole formation and mitigation measures, which may be useful in Frederick County. The Town of Walkersville has a draft ordinance that addresses sinkhole issues.
- Planning for new commercial development should consider placement of water supply wells a priority when planning for such facilities as gas stations, and dry cleaners. Additionally, ensuring the adequacy of the well to supply water for the 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 purchase of and or easements for the purpose of protecting water supplies is available from MDE for community water systems and for non-transient non-community water systems owned by non-profit organizations. 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 Consumer Confidence Report should list that this report is available to the general public by contacting MDE.

Planning/New Development

- MDE recommends that water supply system owners within Frederick County encourage the County to adopt the wellhead protection ordinance.

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.

Contingency Plan

- All water 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 the source water assessment area to ensure that there are no additional potential sources of contamination.
- Water system owners with facilities listed as potential contaminant sources within their source water assessment area should consider regular inspections of certain high-risk facilities.
- Periodic inspections and a regular maintenance program for the supply wells will ensure their integrity and protect the aquifer from contamination.

Changes in Use

- Water system owners are required to notify MDE if new wells are to be put into service. Drilling a new well outside the current source water assessment 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
Department of Natural Resources Digital Orthophoto Quarter Quadrangles
USGS Topographic 7.5 Minute Quadrangles
Maryland Office of Planning 1997 Frederick County Land Use Map
Maryland Office of Planning 1996 Frederick County Sewer Map

TABLES

FIGURES

APPENDICES

APPENDIX A: REPORT FROM MDE OIL CONTROL PROGRAM

DOMESTIC WELL PETROLEUM CONTAMINATION LIBERTYTOWN FREDERICK COUNTY

November 10, 1999 Status

Background: On September 24, 1999 an MDE inspector was notified of gasoline contamination in several homes in Libertytown, Frederick County. These homes were in the vicinity of the intersection of Main Street, Maryland State road 550 and Route 26. On September 27th water samples were taken from three homes with strong gasoline odors. Lab results for benzene, a known human carcinogen and gasoline additive, in these homes ranged from zero to 2463 part per billion (ppb). The EPA has set the maximum permissible level of benzene in drinking water at 5 ppb. MDE then set into motion a series of activities designed to protect residents from additional exposure to contaminants, identify additional domestic wells that were impacted and locate and remove the source of contamination. These activities are summarized below:

- Residence with known impacts were informed of the results and scheduled for carbon units to filter their water.
- A flyer was distributed in the community inform residents of the contamination and requesting MDE be contact if unusual odors or tastes were noticed in the water.
- In addition to individual homes, water samples were taken of all known community gathering places such as churches, the fire hall and elementary school.
- All active underground storage tank facilities were inspected for compliance with leak detection requirements and found to be in compliance.
- Historical information was gathered from town residents on possible sources of the gasoline contamination.

Results of Initial Activities

- Of the 48 locations sampled results for 17 locations are still being processed by the laboratory. Of the 31 results received, 7 locations have results of benzene above the 5 ppb drinking water standard.
- Eight carbon units have been installed at impacted homes. One replaced an existing unit installed by the homeowner prior to MDE's involvement.
- The Libertytown elementary school's water results were positive for another gasoline additive known as MTBE, Methyl Tertiary Butyl Ether, at 5 ppb. There is no EPA health risk minimum standard for this contaminant but EPA has establish a taste and odor threshold of 20 to 40 ppb. The School District responded to the result by providing bottled water to the students as of Tuesday, November 9th, within one working day of learning of the results.

Other Areas of Interest

- Two articles on the contamination in Liberytown appeared in the Frederick News Post. One on Thursday, November 4th and another on Saturday, November 6th.
- MDE was contacted by Dave Dishneau of the Associated Press for an update on contamination in Libertytown.
- MDE has estimated its costs expended to date at \$20,000.

Future Activities

- The president of Liberytown Civic Association has contacted MDE and requested a public meeting on the contamination. MDE will respond to this request and plan an outreach meeting.
- The possible source of the contamination has been identified as the owner of the local antique store, a former country store with gasoline tanks. He is willing to proceed with the removal of the underground storage tanks the week of November 15th.

November 18, 1999 Update

- The owner of the antique store (suspected responsible party) is no longer willing to remove the USTs. His attorney advised him that the tanks are in the right of way of the road and are the responsibility of MDOT. Mr. Clingan, the owner, is however willing to sign an access agreement to allow MDE to proceed with the removal and remediation. An access agreement has been overnight mailed for his signature.
- The State Highway Agency position is firm that underground storage tanks (USTs) in the right of way are still the responsibility of the owner and operator of the USTs. MDE concurs with SHA's position. A meeting with the State Highway Agency is planned to coordinate details of traffic control and to be prepared for the possibility of the road being undermined by the tank removal activities. SHA is willing to provide traffic control or road closures, if needed, but all SHA costs must be reimbursed.
- MTBE has been detected in the stream between the school and the local 7-11 at 7ppb. Additional samples from upstream and downstream of the 7-11 as well as additional domestic wells sampling between the 7-11 and the school are planned. A review of the OCP case file on the 7-11 found a positive result for MTBE in a monitoring well just prior to closure of the investigation. MTBE was not a chemical of concern within state LUST programs at the time of site investigation and closure. Officials from 7-11 are in the process of being notified of their potential responsible party status.
- The Libertytown Elementary School has two wells that join together prior to entering the school. One well had no MTBE detected and the other had test results of 64 ppb. The resulting dilution of the wells accounted for the water tested right from a faucet in the school at 5 ppb. The possible solution of turning off the contaminated well has been referred to MDE's Water Management Administration. It could be an easy fix to the problem or it could cause the contamination to spread.
- A third article appeared in the Frederick News Post on November 18, 1999. The article by Krista Brick was titled, "School's water contaminated". This prompted the school to send a third letter home with students informing the parents of the continued use of bottled water. School district officials report the article caused no phone calls to the school on the day of the article.
- MDE is drafting 54 letters to owners of properties and/or tenants reporting no petroleum contamination was detected in their water samples. Seven residential homes and the school have positive results showing petroleum contamination.
- Once the details of the tank removal at the antique store are worked out with the State Highway Administration and a date is determined for the removal, a public meeting in the town will be held. The contaminant investigation continues.

December 2, 1999 Update

- On November 22, 1999 sampling efforts were expanded to include the homes along South Street and from the homes in the vicinity of the 7-Eleven convenience store toward the Libertytown Elementary School. In addition, sampling was done to confirm the effectiveness of the granulated carbon filters installed on the seven homes in and around the antique store. All filters produced water which was non- detect for MTBE. However, a substance, 2-butanone at 145 ppb was detected in one home. This substance is commonly found in PVC glue and is a result of the filter installation. As the glue cures the readings should diminish.
- The owner of the antique store and probable responsible party has executed an access agreement with MDE to allow MDE to proceed with the UST removal and remediation.
- Coordination with State Highways and the contractor continues in order to schedule the removal of the underground tanks at the antique store on Main Street. The removal is now targeted to occur prior to Christmas week.
- The Libertytown Elementary School continues to show MTBE impact, now 36 ppb, in one of its two wells. The water supplied to the school is combined with a second well and the MTBE end result is 4.6 ppb. The school district continues to provide bottled water for the students.
- The water upstream from the 7-Eleven was non detect for MTBE while the downstream sample was 3 ppb. 7-Eleven has been notified of their potential responsible party status.
- The public meeting will likely occur after the New Year due to a delay in the sampling results for lead. The possibility exists that lead from the leaded gasoline used in the past could have found its way to the water supply. The health and safety risk assessment needs the sample results to be complete. To supplement the public meeting a general mailing to the residents informing them of the current status of the investigation and the planned removal date is planned.

December 9, 1999 Update

- The sampling results for the expanded area of investigation including the homes along South Street and from the homes in the vicinity of the 7-Eleven convenience store toward the Liberytown Elementary School produced no additional areas of concern.
- On December 8th, Oil Control Program Staff met in Liberytown with representatives of the State Highway Administration, Mr. Clingan – the owner of the antique store and probable responsible party and representatives of ENSAT- the State-Lead contractor that will perform the tank removal. SHA has agreed to provide traffic control, which will include the closure of one lane and not the road. The period of work must be limited to between 9am and 3pm. Due to overhead electrical lines, a sign needs to be removed for excavation equipment to operate overtop of the tanks, a portion of the front porch overhang must also be removed prior to removal activities.
- Following the meeting with SHA, the State-Lead contractor has applied for the necessary permits from Frederick County for excavation activities. In addition, due to the proximity to the road, when the tanks are removed from the ground, the backfill must be compacted in 6 inch lifts. The compaction is done by a manually operated compaction device. This approach would require a person in the tank excavation pit and therefore, shoring of the excavation would be required. In lieu of this approach, ENSAT has submitted a request to SHA to use flowable ash fill as backfill thereby eliminating the need to shore the excavation.
- Due to the processing time for the permit, the alternative backfill request and the need for a 3 to 5 day window to accomplish the site preparation and removal activities, the removal activities are now not expected to happen until after the New Year. The investigation of the MTBE source and planning activities for UST removals continue.
- MDE's costs from invoices received to date from ENSAT, the State-Lead contractor for sampling and carbon filter installation total over \$30,000.

- Site work in preparation for the tank removals was accomplished during the week of December 27th which included the removal of part of the antique store's porch, which obstructs heavy equipment access over the top of the tanks. During the removal of a concrete pad on January 4th in front of the store the tops of two tanks were uncovered. These two tanks were empty of product and water.
- Removal of two underground storage tanks (UST's) believed to be the source of domestic well contamination in the Main Street area took place on January 5th. A third UST (550-gallon) believed to have stored kerosene was located on the side of the store and is scheduled for removal following contaminated soil removal from the excavation of the recently removed USTs.
- Three truckloads of contaminated soil were removed from the tank pits in front of the store. The soil was taken to the nearest disposal facility, Clean Rock. Clean fill was also obtained at Clean Rock. However, SHA decided to allow the use of flowable ash fill to bring the excavation up to grade after inspecting the site and observing the use of shoring boxes and tamping soil in 6 inch lifts.
- MDE released a press advisory prior to the removal. A photographer from the Frederick News Post did visit the site during the first day of activity. A reporter from the Frederick News Post did also contact MDE's Office of Communications.
- A mass mailing was made to the residents of the Libertytown this week updating them on the status of the investigation and informing them of the site activities. A commitment was also made to hold a public meeting to report the results of the removal activities and risk analysis of the water contamination. The time frame for the meeting is now expected to be late January or early February.
- One delay in the investigation has been the lack of response of 7-Eleven to reopen the investigation at their Libertytown location. In addition to continued tank removal activities at the antique store, next week will target a response from 7-Eleven.
- A summary of MDE's costs and projections from ENSAT work proposals include: \$30,000 for past sampling and carbon filter installation, \$92,000 for a year of sampling/carbon filter maintenance and \$44,000 for UST removal activities. The total for the above is \$166,000.

March 3, 2000 Update

- Soil samples results collected on 01/06/00 during removal activities from tank pits 1 and 2 revealed the following:
 1. Tank pit 1 Naphthalene 109 ppm, TPH-GRO 0.807 ppm, TPH-DRO 13.4 ppm
 2. Tank pit 2 Naphthalene 1140 ppm TPH-GRO 7.04 ppm, TPH-DRO 172 ppm
- On 01/07/00 Ensat excavated two USTs on RT26, one UST on RT550, and discovered a fourth UST on RT26. Numerous perforations observed on all three USTs excavated. Excavation on RT26 backfilled with flow-ash. Groundwater sample collected from old hand dug well in front of Keller residence, 12010 Main ST, sample analysis was non-detect. Two soil samples collected from tank pit excavation on RT 550, at a depth of at 5' and 6' below grade had the following results:
 1. TPH-GRO 48 ppm, TPH-DRO 1100 ppm
 2. TPH-GRO 158 ppm, TPH-DRO 1730 ppm
- On 01/11/00 Ensat excavates fourth UST. No perforations observed on tank. Ensat collects domestic well sample from Farmers & Mechanics Bank, RTs 26 & 75. Bank employees complaining about odors in water. MTBE detected in sample at 26 ppb. Soil and water samples collected from tank 4 had the following results:
 1. Water (tank content) non detect.
 2. Soil, TPH-GRO 123 ppm, TPH-DRO 10.9 ppm
- 01/13/00 Ensat and B. L. Meyers, Well Drillers, install two monitoring wells (MWs) on RT 550. MW1 drilled to depth of 40' and screened at 5-40' depth. MW2 drilled to depth of 55' and screened at 45-55' depth. Soil sample collected 13' below grade as MW 1 was being drilled had the following result:
 1. TPH-DRO 10.9 ppm
- 01/14/00 Ensat and drillers install MW3 on RT26. MW3 drilled to depth of 105' and screened at 80-105' depth.
- 01/21/00 OCP personnel collect groundwater sample from 7-Eleven store tank field monitoring pipe with the following result:
 1. Benzene 198 ppb
 2. MTBE 197980 ppb
- 01/31/00 Ensat collects twenty-nine (29) samples from seven contaminated domestic wells (DWs), four DWs adjacent to contaminated wells, and school samples.

March 3, 2000 Update (Cont.)

- 02/01/00 Ensat and drillers install MW4 on RT 26. MW4 drilled to depth of 40' and screened at 5-40' depth. OCP staff gauged all MWs and water levels as follows:
 1. MW1 26.05'
 2. MW2 25.65'
 3. MW3 26.00', strong odors
 4. MW4 25.75', strong odors
- 02/08/00 Ensat collects fourteen (14) groundwater samples from DWs in close proximity to RT 75 & 26, in response to contamination detected at bank DW. Four samples analyzed for MTBE had the following results:
 1. Bank: 37 ppb
 2. Sappington Residence, 12067 Main: 362 ppb
 3. Ecker Residence, 12065 Main: 161 ppb
 4. Barnes Residence, 12068 Main: 2 ppb
- 2/09/00 Ensat collects two samples from RT 75 & 26 area.
- 02/11/00 Ensat collects twelve (12) groundwater samples. Three confirmatory samples for wells impacted and nine additional wells included into the sampling study zone. Ensat and plumber install GAC system at Bank. Bank DW serves four businesses. Businesses will be asked to reimburse MDE and take over the maintenance of systems.
- 02/18/00 Ensat and plumber installed GAC units at Sappington and Ecker residence. Ensat and plumber inspect GAC system at Coscetti property, 12001 Main St. Coscetti complaining about low water pressure. Indicated that carbon dust caused blockage of water piper. Plumber checked system and indicated pressure tank and pressure switch needed replacement.
- Following the detection of Benzene and MTBE in a monitoring pipe at the active 7-Eleven retail gasoline station in the company is finally moving forward to investigate their possible contribution to the MTBE well contamination at the school. The Stage II vapor recovery lines were tested on the 3/1/00 with tank and product line testing scheduled for 3/2/00. Containment sump testing will follow on 3/3/00 and 3/6/00. Next step will be the installation of new monitoring wells to define the extent of the groundwater contamination and determine if it has migrated offsite.
- The most recent MTBE sampling results, November 1999, for the Libertytown East Community Water System were negative. These two wells are about the same distance east of the Route 75 MTBE contamination area as the distance Rt. 75 is from the original contamination area at Main Street and Rt. 550.

APPENDIX B: REPORT FROM MDE OIL CONTROL PROGRAM

DOMESTIC WELL PETROLEUM CONTAMINATION MONROVIA FREDERICK COUNTY Case # 2000-1301FR

Background:

On 0/05/98 three 1,000 gallon gasoline underground storage tanks (USTs) were removed from the Green Valley Garage, located on RT 80, across the street from the Welch property. OCP staff was present to observe excavation. No perforations or contamination detected.

On 01/24/00 OCP staff receives phone call from Sharon Welch, 3936 Shakespeare Way, concerning petroleum odors in drinking water. Ms. Welch indicated problem has been occurring since summer time. She did not realize what the problem could be until she and her husband watched the 60-Minute program concerning MTBE.

Results of Initial Activities:

- On 01/ 28/00 OCP collects groundwater sample from Welch property. The residents are informed of the two-week normal turnaround time for results. The residents decide to arrange for an additional sample on their own and contact Fredericktowne Lab to sample their domestic well(DW). The results were as follows:
 1. Fredericktowne Sample- Benzene: 280 ppb and MTBE: 380 ppb
 2. DHMH Sample- Benzene: 153 ppb and MTBE: 260 ppb
- On 02/09/00 OCP performs compliance and Stage II inspection at Green Valley Garage, 11602 Fingerboard Road. No violations were noted. Required owner to sample DW at garage.
- On 02/09/00 OCP contractor, Ensat Corporation, collects eleven (11) groundwater samples (3-day turn around time) from homes and elementary school located in close proximity to gasoline station and Welch property. Three additional DWs identified with gasoline contamination as follows:
 1. Anderson, 11602 Fingerboard Rd (Gas Station), Benzene 672 ppb, MTBE 756 ppb
 2. Wilcom, 11508C Fingerboard Rd, MTBE 13 ppb
 3. Peters, 4002 Tranquility Ct, MTBE 23 ppb

- On 02/11/00 Ensat and plumber install granular activated carbon (GAC) treatment system on Welch property. Ensat and OCP collects seven (7) groundwater samples (3-day TAT) from homes not sampled on 2/9. Two additional homes identified with gasoline contamination as follows:
 1. Clark, 4006 Tranquility CT, MTBE 21 ppb
 2. Holahan, 4004 Tranquility CT, MTBE 4.8 ppb
- 02/17/00 Ensat collects four confirmatory samples (Wilcom, Peters, Clark, and Holahan) from impacted wells to verify presence of MTBE in DWs. Samples submitted for 24 hour turn around time.

Other Areas of Interest:

- *Fox Channel 5 (Washington D.C.) Station did an interview with Welch on 2/17/00.*
- School samples were non-detect for Volatile Organic Compounds (VOCs). School currently has water fountains shut off due to presence of metals in water. Bottled water provided for staff and students.

Future Activities:

- Confirmatory samples with MTBE levels above the EPA Health Advisory of 20 ppb will have a granular activated carbon (GAC) treatment system installed by the OCP.

**March 3, 2000 Update
MONROVIA**

- On 02/18/00 Ensat collects eight (8) samples, one confirmatory sample, Holahan, and seven new samples (3-day TAT) from Tranquility CT and Chaucer CT.
- On 02/22/00 Ensat collects eight (8) samples, one confirmatory sample (4004 Tranquility Ct) and seven new samples (3-day turn around time). The residence at 4010 Tranquility Ct. is showing MTBE at 7 ppb.
- On 02/24/00 Ensat and Water Doctor (water treatment specialist) check Welch GAC system. Welch indicating that system still produces stale odor and now has an oily film in the water. Ensat and plumber install GAC system at Clark (4006 Tranquility Ct) and Peters (4002 Tranquility Ct.) residence.
- Seven homes have been identified with MTBE in their domestic well. The extent of the contamination has not yet been defined on Tranquility Ct. Additional sampling to be performed to identify extent of contamination.
- A follow up sample at the Holahan residence, 4004 Tranquility Ct. showed MTBE levels increased from 5 to 11ppb. OCP will probably have to install a GAC system at this residence if the increasing trend continues.

APPENDIX C

Report of underground injection control inspections from MDE Ground Water Permits Program.

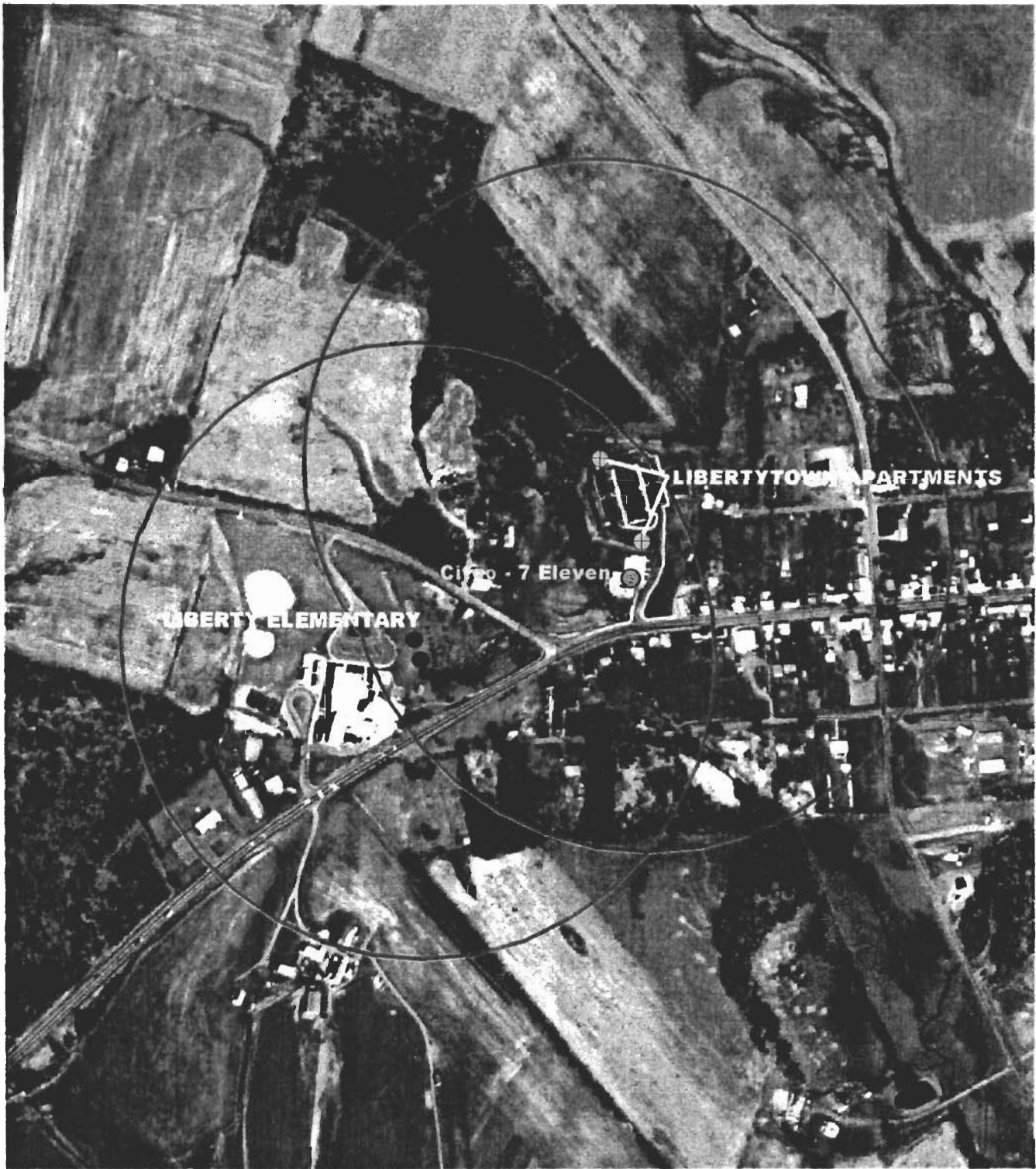


Figure 2b. Source Water Assessment Areas for Liberytown Apartments and Liberty Elementary with Potential Contaminant Sources

Legend

- Community Supply Wells
- Non-Transient Non-Community Supply Wells
- Source Water Assessment Area
- Underground Storage Tank



500 0 500 Feet

Base Photo Source: DNR DOQQ Walkersville NE 4-8-93, Liberytown NW 4-3-95