Department of the Environment

Groundwater Protection Program

Annual Report to the Maryland General Assembly 2013

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Water Supply Program
Water Management Administration

Prepared for:

The Maryland General Assembly
Annapolis, MD

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EXECUTIVE SUMMARY

Approximately one-third of Maryland's population depends on groundwater for drinking water. Groundwater is a finite natural resource, and is fundamental to the long term growth and economic vitality of Maryland. Maintaining a safe and sustainable supply of groundwater is critical to Maryland's public health and prosperity. In 1985, the Maryland Senate adopted Senate Joint Resolution No. 25, which directed the MDE(DHMH at the time) to report by July 1, 1986, and annually thereafter on the development and implementation of a Comprehensive Groundwater Protection Strategy, and the coordinated efforts by State agencies to manage groundwater in the State. This report provides an account of MDE's continuing work toward this mission, and its coordinating efforts with other stakeholders and State agencies during Fiscal Year (FY) 2013. FY2013 accomplishments reflect the evolution of State programs in response to advancing science and increasing public interest in the quality and quantity of groundwater, and the State's continuing emphasis on citizen education and assistance to reinforce regulatory programs. Highlights of groundwater management initiatives during FY 2013 (July 1, 2012 – June 30, 2013) include the following activities:

- As part of the Fractured Rock Water Supply Study, four reports were published, including the Fractured Rock Science Plan. Two other reports assessed factors affecting well yield in the fractured rock areas of Maryland and the impacts of water withdrawals on the hydro-ecological integrity of fractured rock streams. The fourth report is a statistical classification of fractured rock catchments (groups of watersheds) into hydrogeologic regions, based on climatic, topographic, and geologic variables. Lack of funding in FY2013 precluded any significant activity on the Coastal Plain Groundwater Study.
- Work continued under the Marcellus Shale Safe Drilling Initiative to determine whether and how gas production from the Marcellus Shale can be accomplished without unacceptable risk. MDE contracted with the University of Maryland Center for Environmental Science, Appalachian Laboratory, to survey best practices for Marcellus Shale drilling. A suite of best practices suitable for Maryland was presented in a report of recommendations to MDE.
- The USGS published a study on groundwater impacts from the Pearce Creek Dredge Material Containment Area (DMCA) in Cecil County. The study concluded that the dredge spoils disposal site has degraded water quality in nearby residential wells. The Cecil County Department of Health is working to test potentially affected residential wells to determine if the water is acceptable for drinking and other household uses. Additionally, MDE is working with the US Army Corps of Engineers to study the influence of the Courthouse Point Dredge Material Disposal Area, also in Cecil County, on groundwater quality.
- MDE worked with contractors to develop wellhead protection plans for 20 communities with drinking water wells that are vulnerable to contamination. Recommended actions for

source protection include outreach measures, land ordinances, agricultural best management practices, and protection of undeveloped lands.

- MDE published a final regulation that requires nitrogen-removal technology for all on-site sewage disposal systems serving new construction on land draining to the Chesapeake Bay and Atlantic Coastal Bays, or in other areas impaired by nitrogen. On-site sewage disposal systems each discharge an average of 23 pounds of nitrogen per year to groundwater. Systems with the best available nitrogen removal technology will produce half as much pollution as their traditional counterparts.
- Work on the recommendations made by the Governor's Advisory Committee on the Management and Protection of the State's Water Resources (Wolman Commission) came to halt due to lack of funding.

The importance of groundwater to public health and Maryland's environment and economy cannot be over-emphasized. Continuation and enhancement of programs that protect this resource must remain a priority, yet the financial support for this important program is often overlooked. In order to ensure the long-term viability of Maryland's groundwater resource, MDE will need additional resources to facilitate a better understanding and implement a comprehensive strategy for the protection of this critical resource.

INTRODUCTION AND BACKGROUND

In 1985 the Maryland General Assembly passed Senate Joint Resolution No. 25 requiring the Maryland Department of the Environment as the lead agency to develop a Comprehensive Groundwater Protection Strategy for the State to protect the quality and quantity of groundwater . The Assembly directed the Department of Agriculture (MDA) and the Department of Natural Resources (MDNR) to work cooperatively with the Department of the Environment (MDE), in development, coordination, and planning of groundwater policies, programs, and strategies in Maryland. A steering committee formed by MDE, MDA and MDNR produced Maryland's Comprehensive Grou The Maryland Groundwater Protection Strategy is guided by the following goal:

> *The State of Maryland is committed to protect the physical, chemical and biological integrity of the groundwater resource, in order to protect human health and the environment, to ensure that in the future an adequate supply of the resource is available, and in all situations, to manage that resource for the greatest beneficial use of the citizens of the State.*

State, federal and local agencies continue to work cooperatively to achieve this goal with programs that educate business, industry, and the public about the importance of water protection and conservation, in concurrence with programs that enforce federal and State water protection laws. Maryland has become a leader in the implementation of land use practices that minimize the impacts of development on surface and groundwater with best management practices, sensitive area protection (forests, wetlands, groundwater recharge areas, etc.) and Smart Growth that promotes development in regional growth centers where transportation and other public infrastructure are already in place.

This report provides an overview of the condition of Maryland's groundwater resources and a description of efforts in FY 2013 to characterize, restore, allocate, conserve and protect groundwater in Maryland through programs implemented by MDE, and its coordinated efforts with MDA, and MDNR**.**

Figure 1: A winning poster for the first annual MDE Earth Day Poster Contest, themed: Reclaim the Bay! By Aaron Zhu, 1st Grade

MARYLAND'S GROUNDWATER RESOURCES

Groundwater is an abundant, but finite natural resource that sustains Maryland's natural ecosystems and growing population. Groundwater is the source of crucial, continuous base flows to Maryland's rivers, streams and wetlands. It is also a large source of the freshwater that flows to the Chesapeake Bay and to coastal bays. Groundwater also provides freshwater for residential, agricultural, industrial, energy production and other uses in Maryland. About 14% of Maryland citizens obtain water from a well that they own. Overall about 32% of Maryland's population relies on groundwater sources whether from a public source or an individual well. In southern Maryland and the Eastern Shore, groundwater meets practically all water supply needs.

Geologic Conditions

Geologic conditions vary widely across the State, and produce significant variations in the quantity and quality of groundwater. Aquifers in Maryland fall into two major types: unconsolidated Coastal Plain aquifers found east of the Fall Line (a geologic divide that generally coincides with the Interstate 95 corridor), and hard rock aquifers found in the western part of the State. Coastal Plain aquifers composed primarily of sand and gravel layers separated by layers of silt and clay, are productive and generally of good quality. Hard rock aquifers are composed of consolidated sedimentary and crystalline rock, and provide generally low to moderate water yields.

Unconfined aquifers are found throughout the State, and are the primary source of groundwater in the western part of the State. Water levels in these aquifers undergo seasonal fluctuation and are principally recharged by precipitation during the fall and winter months. Confined aquifers, in contrast, are not as directly influenced by precipitation and climate changes because they are separated from the ground surface by relatively impervious layers such as silt, clay or rock. In southern Maryland and on the Eastern Shore, confined aquifers are the primary source of drinking water. The water levels in some confined aquifers in southern Maryland and on the Eastern Shore show long-term steady declines in areas of high use. Increased water demands from a growing population place new stresses on these aquifers. More detailed monitoring and analysis of the State's groundwater resources is needed to assess the long-term viability of many of the State's aquifers in the face of existing and increasing demands for water.

In the Piedmont region, where aquifers consist largely of fractured, consolidated bedrock, successful groundwater production depends on the size and number of water-bearing fractures encountered at a particular well site. Consequently, some fractured-rock aquifers have the lowest yields in the State. Consolidated rocks of sedimentary origin, which can be found in parts of the Piedmont, Valley and Ridge, and Appalachian Plateau regions, can yield higher amounts of water than other fractured rock aquifers. Carbonate aquifers have some of the highest yields of consolidated aquifers in Maryland due to the presence of potentially large solution cavities, a factor that also renders them susceptible to contamination from surface sources.

Declining water level trends in some areas of southern Maryland have raised questions about the long-term sustainability of current groundwater withdrawals. On the Eastern Shore, increases in agricultural irrigation continue to place greater demands on groundwater supplies.

The uncertain degree to which groundwater moves between different aquifers in the Coastal Plain is a major obstacle to reliable predictions of sustained aquifer yields in both Southern Maryland and the Eastern Shore. In hard rock aquifers in the western part of Maryland, the availability of groundwater to meet the increasing demands of growing communities is also uncertain, particularly where growth is concentrated.

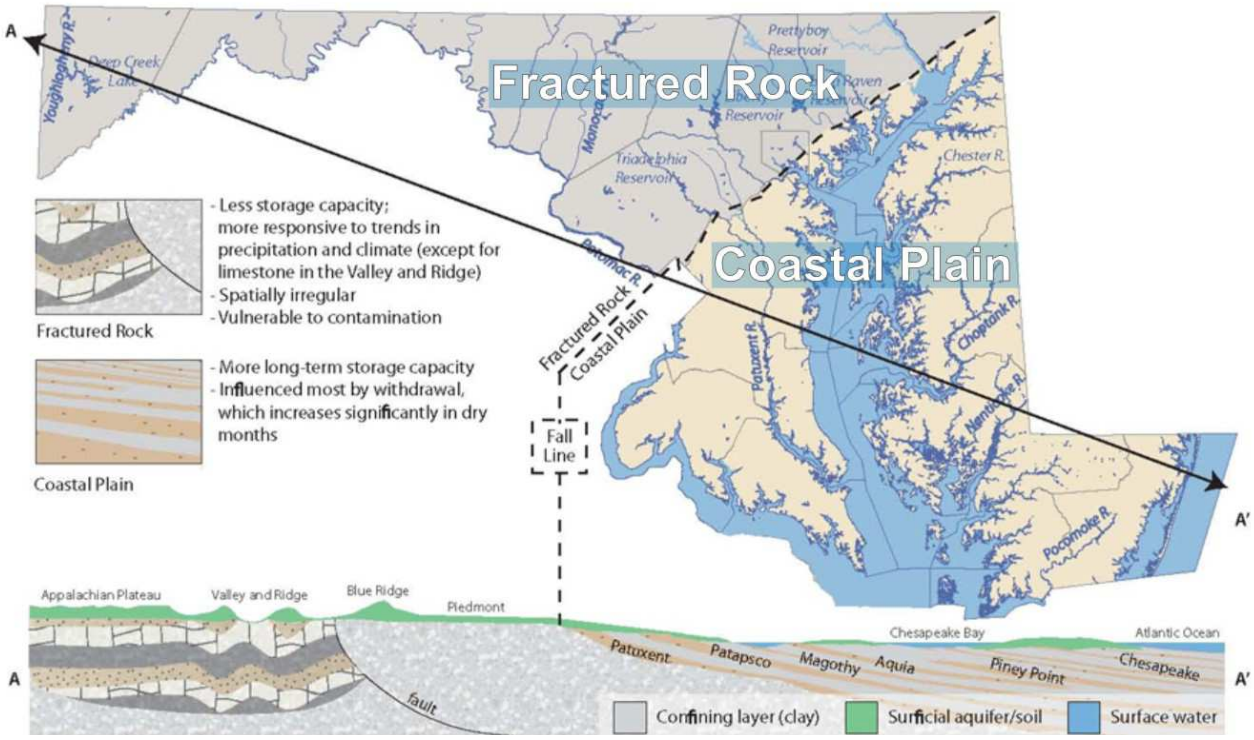

Figure 2: Division and characteristics of fractured-rock and Coastal Plain geology in Maryland (from MDNR)

Groundwater Quality and Quantity

Except in some urban and industrial areas, Maryland's groundwaters are generally of good quality and meet drinking water standards. Incidents of serious contamination are usually localized near specific contamination sources. However, geologic conditions in some areas of the State make groundwater more vulnerable to anthropogenic influences. Areas most susceptible to groundwater contamination from local land use are the carbonate rock areas of Allegany, Garrett, Washington, Fredrick, Carroll and Baltimore Counties; the unconfined Coastal Plain aquifers; the outcrop areas of major confined aquifers along the Baltimore-Washington corridor; and the hard rock aquifers of central and western Maryland. Potential contaminant sources include point sources such as landfills, underground storage tanks, spills, improper discharge of wastes containing solvents (such as dry cleaning fluids), and improper storage of

salt, fertilizer, or other materials on bare ground. Military installations often present unique risks such as contamination from perchlorate, an ingredient of solid rocket propellant.

Nonpoint sources of groundwater contamination include livestock waste, onsite sewage disposal, application of fertilizers and pesticides, infiltration of urban runoff and road salt application. Nonpoint sources usually do not cause excessive contamination at specific well locations but often represent the largest loadings of pollutants to groundwater over large areas. Because groundwater contributes a significant percentage of water to surface water flow, delivery and reduction of nutrients via groundwater is a significant issue for Maryland's streams and reservoirs, and has a major impact on water quality in the Chesapeake Bay.

Local natural conditions affect both the availability and the quality of groundwater. While natural groundwater quality is generally good, some areas may have hard water and locally high iron levels. Surveys of naturally occurring radionuclides in groundwater have shown that portions of the Magothy and Potomac Group aquifers in the Coastal Plain, primarily in Anne Arundel County, are subject to high levels of radium. The Piedmont Aquifers of central Maryland often have elevated radon levels. Levels of naturally occurring arsenic above the federal drinking water standard are not uncommon in Garrett County and in the Aquia and Piney Point aquifers in southern Maryland and the central Eastern Shore. In portions of the carbonate rock aquifers of Central and Western Maryland, groundwater may be directly influenced by surface water, presenting the risk of pathogen contamination.

Although water resource indicators for Maryland suggest that there is an abundance of water to meet present and future needs, in recent years some areas have suffered serious water shortages. The 2002 drought ignited widespread concern for the adequacy of the State's water resources. Furthermore, Maryland's population is expected to increase by about 1.1 million over the next 25 years. Population growth, increasing demand for agricultural water use, changes in land use, and climate change, will further tax the State's water resources.

As water demand increases with population growth, communities find it increasingly difficult to find sufficient quantities of water without reaching beyond the boundary where they have a clear right to withdraw groundwater. The need to preserve some groundwater as base flow discharge to local streams and wetlands also affects its availability for withdrawals. In some areas, water quality concerns can limit the quantity of water available for withdrawal. For example, the threat of brackish water intrusion into the Aquia aquifer beneath Kent Island has precluded its full development as a drinking water supply source. In other instances, groundwater contamination due to a variety of human activities has affected water withdrawals at numerous sites.

Reliable assessments of water availability cannot be made without additional monitoring and modeling of groundwater movement within and between aquifers. Such information is needed to better predict the movement of groundwater contaminants as well. Estimating the sustainable yield of the State's aquifers will be an essential step in assessing the adequacy of Maryland's groundwater to meet the needs of current and future generations and their environment.

GROUNDWATER RESOURCES PROTECTION

Coordination of Groundwater Protection

Agency Coordination

MDE has the primary responsibility for the protection of Maryland's groundwater resources. MDE's comprehensive approach involves coordination and collaboration with a number of State agencies and various stakeholders such as, the Maryland Department of Agriculture (MDA), the Maryland Department of Natural Resources (MDNR), local governments, and scientific organizations such as the Maryland Geological Surveys (MGS) and the US Geological Survey (USGS). Many programs within MDE regulate specific types of potential pollution sources to the State's water resources and address compliance with applicable regulations. In addition to the many water quality protection programs, MDE's Water Supply Program manages water withdrawals to ensure against unreasonable impacts on the water resource and other water users. FY2013 program activities related to groundwater are described in subsequent sections. Complete descriptions of the programs themselves are provided in the Appendix.

MDA coordinates with MDE on issues related to pesticide usage and nutrient management. Development of regulatory controls and best management practices for storage and application of pesticides helps to minimize groundwater contamination. Nutrient management plans protect the health of waterways by establishing both short and long-term strategies for reducing nutrient levels in groundwater, streams, rivers and the Chesapeake Bay. MDE also works with the Maryland Geological Survey (MGS) of the MDNR on projects related to the assessment of water supplies and groundwater resources. Ongoing projects include Statewide groundwater quality and groundwater level monitoring.

In addition to coordinating with other State agencies, MDE partners with federal agencies, such as the United States Geological Survey (USGS), to conduct technical projects on groundwater quality or resource availability (see Table 1 below). In 2013, two cooperative studies, the Coastal Plain Groundwater Study and the Fractured-Rock Water Supply Study that were initiated in 2008, and supported financially by MDE based on recommendations of the Governor's Advisory Committee for the Management and Protection of the State's Water Resources have been suspended due to lack of financial support.

Annually, the Water Supply Program (WSP) receives approximately $385,000 through §106 of the Clean Water Act to manage the groundwater protection responsibility under the source protection guidelines outlined in the grant agreement with the U.S. Environmental Protection Agency (EPA). . These funds are used to support our comprehensive efforts for the coordination of activities around the State, including groundwater assessment projects, wellhead protection efforts and educational outreach activities.

A listing of programs involved in groundwater protection is provided in Table 1 below. Detailed information about each program is available on the referenced pages in the Appendix.

Table 1:

Groundwater Protection Activities. See MDE program descriptions in the Appendix.

Maryland Department of the Environment		
Water Management Administration		
Activity	**Program/Office**	**Appendix Page**
Water Appropriations and Use Permits	Water Supply Program	A-2
Source Water Protection	Water Supply Program	A-2
Safe Drinking Water Act Implementation & Technical Assistance	Water Supply Program	A-2
Groundwater Discharge Permits	Wastewater Permits Program	A-3
Underground Injection Control	Wastewater Permits Program	A-3
On-Site Sewage Disposal Systems	Wastewater Permits Program	A-4
Water Well Construction	Wastewater Permits Program	A-5
Stormwater Management	Sediment, Stormwater & Dam Safety Program	A-5
Land Management Administration		
State and Federal Site Remediation	Land Restoration Program	A-6
Voluntary Site Cleanup	Land Restoration Program	A-6
Hazardous Waste Management	Land Restoration Program Solid Waste Program Waste Diversion & Utilization Program	A-7
Underground Storage Tank Oversight	Oil Control Program	A-8
Oil Control	Oil Control Program	A-8
Solid Waste Management	Solid Waste Program	A-9
Waste Diversion & Utilization	Waste Diversion & Utilization Program	A-9
Mining Permits	Mining Program	A-10
Maryland Department of Natural Resources		
Maryland Geological Survey	Resource Assessment Service	-
Monitoring and non-Tidal Assessments	Resource Assessment Service	-
Maryland Department of Agriculture		
Nutrient Management	Office of Resource Conservation	-
Pesticides Management	Office of Plant Industries and Pest Management	-
U.S. Department of the Interior		
Water Resources Investigations	U.S. Geological Survey	-
U.S. Environmental Protection Agency		
The State coordinates with various offices within USEPA to implement the Safe Drinking Water Act, Source Water Protection Programs, Underground Injection Control Program, site remediation, and other activities.		-

Education & Outreach

Each September, the Water Supply Program sponsors the Maryland Groundwater Symposium. This event has continued to evolve as a key source of topical information on the most current issues affecting groundwater management in the State. On September 27, 2012, the twenty-first annual symposium attracted more than 430 sanitarians and other groundwater professionals from local governments, State and federal agencies, and private sector organizations. The keynote address was provided by the Honorable Maggie McIntosh, Representative, Maryland House of Delegates. Other plenary presenters included Ed Singer representing the Conference of Environmental Health Directors, and John H. Quigley, former Secretary of the Pennsylvania Department of Conservation and Natural Resources. More than thirty presenters addressed a variety of topics related to groundwater, including source water protection; drinking water, wells, and water use, on-site sewage disposal, and groundwater flow, contaminant transport, and modeling. Presenters included participants from local, State and federal organizations, including MDE, MDNR (including MGS), EPA, USGS, University of Maryland, Frederick County Department of Planning, Anne Arundel Health Department, Augusta County Service Authority (Virginia), Virginia Department of Public Health, Maryland Onsite Wastewater Professionals Association and several consulting companies.

Governor Martin O'Malley proclaimed the week of March 10-16, 2013, as Groundwater Awareness Week. Maryland Groundwater Awareness Week encourages citizens to learn more about groundwater, issues of contamination, and ways to protect our freshwater supplies. For Groundwater Awareness Week, MDE's Secretary, Robert Summers, PhD, participated in an outreach event at Sandy Point State Park. Dr. Summers with Frank Dawson, Assistant Secretary of the Department of Natural Resources, Maryland Environmental Services, and Canaan Valley Institute, highlighted the importance of properly functioning septic systems and drinking water-well maintenance.

Figure 3: MDE Secretary, Robert Summers, participates in an education event at Sandy Point State Park for Groundwater Awareness Week, March 2013

Challenging issues in Management of Groundwater Resources

The Maryland Coastal Plain region, including southern Maryland and the Eastern Shore, is largely dependent upon groundwater for its water supply. Decades of increased pumping due to increasing demand have created substantial cones of depression in confined aquifers of Southern Maryland. To protect the storage capacity of these aquifers, WSP has begun directing, , applicants for new water appropriation permits to apply for withdrawal from deeper aquifers. Switching water use to deeper aquifers has allowed both aquifer recovery and stabilization of water levels in some locations.

Central Maryland communities in the Piedmont region have expended considerable resources seeking adequate water supplies to support new growth and/or enhance the reliability of their sources for existing users. While the largest towns and cities in the Piedmont rely on surface water, many medium and smaller towns rely primarily on groundwater sources. One challenge is that water systems do not always know how their sources may be impacted by drought conditions. That raises a significant concern since some communities have made commitments to provide water beyond the reliable drought capacity of their existing water supplies.

The conditions described above highlight the importance of managing water resources, including the management of both use and demand. MDE's Water Supply Program (WSP) manages water use through its permitting program to ensure that water uses are beneficial and do not have an unreasonable impact on the resource or other users. The State also assists with community development of plans to reduce demand, manage growth, and seek alternative water supplies.

Demand management is a means for extending water supplies and delaying or eliminating the need to develop new sources. Sound water use practices reduce the amount of stress that we place on our resources, both by limiting water withdrawals and by decreasing wastewater discharges. Managing demand is one important alternative that water suppliers can use to help meet their water supply needs.

Water efficiency technologies, water reuse, and behavioral changes can reduce water demand by at least 10 to 20 percent, effectively extending existing water supplies. Demand management strategies can include a variety of options. Potential approaches include reducing losses from leakage, implementing rate structures or rate surcharges that encourage customers to conserve, providing incentives for customers to install low-flow fixtures or appliances, working individually with large-volume users to identify potential water savings, and using public outreach and education to encourage consumers to modify their behavior. Conducting leak detection surveys and installing more sophisticated metering systems will help communities determine locations of leaks, which can result in more rapid repair and greater water savings.

The need for additional resources to ensure that the State is able to effectively manage its water resources, including groundwater supplies, was documented in the series of reports by the Advisory Committee on the Management and Protection of the State's Water Resources (2004, 2006 and 2008). One possible source of funding is the implementation of a permit fee for Water Appropriation and Use permits. During the 2012 legislative session, legislation was introduced to give MDE authority to implement a permit application and water use management fee. The

Bill did not pass. MDE met with stakeholders in the fall of 2012 to discuss various potential fee structures. No consensus was obtained and no bill was introduced in the 2013 legislative session. In May of 2013, MDE, the U.S. Geological Survey (USGS), the Maryland Department of Natural Resources - Monitoring and Non-Tidal Assessment Division (MDNR-MANTA), and the Maryland Geological Survey (MGS) met with the Chesapeake Environmental Protection Association (CEPA) to discuss funding needs and priorities for comprehensive water supply studies, including the Coastal Plain and Fractured Rock Water Supply Studies, discussed later in this report.

Water Appropriation and Use Permitting

Through the permitting process, MDE's Water Supply Program seeks to assure that groundwater withdrawals do not exceed the sustained yield of the State's aquifers. Rigorous evaluations of permit applications are performed to ensure appropriate useage. See Appendix page A-2 for additional programmatic description.

Between May 2012 and April 2013, WSP issued approximately 727 Water Appropriation and Use Permits, including new and reissued permits. Of new permits issued, fifty-six percent were issued for agricultural irrigation. However, approximately eighty-three percent of new permits issued for water use greater than 10,000 gallons per day (average use) were for agricultural purposes. About eighty-nine percent of new permits issued were for groundwater withdrawals as opposed to withdrawals from surface water.

In addition to processing permit applications, the program continued to evaluate requests for exemptions, per *Maryland Code Annotated*, Environment Article §5-502. The law exempts most groundwater withdrawals of 5,000 gallons per day (gpd) or less from the requirement to obtain a permit. Permits must still be obtained for community drinking water systems and withdrawals located in Water Management Strategy Areas (see p.13). In FY2013, WSP focused heavily on expired permits that are eligible for exemption. As a result, in FY 2013 (to June 11, 2013), 471 exemptions were granted.

Environment Article §5-516 enacted civil penalties for violations of appropriation regulations, or failing to comply with a Water Appropriations and Use Permit. This allows the WSP to more effectively enforce permit conditions. In FY 2013, the WSP issued Notices of Violation for failure to renew a permit, failure to report water usage as required by the permit, and withdrawal of more water than allocated under the permit. WSP also increased their focus on compliance with special permit conditions, such as requirements for maintaining minimum stream-flow when withdrawing surface water. In FY 2013, 225 enforcement actions were taken.

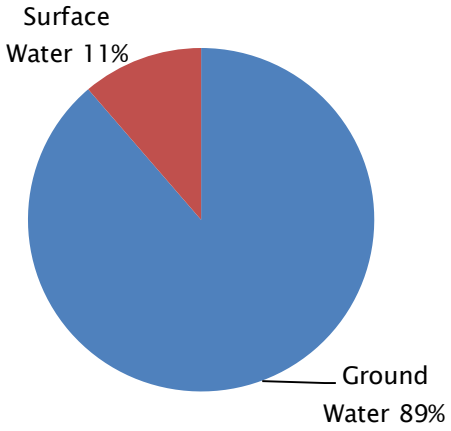

Figure 4: Water source for permits issued from May 2012 through April 2013

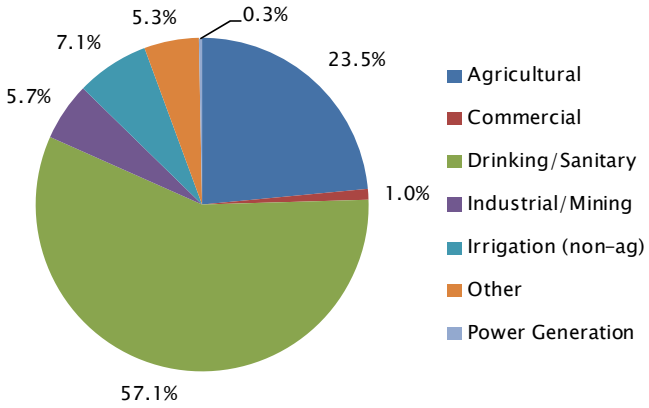

Figure 5: Type of water use for all active permits as a percentage of the total number of active permits to May 9, 2013

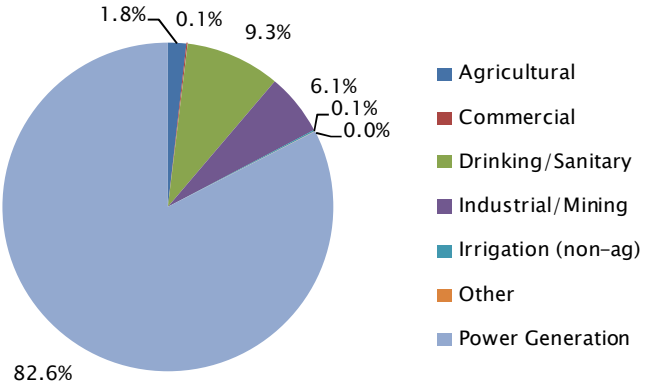

Figure 6: Type of water use for all active permits as a percentage of total water appropriated (e.g. 83% of all water appropriated is for power generation; data to May 9, 2013)

This year, WSP increased its focus on maintaining system compliance with permit conditions that require annual submission of water audits and loss reduction plans. Water audits are conducted to determine the amount of water lost from a distribution system due to leakage, storage overflow, meter malfunctions, and theft. Annual audits are included as a permit condition for all public drinking water systems that serve more than 10,000 people. If a water audit indicates water loss greater than 10%, the system is required to develop and implement a water loss reduction plan. Water auditing and loss reduction improves water use efficiency and can save a water system from having to invest in the development of new sources. In FY2013, WSP published revised guidance for preparing water audits and water loss reduction plans and developed an improved tracking system to monitor submissions.

In FY2013, WSP also revised the guidance document and worksheet for completing capacity management plans. Capacity management plans are required for systems that operate at or above 80% of their water appropriation permit allocations. The plans are useful in identifying the relationship between the demand for water and the capability of the system to meet that demand. WSP also oversaw a contract in FY2013 for the completion of 42 capacity management plans at community water systems across the State. A summary of findings from those plans has been developed and in 2014, MDE will review the summary, identify future and existing deficits, and work with water systems to alleviate any deficits.

Smart Growth and Water Supply in the Piedmont Region of Maryland

Smart Growth development occurs at a density of at least 3.5 residential units per acre, while drought year groundwater recharge in the Piedmont is typically between one and two units per acre. Communities therefore will depend on recharge beyond the boundaries of their water service areas in order to serve the new development. Towns using groundwater as their sole water source have struggled with the problem of obtaining sufficient land to ensure that water recharge is sufficient to meet the communities' needs.

During the 2008 legislative session, the Maryland General Assembly passed SB 674, which authorizes MDE to give priority to public water systems that provide water to municipal corporations when allocating groundwater in Carroll, Frederick, or Washington counties. Beginning in 2009, MDE met several times with a stakeholder workgroup to develop regulations for implementing this law. Regulations are under review at MDE and are expected to be published in the Fall of 2013.

Water Management Strategy Areas

Areas that require special groundwater management consideration are delineated as Water Management Strategy Areas. Special consideration is given to aquifers experiencing excessive drawdown and/or salt water intrusion. Management options include limiting withdrawals in a certain aquifer, directing withdrawals to a different aquifer, or additional scrutiny and/or water level monitoring when permits are requested for these areas. Water Management Strategy Areas are identified in Table 2.

The Aquia aquifer on the Kent Island in Queen Anne's County is affected by salt water intrusion, which is exacerbated by pumping. To prevent further degradation of the Aquia aquifer, new appropriations for Kent Island are directed to deeper aquifers. Due to salt water intrusion, special management considerations are also taken into account when permitting withdrawals for the Aquia aquifer in the Annapolis Neck area of Anne Arundel County, the upper and lower Patapsco aquifers in the Indian Head areas of Charles County, and the Columbia aquifer beneath the Ocean Pines area in Worcester County.

The Maryland Geological Survey (MGS) continued to monitor and assess the effects related to saltwater intrusion in FY 2013. Groundwater quality monitoring continued on Kent Island and in Ocean City. Ocean City's water supply comes from wells in three well fields,

including the Gorman Avenue and 44th Street well fields. The Gorman Avenue wells are screened in the deeper, brackish, Manokin aquifer. The major source of brackish water in the Manokin aquifer is the lateral encroachment of the freshwater-saltwater mixing zone. The 44th Street wells are screened in the shallower Ocean City aquifer. Leakage of brackish water from the Manokin aquifer into the Ocean City aquifer has resulted in chloride concentrations approaching the secondary standard at some 44th Street well field locations. High chloride concentrations are exacerbated by pumping and a relatively thin confining unit between the Manokin and Ocean City aquifers. USGS monitors groundwater levels and chloride levels in about 25 wells in the Ocean City area, and provides Ocean City with a summary report at the end of each year. The annual report also includes pumpage amounts from Ocean City's production wells.

Table 2: Water Management Strategy Areas

Area	County	Target Aquifer	Issue
Annapolis Neck	Anne Arundel	Aquia	Saltwater Intrusion
Indian Head	Charles	Lower & Upper Patapsco	Excessive Drawdown & Saltwater Intrusion
Waldorf	Charles	Magothy Patapsco	Excessive Drawdown
Kent Island	Queen Anne	Aquia	Saltwater Intrusion
St. Martin's River/ Ocean Pines	Worcester	Columbia	Saltwater Intrusion

Excessive drawdown is identified to be a concern for the Lower Patapsco and Magothy aquifers in Charles County. When evaluating permit requests for withdrawals from confined aquifers, by regulation, the WSP must not allow drawdown below the "80% Management Level" (Figure 7). The 80% Management Level represents 80% of the drawdown from the pre-pumping potentiometric surface (well water-level) to the top of the aquifer. In the 1980's, a plan was developed to limit water use from the Magothy aquifer to ensure that water levels stayed above the 80% Management Level and to develop wells in the Lower Patapsco aquifer to reduce the stress on the Magothy. Since the plan was developed, water levels in the Magothy aquifer have been maintained significantly above regulatory thresholds. By 2007, however, the new withdrawals from the Lower Patapsco aquifer resulted in water levels reaching the 80% Management Levels along the Potomac River. Subsequent reduction of withdrawals from the Lower Patapsco has allowed water levels to rebound. A long-term solution for the water supply needs of Charles County has yet to be developed.

Agricultural water use has been growing steadily in recent years, particularly for irrigation on Maryland's Eastern Shore. In general, the WSP directs large irrigators to use the unconfined aquifers, reserving the more protected confined aquifers for individual potable and municipal uses. In some areas, however, the unconfined aquifer produces low yields, or is nonexistent, compelling an increasing number of farmers to seek water appropriation permits for confined aquifers or surface water. In some of these instances the shallowest confined aquifers have many individual users and nearby municipal users. Analysis by the Department has resulted in advising a few farmers to consider using deeper confined aquifers to avoid conflicts with individual well owners and municipal uses.

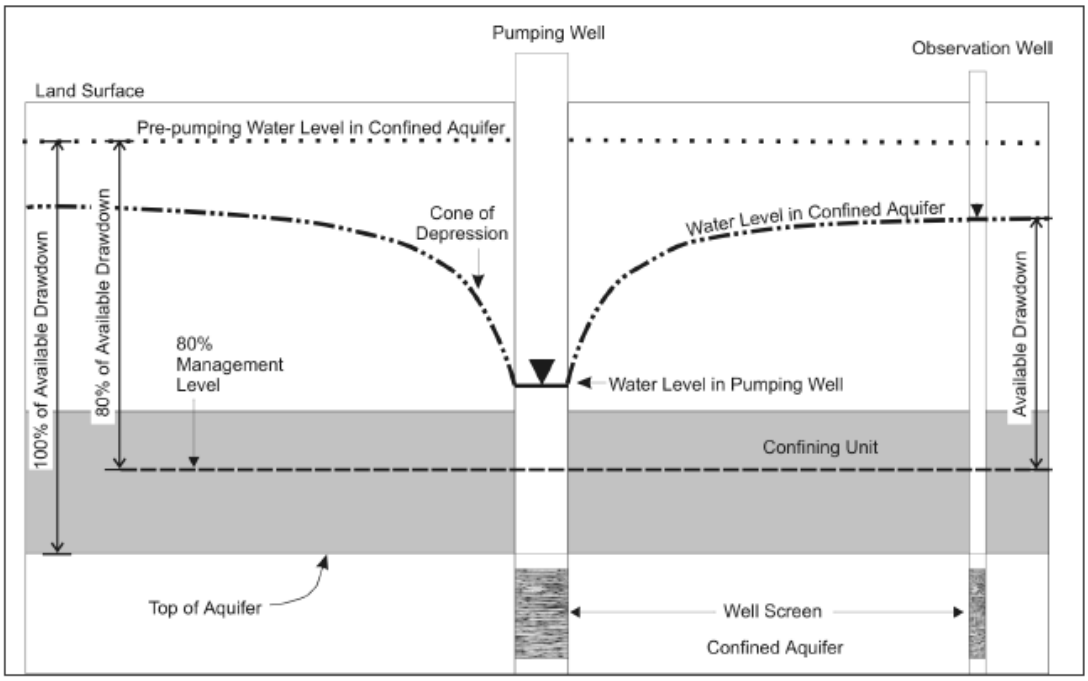

Figure 7: Illustration of the 80% Management Level in confined aquifers.

Drought Management

Drought conditions are evaluated on a regional basis, and drought status is assessed monthly during normal conditions and more frequently when drought conditions exist. During a period of drought emergency, MDE coordinates with local governments through a network of local drought coordinators and maintains continual contact with water suppliers to ensure that the detrimental impacts of a drought emergency are minimized. Each year, MDE works with the USGS to add "real-time" monitoring capability to additional wells that are monitored for drought. Real-time groundwater measurements that improve data availability and allow the State to better assess drought conditions are only available at 2 of the 25 sites measured monthly to monitor for drought. In FY2010, eight wells were converted to real-time. Unfortunately, as of June 2013, none of the wells converted to real-time in FY2010 are still real-time. Real-time measurements were discontinued at three sites during FY2013 due to lack of funding.

MDE evaluates drought status for each region using appropriate regional indicators, which may include rainfall, stream flow, groundwater levels, and reservoir storage. Rainfall is evaluated as percent departure from average, from the start of the Water Year (October 1). Stream flow is evaluated by comparing the 30 day average to the historic record of 30 day averages ending the same day of the year. Groundwater levels are evaluated either by comparison with the historic record of measured values in the same month of the year, or, for a confined aquifer, as a departure from trend. Reservoir levels are evaluated using an estimate of days of storage remaining. Regional assessments, however, may not be adequate to predict water shortages at specific localities and/or water systems. Some local governments have developed individualized drought response plans to meet their specific communities' needs.

The Eastern and Central Regions of Maryland were in Drought Watch at the end of FY 2012. By July 2012, drought conditions for the Eastern Region had progressed into Warning status (more severe than Watch). By the end of August and September, 2012, conditions had returned to Normal for the Central and Eastern Regions, respectively. While groundwater levels in the unconfined aquifer in the Eastern Shore were lower than normal as a consequence of the drought, the difference was relatively small (about 2 feet below monthly median values during the Warning period) compared to the full thickness of the aquifer (typically 40 – 100 feet thick). Although wells in the unconfined aquifer were not threatened, the drought monitoring showed that stream flows in the Eastern Shore were in the lowest five percentile values during the summer of 2012, as a few feet of decline in aquifer levels can translate into significantly lower stream flow. The Department received a few calls during 2012 regarding impacts of lowered water levels in confined aquifers on a few private water supplies.

All Maryland Drought Regions were in "Normal" status at the end of June, 2013. MDE's website (www.mde.state.md.us/programs/Water/DroughtInformation) is accessible by the public and shows current hydrologic conditions and drought assessment data. When regions are "Normal" status, drought evaluation is performed at the end of the month.

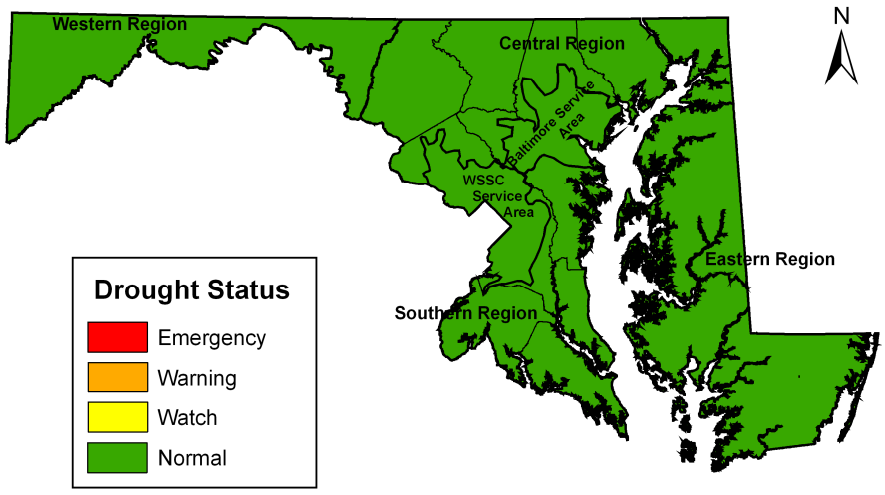

Figure 8: Drought Status in Maryland as of June 30, 2013

Monitoring and Assessment of Groundwater

Many of the initiatives described below are ongoing efforts that provide critical support to other State groundwater management programs. Although these programs provide crucial short term information, their primary value will be the comprehensive picture of groundwater resources that they will provide over time. The future of these projects is uncertain, and sufficient funding has not been secured to complete the necessary work. It is essential that long-range funding is provided to assure the maximum benefit of the groundwater assessment efforts.

Coastal Plain and Fractured Rock Water Supply Studies

In 2004, the Maryland Advisory Committee on the Management and Protection of the State's Water Resources identified the need for a comprehensive assessment of groundwater resources in the Maryland Coastal Plain, where the population is expected to grow by 44 percent between the years 2002 and 2030. Withdrawals from the confined aquifers of the Coastal Plain in southern Maryland and the Eastern Shore have caused water levels in some aquifers to decline by tens to hundreds of feet from their original levels, and the rate of decline is expected to increase as the population in these areas grows. A more comprehensive understanding of the confined aquifer systems and how much water is available in these systems is needed in order to make sound management decisions and appropriately evaluate water withdrawal requests. The first phase of a three-phase Regional Coastal Plain Aquifer Assessment began in 2006.

Similarly, the 2008 Final Report of the Maryland Advisory Committee on the Management and Protection of the State's Water Resources identified the need for a comprehensive assessment of water resources in the part of Maryland underlain by fractured-bedrock aquifers. This region covers the area of the State north and west of Interstate 95 and supplies water to approximately 4.4 million Maryland residents, or approximately 76 percent of the State's population. The fractured rock region is particularly susceptible to drought, because groundwater is mostly unconfined and responds directly to recharge (or the lack thereof). The Fractured Rock Water Supply Study was initiated in 2009.

In FY 2013, four reports were published:

- "*Statistical Classification of Hydrogeologic Regions in the Fractured Rock Area of Maryland and Parts of the District of Columbia, Virginia, West Virginia, Pennsylvania, and Delaware*" (available at http://pubs.usgs.gov/sir/2013/5043/);
- "*Ecological Response to Flow Alteration: A Literature Review Within the Context of the Maryland Hydroecological Integrity Assessment*";
- "*A Science Plan for a Comprehensive Assessment of Water Supply in the Region Underlain by Fractured Rock in Maryland*" (available at http://pubs.usgs.gov/sir/2012/5160); and

- Report of Investigations No. 79, "*Preliminary Assessment of Factors Affecting Well Yields in the Fractured-Rock Terrane of Frederick County and Portions of Carroll and Montgomery Counties, Maryland*."

The latter report evaluated 2,315 wells in the study area with respect to well yield and geology, well depth, well construction, and other factors. Additionally in FY2013, the Maryland Coastal Plain Aquifer Information System (MCPAIS), a geospatially-referenced database that includes hydrologic, geologic, and water-use data for the Coastal Plain, was updated to make it compatible for use with Version 10 of ArcGIS.

To date, activities have been supported by funds from MDE and in-kind services from MDE, MGS, MDNR, and USGS. Lack of funding in FY2013 precluded the funding partners from performing any significant activity on the Coastal Plain Study. Completion of future activities will require an estimated $14M from current and new funding partners. Information about the studies can be found at the project website: http://md.water.usgs.gov/wss/. The agencies are seeking funding from a variety of sources, but to date funds have not been identified to support the continuation of these important investigations.

Planned future study activities include:

- Enhancement of groundwater level, stream flow, and water quality monitoring networks;
- Development of tools to facilitate scientifically sound management of groundwater resources;
- Compilation of additional water quality information;
- Continuation of outreach activities and providing selected tool components for public use;
- Completion of a comprehensive water-use database with a cross-reference table;
- Development of a Sustainable Yield Estimator desktop tool for the fractured rock region;
- Completion of a regional analysis of factors affecting reliable fractured rock groundwater yields;
- Completion of an evaluation of the influence of withdrawals to stream hydroecology in the fractured rock region; and
- Completion detailed studies of the Coastal Plain groundwater flow system and water budget.

Results of a recent (June 2012) study performed by USGS, MGS, and MDE documents the age of groundwater in the upper Patapsco aquifer in the Maryland Coastal Plain. The study determined that the age of groundwater in the upper Patapsco aquifer ranges from a few years old to over one million years old. The oldest water was found at the greatest distance from the aquifer outcrop area. These results will be used to help calibrate groundwater flow models that are planned for development under the Coastal Plain Groundwater Study. Further Information on this study is available at: http://www.usgs.gov/newsroom/article.asp?ID=3246#.UbdtYvq_-Sp

Evaluation of Lead and pH in Harford County

The MGS, in cooperation with the Harford County Health Department (HCHD), evaluated the occurrence and distribution of lead and pH in well water in the Piedmont area of Harford County. Lead concentrations from water samples collected from some wells in the Grafton Ridge community in Harford County exceeded the U.S. Environmental Protection Agency's Action Level of 15 micrograms per liter (µg/L). The source of the lead in the water has been a matter of dispute. Eighty domestic water wells were sampled and tested for lead, pH, chloride, and specific conductance. The water quality data will be evaluated in relation to geologic formation, and will provide a baseline of data that can be used to guide management initiatives. The DHMH collected data on the plumbing system at each site, and these data will be used to help identify potential sources of lead found in drinking-water systems. The final report for this project will be available in September 2013.

Maryland Groundwater Quality Monitoring Network

The Maryland Groundwater Quality Monitoring Network is an ongoing monitoring effort intended to document the chemical quality of Maryland aquifers. In FY 2013, MGS continued to work on well-water methane evaluation in the Appalachian Plateau of Maryland. This work is being done because of the interest in the potential development of natural gas reserves in the Marcellus Shale in western Maryland. Water samples collected from wells in these counties will provide an overall assessment of ground-water methane concentrations in the region and a baseline prior to any drilling for natural gas in the Marcellus Shale.

In FY2013, MGS produced a report to MDE entitled "*Dissolved-Methane Concentrations in Well Water in the Appalachian Plateau Physiographic Province of Maryland*." This report discusses well-water methane levels in 49 wells sampled in 2012. About 40 percent of wells had detectable levels of methane present, most of which had very low concentrations. None of the samples exceeded the recommended action level of 10,000 micrograms per liter. Also in 2013, MGS sampled an additional 30 wells for methane. Monthly methane samples and isotopic samples were collected to help determine methane variation and sources. The study, while not yet complete, indicates that there can be significant variability in methane concentrations in the same well over time. MGS plans to publish a final report on the methane sampling in FY 2014.

The USGS also conducted sampling of several public water supply wells in order to assist in establishing baseline water quality conditions in western Maryland. Samples were analyzed for a suite of parameters including major and minor ions, trace elements, and radiochemical constituents associated with Marcellus Shale formation fluids and hydraulic fracturing fluids. Samples were also analyzed for dissolved gases including methane.

Groundwater Level Monitoring

Water-level data are collected on an ongoing basis by MGS and USGS from several statewide, regional, and county networks. Statewide, Maryland's groundwater network consists of approximately 200 wells that are monitored at intervals ranging from continuous recording (mostly in the unconfined aquifers) to biannually (in confined aquifers). Additionally, about 260

wells in the Maryland Coastal Plain are measured once a year to monitor effects of groundwater withdrawals by power plants and other users; these data are used to publish potentiometric-surface maps for major aquifers. Several counties also support additional water-level groundwater monitoring at 45 wells by MGS and USGS. All data collected by MGS and USGS personnel are stored in the USGS-NWIS database and are published annually.

Marcellus Shale Safe Drilling Initiative

Portions of the gas-rich Marcellus and Utica shale formations underlie the western-most part of Maryland (mostly Garrett and Allegany counties). Advances in two technologies, horizontal drilling and high-volume hydraulic fracturing, have enabled the economic recovery of hydrocarbon resources from these formations. The process involves drilling vertically from the surface until the drill bit approaches the shale formation, then turning the bit to drill horizontally through the shale, sometimes for more than a mile. Steel casing is inserted into the borehole and cemented in place to isolate the gas well from any underground sources of drinking water. The casing in the horizontal portion is perforated and a mixture of water, small particles (usually sand) and chemicals are injected under high pressure; the shale fractures and the particles prop the fractures open, allowing the gas to flow into the wellbore.

The first application for a permit to produce gas from the Marcellus Shale in Maryland using horizontal drilling and high volume hydraulic fracturing was received in 2009. Applications for a total of seven wells were received by MDE, but all applications have since been withdrawn. Although there has been gas drilling and production in Maryland for decades, recovering gas from the Marcellus Shale presents new opportunities and challenges. The industry claims that there have been no documented occurrences of groundwater contamination associated with hydraulic fracturing, but investigations are underway at the federal level and in other states into instances of drinking water contamination to see if they were caused by gas operations.

To address the need for information to evaluate these permit applications properly, the Governor issued the Marcellus Shale Safe Drilling Initiative in Executive Order 01.01.2011.11 on June 6, 2011. The order directs MDE and DNR to assemble and consult with an Advisory Commission in the study of specific topics related to horizontal drilling and high volume hydraulic fracturing in tight shales. The purpose is to assist State policymakers and regulators in determining whether and how gas production from the Marcellus Shale in Maryland can be accomplished without unacceptable risks of adverse impacts to public health, safety, the environment, and natural resources.

The first report was completed in December 2011. This report made recommendations about raising money to fund the studies and recommendations for revisions to the law on liability. House Bill 1123 (2012) included one of the liability recommendations; it passed and was signed by the Governor. It provides, beginning July 1, 2012, that if a water supply within 2500 feet of a vertical borehole is shown to be contaminated within 1 year after a gas well is installed and completed, there is a presumption that the gas well activity is the cause, unless the

owner of the drinking water supply refused to allow sampling before the gas activity began. The operator of the gas well can provide evidence to rebut the presumption.

In the 2013 legislative session, SB 854 was passed and becomes law on October 1, 2013. That law, which was also recommended in the December 2011 report, modifies the financial assurance requirements for oil and gas wells to ensure that sufficient money will be available to close the well if the operator fails to do so. It also requires environmental impairment liability insurance.

The date for the second report, on best practices, was extended to August 2013. In furtherance of developing Best Practices recommendations, MDE contracted with the University of Maryland Center for Environmental Science, Appalachian Laboratory, to survey best practices from several states and other sources, and to recommend to MDE a suite of best practices appropriate for Maryland. The principal investigators, Keith N. Eshleman, Ph.D. and Andrew Elmore, Ph.D., compiled best practices from five states, as well as the recommendations of expert panels and organizations, and presented a suite of best practices suitable for Maryland in *Recommended Best Management Practices for Marcellus Shale Development in Maryland.*[1] MDE and DNR are currently evaluating those recommendations and preparing a report on their recommended practices. A draft for public comment is expected to be released in the spring of 2014.

The Governor proposed and the legislature approved a supplemental FY2013 appropriation that provides MDE with $1 million and DNR with $500,000 to complete the studies required under the Executive Order. The Departments are using this money, among other things, to expand the pre-drilling monitoring of air and water, and undertake an economic study and a public health study. The final report mandated by the Executive Order is due August 2014.

Even before this additional money became available, DNR had expanded and modified its monitoring program to include 12 continuous water monitoring sites chosen for their relevance to potential gas development. DNR also began a volunteer partnership with Garrett County watershed associations, Trout Unlimited and other citizens where volunteer stream waders are collecting baseline water and biological data from over 70 stream segments. More information on stream monitoring in the Marcellus shale region can be found online (http://www.dnr.state.md.us/streams/marcellus.asp).

Oversight of Public Water Systems

Groundwater continues to be a reliable and safe source of drinking water for thousands of Maryland residents. MDE's Water Supply Program is responsible for ensuring that public drinking water in Maryland is safe and adequate. Statewide, there are about 473 community public drinking water systems, of which about 423 use groundwater as their only water source. These groundwater systems serve more than 700,000 residents. Additionally there are about 553

1 http://www.mde.state.md.us/programs/Land/mining/marcellus/Documents/Eshleman_Elmore_Final_BMP_Report_22113_Red.pdf

Maryland facilities defined by the Safe Drinking Water Act as non-community non-transient public water systems that rely on groundwater. These small facilities include schools, day care centers, and office buildings. There are also about 2,381 transient non-community public systems such as restaurants, churches, community centers, and campgrounds that use their own groundwater wells.

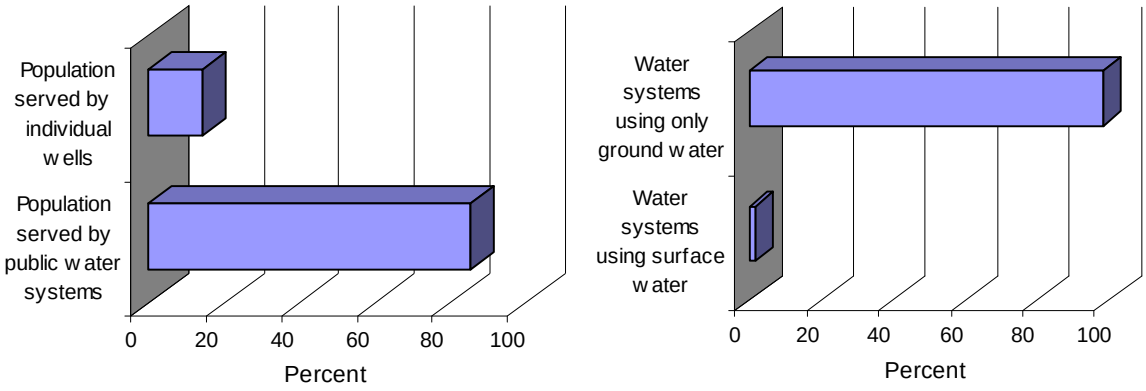

Figure 9: Percentage of population served by public water systems or individual (private) wells and percentage of water systems using surface or groundwater (PDWIS, 2012).

New Regulatory Initiatives

On February 13, 2013, EPA promulgated the final Revised Total Coliform Rule (RTCR), amending the 1989 Total Coliform Rule (TCR). The 1989 TCR was promulgated to protect public health by ensuring the integrity of public drinking water systems through monitoring for the presence of microbial contamination. The RTCR requires public water systems that may be vulnerable to microbial contamination to identify and fix defects. The new rule also establishes specific criteria for small groundwater systems to qualify for and stay on reduced monitoring. The potential for increased monitoring frequency has been added for high-risk small systems with an unacceptable compliance history. The RTCR also establishes a Maximum Contaminant Level Goal (MCLG) and Maximum Contaminant Level (MCL) for *E. Coli*, and eliminates the MCLG and MCL for total coliform. *E. Coli* is a more specific indicator of fecal contamination and other pathogens. Some public notification requirements have also changed under the RTCR. Public water systems and agencies must comply with the requirements of the RTCR beginning April 1, 2016. Systems on annual monitoring must have an initial and reoccurring annual site visits beginning in calendar year 2017.

Wellhead Protection

The Water Supply Program has delineated wellhead protection areas (WHPAs) around each public drinking water well, identified existing and potential sources of contamination, and offered recommendations for protecting the water supply sources. Implementing protection

plans, however, must be a local effort involving citizens, the regulated community, and elected officials.

During FY2013, two outside vendors worked closely with 20 communities to develop wellhead protection plans. The vendors are under contract with MDE. The communities developing wellhead protection plans were selected because their drinking water systems include wells that are potentially vulnerable to contamination. Recommended actions for source protection include land use ordinances, agricultural best management practices, protection of forested lands, and outreach to commercial, industrial, and residential consumers. Final reports will be submitted to MDE by Fall 2013. In FY2014, MDE will work with the selected communities to implement the measures identified in the wellhead protection plans.

Well Siting

One priority for MDE's Water Supply Program is to ensure the safety of new public water supplies by reviewing and evaluating proposals for the siting of new wells. To ensure that wells are sited in the safest locations, staff review Departmental databases to identify existing or potential contamination sources, and use site investigations to verify this information and evaluate any additional factors that might influence the safety of the water supply. In FY 2013, the Water Supply Program reviewed proposals for the siting of approximately 18 new public water supply wells.

Figure 10: MDE staff member performing a well inspection

WATER QUALITY PROTECTION AND RESTORATION

Groundwater supplies in Maryland are impacted by both natural influences and human-induced contamination. Population growth and development over the past 50 years has impacted water quality in both agricultural and urban areas in the State. Although Maryland has many programs in place to minimize and remediate existing groundwater contamination, threats to groundwater quality increase as new homes, new commercial development, and new roads are built to meet the needs of a growing population.

Drinking Water Quality Issues

Public drinking water systems are required by Federal law to monitor regularly to assure compliance with EPA standards. In Maryland, private individual wells are typically tested only for limited contaminants (bacteria and nitrates) when the well is first drilled; any subsequent testing is at the discretion of the homeowner.

Water Quality Study of Coastal Plain Aquifers

As part of its National Water Quality Assessment program (NAWQA), the USGS sampled groundwater quality in Maryland under two separate initiatives in FY2013. Under the Principal Aquifer Assessment, about 25 public water-supply wells in confined aquifers throughout Southern Maryland and the Eastern Shore were sampled during the summer of 2012. Under another initiative to assess the effects of land use on groundwater quality, wells in shallow unconfined aquifers were sampled on the Eastern Shore. Groundwater samples were analyzed for a broad array of water quality constituents, including major ions, nutrients, volatile organic compounds, metals, and pesticides. These data are available from the National Water Information System (NWIS) at http://nwis.waterdata.usgs.gov/md/nwis/qwdata. Table 3 shows the wells sampled for the land use assessment. The information shown in Table 3 must be input into the NWIS web interface to review the samples collected under this assessment.

Table 3: Wells sampled by the USGS for the land use assessment

County	Sample ID / Site Number	Sample Date	County	Sample ID / Site Number	Sample Date
Caroline	385009075444402	6/27/2012	Somerset	381245075404002	8/15/2012
Dorchester	383225075565002	7/9/2012	Caroline	385134075480401	8/16/2012
Dorchester	383328076153602	7/10/2012	Worcester	380358075292901	8/20/2012
Kent	391927076000301	7/11/2012	Worcester	381754075083603	8/22/2012
Caroline	384631075524901	7/23/2012	Wicomico	382403075233202	8/29/2012
Queen Annes	390126075575402	7/31/2012	Worcester	381543075273802	8/30/2012
Talbot	384946076002201	8/14/2012	Kent	391836075560801	9/26/2012

Dredge Materials Containment Areas, Cecil County

Pearce Creek

The Pearce Creek Dredge Material Containment Area (DMCA) is located in the western part of Cecil County in Earlville, Maryland, just east of the Chesapeake Bay and along the Elk River and Pearce Creek. The DMCA has been owned by the U.S. Government since the 1930's and was used by the U.S. Army Corps of Engineers (USACE) for the placement of dredged material from the approach channel to the Chesapeake and Delaware (C&D) Canal until 1992. Due to groundwater deterioration which was detected in the vicinity of the site, MDE has not authorized the use of the DMCA since that time. Subsequent to 1992, the Pooles Island open-water placement site(s) were used for the placement of dredged material until these areas were closed in 2010, as required State law.

In FY2013, the USGS released a report on groundwater impacts on water quality in the vicinity of the Pearce Creek DMCA. The study ("*Hydrogeologic Framework, Hydrology, and Water Quality in the Pearce Creek Dredge Material Containment Area and Vicinity, Cecil County, Maryland, 2010-11*"; http://pubs.usgs.gov/sir/2012/5263/), conducted by the USGS in cooperation with USACE, concluded that use of the DMCA, combined with pre-existing natural conditions, has degraded nearby groundwater quality. The data collected over a two year period from new and existing wells (including domestic wells) and surface water sites, indicate that the DMCA has influenced both natural groundwater flow patterns and water quality. In most of the samples analyzed, heavy metals in the water were elevated above the applicable regulatory threshold (primary MCL, secondary MCL, or health advisory levels). The USGS determined that the DMCA is the source of high total dissolved solids and is the driver of geochemical processes that enhance the mobilization and transport of metals.

Unfortunately, the DMCA has impacted the source of water for wells drawing from the Magothy and the shallow upper Patapsco aquifers in the adjacent neighborhood of West View Shores. Most residential drinking water wells (71%) in West View Shores obtain their water from the shallow upper Patapsco aquifer. Since publication of the USGS report, the Cecil County Health Department has offered to perform water quality testing of potentially impacted residential wells, including testing for metals and radionuclides. MDE is working with the Maryland Port Administration (MPA) and USACE to determine options for ensuring that residents have safe drinking water. Potential options include drilling new wells in an unaffected aquifer, installing in-home treatment systems, or connecting to a public water system.

Due to the closing of the Pooles Island open water placement site(s), the future use of the Pearce Creek DMCA has taken on elevated importance to USACE and MPA. Therefore, USACE is investigating options, such as engineering controls, to ensure that any future placement of dredged material occurs in an environmentally sound manner without further impact to human health or the environment. In FY2014, MDE will evaluate these proposals, in light of the USGS study and public concerns, when making a determination on USACE's application for Water Quality Certification (WQC) pursuant to Section 401 of the Clean Water Act. WQC, issued by MDE's Wetlands and Waterways Program, is required for reuse of the site. To date, USACE has not applied to MDE for WQC to reopen the Pearce Creek DMCA.

Courthouse Point

The Courthouse Point DMCA is located northeast of the Pearce Creek DMCA, along the Elk River near the mouth of the C&D Canal. The DMCA has been used for the disposal of dredged material from the approach channel to the C&D Canal since around 1970. Similar to Pearce Creek, a Clean Water Act, Section 401 WQC from MDE is required for continued use of this site.

In its evaluation of the USACE's most recent application for a WQC to utilize the Courthouse Point DMCA, MDE requested that USACE conduct a hydrogeologic investigation to determine if local water quality has been impacted, or could potentially be impacted, by the placement of dredged material at the site. In FY2013, MDE's Water Supply Program worked with USACE to finalize plans for the sampling and analysis of water from DMCA monitoring wells and nearby residential wells. Additionally, geologic logs and groundwater flow direction will be evaluated. Currently, several new monitoring wells are being installed. All wells will be sampled by October, with results of the study expected in late 2013.

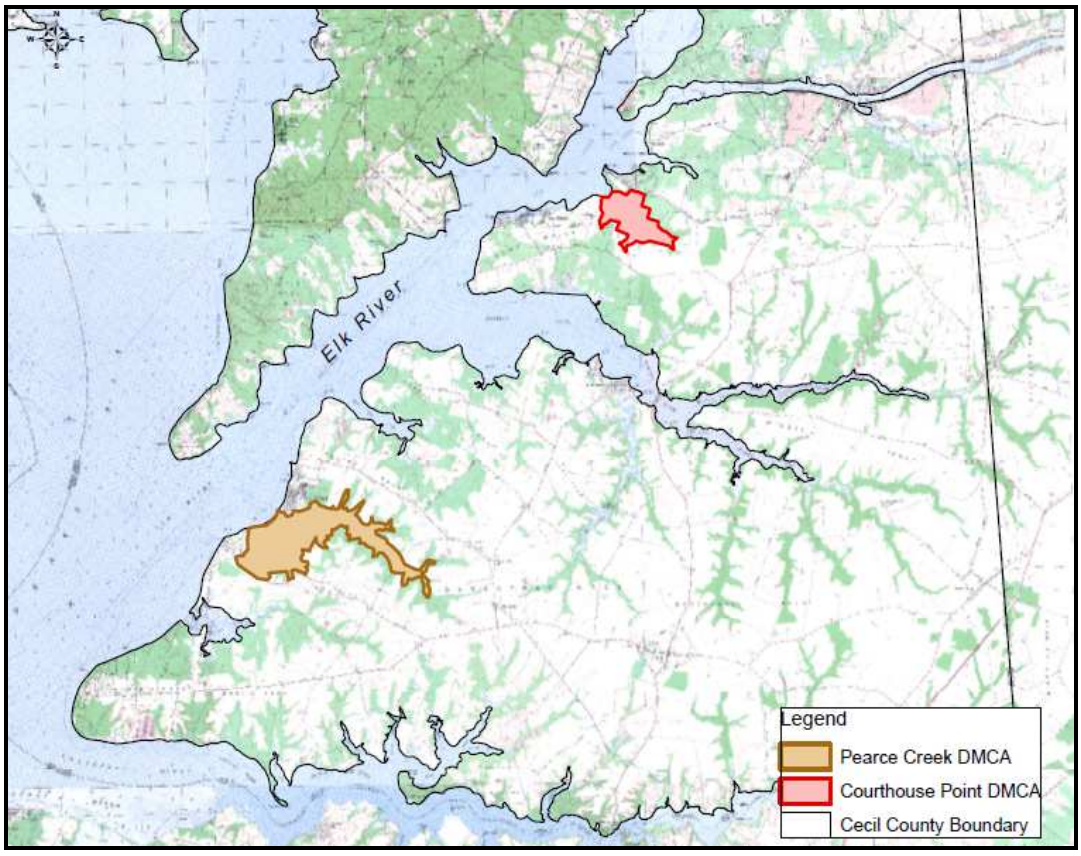

Figure 11: Location of Pearce Creek and Courthouse Point sites in Cecil County

Trichloroethylene: Salisbury-Morris Mill Site, Wicomico County

In FY2013, a collaboration of state and local agencies worked to address the discovery of trichloroethylene (TCE) in private wells in Wicomico County. The affected area is located in a rural residential area three miles south of Salisbury. It consists of the Morris Mill subdivision, the Coulbourne Wood subdivision, portions of Anthony Lane and portions of Coulbourne Mill Road. The issue is currently being addressed through collaboration between MDE's Land Management Administration and Water Supply Program, the Wicomico County Health Department, the Maryland Department of Health and Mental Hygiene, and the USEPA.

In July 2012, a resident of the Morris Mill area detected a chemical odor in his well. Analysis of the well water indicated the presence of TCE at 57 parts per billion (ppb). As a result, the Wicomico County Health Department sampled wells within a 1000 ft radius of the original well. In October 2012, MDE was notified by the Wicomico County Health Department that several residential wells were contaminated with TCE above the drinking water MCL of 5 ppb. To date, MDE has sampled water from over 250 residences and determined that 76 residential wells have concentrations of TCE ranging from detectable to 550 ppb. TCE is a chlorinated solvent not found in the natural environment. It is used in a variety of industrial applications, most commonly as an extractant and metal degreaser. TCE is dense non-aqueous phase liquid (DNAPL), and is therefore denser than water and can be difficult to remediate. Consumption of water with TCE in excess of the MCL over many years could lead to liver problems and increase the risk of getting cancer.

The affected groundwater wells are located in the Salisbury aquifer, a shallow unconfined aquifer, which is recharged rapidly from precipitation and is susceptible to both point and non point source pollution and contamination. To determine the source of contamination, a subsurface investigation was performed. The investigation consisted of the installation of ten groundwater monitoring wells for water quality analyses and water-level measurements, soil gas analyses, and in-house vapor monitoring. Additionally, a number of potential TCE sources were investigated, including a former Asphalt Plant on Route 13, several historic dump sites, the former Crystal Lake Sand and Gravel Quarry, and a former septage disposal/spreading area. Review of historic documentation and results of sample analyses indicate the most probable cause of the TCE contamination to be the historic septage disposal and spreading area. Septage at this site along Morris Mill Road was spread on farm fields from the early 1950's until mid-1980. It is suspected that TCE was used in or dumped into septic systems, from which waste was pumped for use as field fertilizer.

A Removal Action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) was implemented by the USEPA as part of their emergency response protocol. To date, 18 residences are being supplied bottled potable water. Thirty-eight residences have received granular activated carbon (GAC) water treatment systems installed by EPA. Public water service connection has been identified as the best long term solution to provide these homes with clean drinking water. Two water systems, Fruitland and Salisbury, have been identified as possible suppliers of drinking water to the affected area. The City of Fruitland has developed an initial concept for an $8 million project that would install nearly 39,000 ft of water main piping to serve 256 existing residences and potentially 314 future

residences. As of April 2013, MDE, Wicomico County and the cities of Salisbury and Fruitland are working cooperatively to find a practical and affordable solution to mitigate the problem.

Nitrate

Nitrate pollution in groundwater is becoming increasingly problematic, especially in aquifers underlying agricultural areas. The primary sources of nitrate to groundwater are from agricultural land uses, including land application of commercial fertilizers and manure from animal feeding operations. Other major sources include wastewater treatment plants, onsite sewage (septic) systems, and atmospheric deposition of air pollutants.

Due to agricultural land use practices, nitrate concentrations in shallow waters of unconfined Coastal Plain aquifers on Maryland's Eastern Shore commonly exceed the Federal Drinking Water Standard of 10 mg/L. Concentrations greater than 10 mg/L can cause methemoglobinemia, a dangerous blood disorder, in infants. Shallow groundwater is generally used for irrigation and other non-potable uses, while water for public drinking is pumped from deeper in the unconfined aquifer or from confined aquifers. Private residential wells are not monitored regularly and many homeowners are not aware of potential contamination. In addition, over time, contaminated groundwater can move deeper into the unconfined aquifer or may affect water in confined aquifers if there is a hydrologic connection between geologic layers.

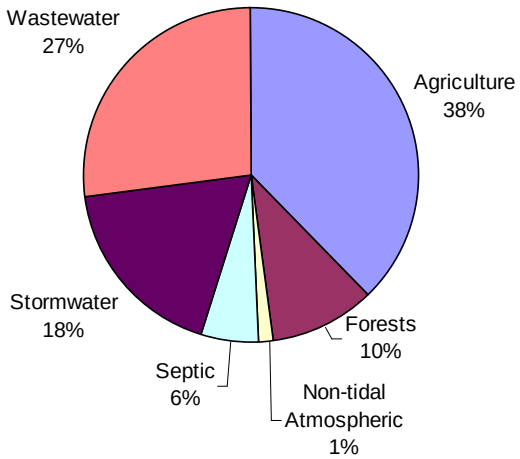

Figure 12: Nitrogen Loading to the Chesapeake Bay from Maryland, 2010
(from: Maryland Phase II Watershed Implementation Plan For The Chesapeake Bay TMDL, MDE)

Nitrate from groundwater discharges represents a major contribution to nutrient pollution in surface waters and the Chesapeake Bay. In FY2013, USGS published Scientific Investigations Report 2012-5235, on the residence time of nitrate in groundwater and surface waters in the

Coastal Plain of Delaware. Water chemistry, nitrogen isotopes, and age-dating techniques were used to estimate nitrogen residence time in groundwater of the Bucks Branch watershed in Sussex County, Delaware. Analyses indicate that the median age of groundwater is 18 years. Isotopic analyses revealed agricultural land use as the predominant source of the nitrate. Results of this study may be used by resource managers in the Mid-Atlantic Coastal Plain to better understand the impacts and timeframes of nitrogen management efforts. The relatively long residence of nitrate in the watershed implies that any reduction in nitrogen applications to land may take years to manifest in surface water quality improvements.

All public water systems are required to conduct monitoring for nitrate on at least an annual basis. In calendar year 2012, 22 water systems reported exceedance of the drinking water standard for nitrate. Currently, approximately 54 systems operate nitrate treatment systems to remove nitrate from drinking water via ion exchange and/or reverse osmosis. The number of systems treating for nitrate is up by ten since CY2011.

As part of its source water protection activities, MDE's Water Supply Program, evaluates contaminants of concern, such as nitrate. Work is ongoing to assess the sources of nitrate in groundwater used by community water supplies. Identification of nitrate sources and concentration trends can assist watersheds in the development of management actions. In addition, MDE's Wastewater Permits Program administers The Bay Restoration Fund (BRF), which finances wastewater treatment plant and septic system upgrades, and implements cover crop programs to reduce nitrogen loading to the Bay from runoff and groundwater. Approximately 600 onsite sewage disposal systems per year are upgraded to remove nitrogen; totaling 14,000 pounds of nitrogen removed from discharges to groundwater.

MDA's Nutrient Management Program works to enforce the Water Quality Improvement Act of 1998, widely known as Maryland's Nutrient Management Law. These regulations require farmers to implement nutrient management plans which address nitrogen and phosphorus inputs to the environment. On October 15, 2012, revised nutrient management regulations became effective. The revised regulations are designed to help Maryland achieve nutrient reduction goals identified in the Watershed Implementation Plan for the Chesapeake Bay. The updated regulations include new limits on nutrient and nitrogen applications and changes in nutrient source management practices.

In FY2013, a voluntary Maryland Agricultural Certainty Program was established through the passage of Senate Bill 1029. Agricultural certainty programs seek to provide agricultural operations with certainty that, in exchange for the voluntary adoption of stringent conservation practices, a state will not impose additional environmental protection requirements on their operation for a given period of time. This program will accelerate the implementation of agricultural best management practices to meet State agricultural nitrogen, phosphorus, and sediment reduction goals. The program will be developed by MDA in coordination with MDE.

Groundwater Remediation and Restoration

Contaminated Sites

MDE's Land Management Program Administers a "Superfund" program, which assesses suspected hazardous waste sites, including federal facilities, to control and remove environmental and public health threats through site cleanups and remedial actions. The Voluntary Cleanup Program provides a streamlined process for the remediation and redevelopment of former industrial or commercial properties that are contaminated or perceived to be contaminated with controlled hazardous substances. See Appendix page A-6 for further programmatic description.

The State Master List (SML) identifies potential hazardous waste sites in Maryland. The SML includes sites currently identified by the USEPA's Comprehensive Environmental Response, Compensation and Liability Information System. The SML contains 223 sites that have been identified statewide with known or potential contamination and another 211 sites that have been archived and transferred to the SML - Formerly Investigated Sites. The Non-Master List includes sites that are currently under investigation or have been previously investigated but are not listed on the SML. The Non-Master List contains 90 sites that have been identified statewide with known or potential contamination and another 176 sites that have been archived and transferred to the Non-Master List – Formerly Investigated Sites.

MDE is advising that it shall merge the current inventory of sites into a single Brownfield Master Inventory List. Consistent with the requirements of the Controlled Hazardous Substance Act, MDE shall combine sites on the State Master List, Non-Master List, and Voluntary Cleanup Program sites into a single list that shall be published on the MDE website.

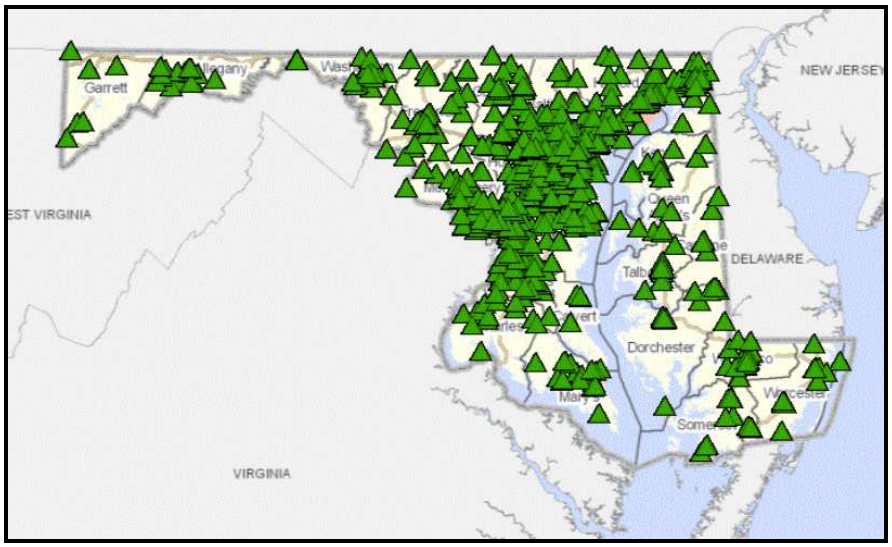

Figure 13: A searchable GIS database of Land Restoration Program Sites may be found at: http://mesgisservices.com/mde_lrp/

Since the inception of the Voluntary Cleanup Program (VCP) in 1997, 753 applications have been received for 744 properties representing approximately 15,364.24 acres. Five-hundred and ninety properties have been accepted into the program. Since 1997, the VCP has issued a Certificate of Completion (COC) for 137 properties and issued a No Further Requirements Determination (NFRD) for 281 properties. The majority of these sites were issued a prohibition on the use of groundwater beneath these areas for any purpose.

Oil Control and Underground Storage Tanks

The Oil Control Program (OCP), within MDE's Land Management Administration, is the unit responsible for the implementation of the Underground Storage Tank (UST), Leaking Underground Storage Tank (LUST), and Aboveground Storage Tank (AST) programs. These programs provide for preventive actions to minimize ground and surface water pollution from the storage of petroleum products. See Appendix page A-8 for additional programmatic description.

The OCP has tracked reports of over 11,842 confirmed underground storage tank system releases from tanks other than heating oil tanks throughout Maryland. Of these releases, over 11,497 site cleanups have been completed. During FY 2013, OCP oversaw the investigation and cleanup of over 336 heating oil related cases. The OCP continues to provide oversight at both motor fuel and heating oil sites where cleanups have been initiated. A list of open and closed petroleum subsurface investigation/remediation sites can be found on the OCP's website at: http://www.mde.state.md.us/programs/Land/OilControl/RemediationSites/Pages/Programs/LandPrograms/Oil_Control/RemediationSites/index.aspx

Emergency Response

MDE's Emergency Response conducts immediate removals of oil and hazardous materials that threaten both surface and ground water sources. Each year, Emergency Response responds to approximately 650 spills of hazardous materials and petroleum products occurring on land and water throughout the State. These spills are handled in a way that protects public health and safety and minimizes the contamination of water resources. If a spill occurs within a source water protection area, the appropriate public water system(s) will be notified so that monitoring of potential impacts to drinking water can begin. Water Supply Program engineers are on call 24-hours per day to provide technical assistance during any water supply emergency.

Onsite Sewage Disposal Systems

MDE has delegated the authority for administering on-site sewage disposal (OSDS) programs to county health departments or to a local Approving Authority. MDE personnel oversee the delegated programs, provide technical support, investigate potential public health threats and perform on-site evaluations of innovative and alternative sewage disposal system applications. Approximately 420,000 homes in Maryland use onsite sewage disposal systems. See Appendix page A-4 for additional programmatic information on OSDS and the Bay Restoration Fund.

Best Available Technology (BAT) for the removal of Nitrogen

The Maryland Department of the Environment (MDE) published a final regulation on September 13, 2012 that requires nitrogen-removal technology for all OSDS serving new construction on land draining to the Chesapeake Bay and Atlantic Coastal Bays or in other areas where bodies of water are impaired by nitrogen. This regulation includes provisions that establish minimum operation and maintenance requirements for the life of the nitrogen-removal technology to ensure that these systems do not fall into disrepair and damage the environment. Individuals who either install and/or maintain the nitrogen-removing technologies will have to complete a course of study approved by MDE and be certified by the manufacturer. The effective date of the regulation was January 1, 2013.

Recognizing the impact that development using OSDS was having on the waters of the State, the Governor formed the Task Force on Sustainable Growth and Wastewater Disposal. The Task Force convened in the summer of 2011 to recommend regulatory, statutory, or other actions to address the impacts of OSDS on nutrient pollution and development in general. The Task Force included members of the Maryland Legislature, local government, the development community and environmental groups. The above regulation implements the Task Force recommendation to require nitrogen removal technology for OSDS installed to serve new construction. The regulation will affect an estimated 55,972 septic systems, 2,240 per year, over a twenty-five year period. Each OSDS discharges on average 23.2 pounds of nitrogen per year to groundwater. OSDS with BAT produce half as much nutrient pollution as their traditional counterparts. By the 25th year, the installation of these BAT systems will be preventing 649,275 pounds of nitrogen per year from being discharged to groundwater.

Bay Restoration Fund

The Bay Restoration Fund (BRF) was signed into law on May 26, 2004, because the Chesapeake Bay had been experiencing a decline in water quality due to over-enrichment of nutrients (mainly phosphorus and nitrogen). The law established a dedicated fund for improving the water quality of the Chesapeake Bay by financing wastewater treatment plant and septic system upgrades and implementing cover crop programs to reduce nitrogen loading to the Bay from runoff and groundwater.

In FY 2012, the Maryland Legislature passed House Bill 446 which generally doubles the Bay Restoration Fee, beginning July, 2012. The fee increase was necessary to continue upgrading the State's major wastewater treatment plants with nutrient removal technologies. As a result of the BRF, more than 7.5 million pounds of nitrogen and more than 260 thousand pounds of phosphorus will be reduced each year, which will meet over one-third of Maryland's nutrient reduction commitment under the Chesapeake Bay 2000 Agreement. With the doubling of the fee, approximately 600 OSDS per year will be upgraded reducing the discharge of nitrogen to groundwater by more than 14,000 pounds each year. The BRF statute includes funding to

provide grants for the incremental cost of upgrading OSDS to best available technology (BAT) for nitrogen removal.

Through June of 2013, septic systems serving greater than 4,000 homes have been upgraded to remove nitrogen with BRF grants, reducing the load of nitrogen discharged to groundwater by over 86,000 pounds per year. To date, 16 proprietary technologies have been approved as grant eligible BATs for removing nitrogen. Currently, six proprietary technologies have unconditional approval as BAT and an additional six technologies have conditional approval as additional performance data is collected for these systems.

Legislation

Senate Bill 236, the Sustainable Growth and Agricultural Preservation Act of 2012 was passed by the General Assembly on April 9, 2012 and signed by Governor O'Malley on May 2, 2012. The purpose of the legislation is to decrease future nutrient pollution to the waters of the State and to reduce the amount of forest and agricultural land developed by large lot developments. It does this by limiting major residential subdivisions served by OSDS.

The law provides counties and municipalities the option to adopt a growth tier map that identifies where residential major and minor subdivisions may be located in their jurisdiction and what type of sewerage system will serve them. Without an adopted tier map, a local jurisdiction may not authorize a major residential subdivision served by OSDS. The four tiers described in the Act are as follows:

- Tier I areas are currently served by sewerage systems.
- Tier II areas are planned to be served by sewerage systems.
- Tier III areas are not planned to be served by sewerage systems. These are areas where growth on septic systems can occur.
- Tier IV areas are planned for preservation and conservation and prohibit residential major subdivisions.

The Maryland Department of Planning estimates that this bill will reduce the number of new homes served by OSDS by approximately 50,000 through 2035. This will reduce the nitrogen load to groundwater from OSDS by 580,000 pounds per year had those homes been constructed on OSDS.

Permit Programs

MDE issues many types of permits for activities that can have a negative impact on groundwater quality. Permits can establish limits for specific chemicals or groups of pollutants, or can require best management practices that reduce releases to the environment. All of the described permitting programs serve to protect groundwater in some capacity, either by regulating legal discharges to groundwater or by preventing pollutants from reaching

groundwater. Programmatic information for each program can be found in the Appendix, as noted beside each subtitle.

Groundwater Discharge (Appendix pg. A-3)

In FY 2013, MDE issued 29 municipal groundwater discharge permits and 21 industrial groundwater discharge permits.

Underground Injection Control (Appendix pg. A-3)

USEPA delegated authority for the Underground Injection Control (UIC) program to Maryland in 1984. There are six classes of UIC wells. Maryland currently has primacy for five classes of wells, but plans to proceed with application for primacy for Class VI UIC wells. Class VI wells are a new class of wells for sequestering carbon dioxide. Once primacy is obtained, funding for the associated increase in workload will be critical.

In FY 2013, 503 UIC inspections were conducted by two MDE inspectors. The inspectors issued 34 Notices of Corrective Action. In FY 2013, 18 facilities were returned to compliance.

There is a developing interest in producing natural gas from the Devonian Marcellus Shale in Western Maryland's Garrett County using the technology of hydraulic fracturing, also known as hydrofracking. This methodology uses tremendous quantities of fresh water for the fracturing process and then, as a byproduct of gas production, produces very large quantities of contaminated water for disposal. One disposal option is via a UIC Class II Well. Class II wells discharge wastewater beneath the lowermost underground source of drinking water. There are no pending applications for Class II disposal wells and no Class II wells currently operate in Maryland. The UIC Program works with MDE's Water Supply and Mining Programs to review permit applications for hydrofracking.

Inquiries have also been made to Maryland's UIC program regarding aquifer storage and recovery (ASR) wells. ASR wells are being considered in several locations in Maryland to store treated drinking water in an aquifer, for later withdrawal and use during periods of peak demand. These types of wells are regulated differently across the country. Since it was not named as a high risk well in the EPA's Phase I Class V Rule, this category of Class V wells are Rule authorized. Therefore, some UIC regulating authorities do exercise the regulatory option of Rule authorization for ASR wells, and some require permits. In Maryland, a UIC permit is required for ASR wells. To date, no applications have been received for ASR wells.

Hazardous Waste (Appendix pg. A-7)

MDE's Land Management Administration (LMA) supervises hazardous waste generators and treatment, and storage and disposal facilities through both State regulations and a federally mandated permit program. LMA's Waste Diversion and Utilization Program (WDUP) manages the hazardous waste permit program and implements the requirements of the federal Resource

Conservation and Recovery Act (RCRA) as well as the requirements of State law. In Maryland, there are approximately 10,500 facilities registered as generators of hazardous waste. There are 20 facilities that have been issued permits allowing treatment of hazardous waste, storage of hazardous waste for longer than 90 days, acceptance of hazardous waste from off-site, and/or management of hazardous waste in land disposal units. The permitted hazardous waste land disposal units have all gone through closure and are subject to post-closure care requirements.

Solid Waste (Appendix pg. A-9)

Within MDE's Land Management Administration, the Solid Waste Program regulates through permitting, monitoring and compliance activities, the management and disposal of non-hazardous waste such as municipal solid waste, industrial waste, construction and demolition waste, land-clearing debris and natural wood waste, and also performs enforcement activities for scrap tires, sewage sludge, Controlled Hazardous Substances, and Coal Combustion Byproducts. In FY2013, the program regulated 24 municipal solid waste landfills, four industrial waste landfills, and six construction and demolition waste landfills, and evaluates environmental monitoring data for three former or operating sewage sludge storage or treatment facilities and approximately 60 closed landfills.

Waste Diversion and Utilization (Appendix pg. A-9)

The Waste Diversion and Utilization Program, within MDE's Land Management Administration, regulates the utilization of sewage sludge that is applied as a soil amendment to farmland or used for the reclamation of land such as mined sites, and regulates the discharges from Animal Feeding Operations (AFO) in Maryland. By regulating nutrient applications, excess application can be controlled and groundwater protected. The Waste Diversion Utilization Program also provides a regulatory program for the management, transportation, and recycling of scrap tires. Scrap tire burning represents a serious source of pollution to ground and surface water.

In 2011, House Bill 817, signed by Governor Martin O'Malley, directed MDE, in consultation with MDA, to study composting, develop recommendations on how to promote composting in the state, and to report findings and recommendations to the General Assembly. To this end, MDE convened a Composting Workgroup that included representatives from MDE, MDA, MES, the composting industry, local governments, and stakeholders. The workgroup met monthly from May to December, 2012. In January 2013, the workgroup published the "*Composting Workgroup Final Report*", prepared for the General Assembly. The workgroup made recommendations for promoting composting and for establishing a conceptual framework for the future regulation of composting facilities. House Bill 1440, approved by the Governor in May 2013, allows compost and composting facilities to be regulated separately from other solid waste facilities and in a manner that will encourage additional composting and reduce barriers to the construction of new facilities.

Mining (Appendix pg. A-10)

See "Marcellus Shale Safe Drilling Initiatives" in the Groundwater Resources Protection chapter of this report for current information from the Mining Program.

Stormwater Management (Appendix pg. A-5)

The "Stormwater Management Act" became effective on October 1, 2007. MDE's Stormwater Management Program is responsible for implementing this act and its provisions for improving storm water management in Maryland. Stormwater runoff contributes to surface and groundwater pollution, flooding, stream channel erosion, sedimentation, wildlife habitat deterioration, and lower stream base-flows. The goal of MDE's Stormwater Management Program is to maintain after development, pre-development runoff characteristics. The Program achieves this through Environmental Site Design (ESD) requirements, Best Management Practices (BMPs), and implementation of the municipal separate storm sewer system (also known as MS4) permit program under the federal National Pollutant Discharge Elimination System (NPDES).

MDE issues NPDES Phase I permits to large (populations of greater than 250,000) and medium (populations between 100,000 and 250,000) municipalities. Municipalities with less than 100,000 people are handled separately under Phase II NPDES stormwater rules. Large and medium counties and municipalities in Maryland include Anne Arundel, Baltimore, Carroll, Charles, Frederick, Harford, Howard, Montgomery, and Prince George's Counties, Baltimore City, and the State Highway Administration (SHA). These permits require each of these municipalities to retrofit 20% of their respective impervious area not already treated with a stormwater best management practice (BMP). Environmental Site Design (ESD) and structural stormwater practices are being implemented according to these permits to address waste load allocations associated with Chesapeake Bay total maximum daily loads. This restoration requirement alone has placed significant financial pressure on Maryland's urban jurisdictions because prior capital funding levels are proving insufficient to support the increases in BMP construction that will be needed in the future.

To address the relative absence of dedicated, capital stormwater management support, the Maryland Legislature passed House Bill 987 in 2012 to require these most populated localities to develop watershed restoration funds. This State law mandates that systems of charges be implemented to provide the necessary local budgets to build runoff controls for the most densely developed areas covered by the NPDES MS4 permit program. These include the large and medium counties and municipalities identified above. The restoration funds, sometimes called stormwater utilities, are typically based on the amount of impervious surface area on owned property. Because impervious surface area prevents rainfall from infiltrating naturally into the ground, all property with impervious surface area contributes to runoff borne pollution and therefore all property should contribute the support needed to help address the problem. These

funds are to be established by July 1, 2013; therefore, many localities are in the process of developing their local programs and fee structures.

Water Well Construction (Appendix pg. A-5)

Responsibility for permitting well construction is delegated by MDE to local county health officers or other county environmental officials. MDE employees direct this delegated program and provide technical assistance to county personnel.

In FY2013, significant progress was made toward updating Maryland's Well Construction regulation, COMAR 26.04.04. These regulations have not been updated significantly since 1980. Changes were proposed by MDE's Onsite Systems Division and reviewed by the Conference of Environmental Health Directors and the Maryland State Board of Well Drillers prior to their final promulgation in 2010. However, publication of the final regulation did not occur because MDE withdrew the regulations concomitant with concerns expressed by the Administrative Executive Legislative Review Committee. The current proposed update of COMAR 26.04.04 includes the regulations that were previously not promulgated, in addition to many other changes. Public meetings were held on the proposed regulation changes on March 26, March 28, April 2, and April 3, 2013, to solicit comments for consideration prior to final draft publication. Comments have also been received from other stakeholders, including state and local agencies.

The draft regulation changes include regulatory requirements for geothermal wells, which have gained popularity due to various renewable energy efficiency incentives. In order to protect drinking water aquifers, codifying the requirement for borehole grouting from the bottom to top of the well and defining setback distances from potential sources of contamination were necessary. Defining the types of wells that can be drilled under a single permit is very important to the permit cost of some environmental or large geothermal sites. A maximum number of wells that can be constructed of a non-potable nature was increased to 20 boreholes from the current maximum of 10. Clusters of piezometers or monitoring wells used in spill investigations would have no limit on the number permitted in a cluster. The current regulation does not include a variance (exception) provision. The State is proposing this in the regulation to deal with difficult construction or well siting criteria. Following consideration of public comments and internal review, MDE hopes to publish the regulations in FY2014.

Pesticides Management

The Maryland Department of Agriculture (MDA) Pesticide Regulation Section, the State's lead agency for implementing the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), continues to implement, maintain and update, as needed, its generic Pesticide Management Plan (PMP). As an addendum to the PMP, the United States Environmental Protection Agency (EPA), in cooperation with the states, has developed a *State Pesticides of Interest* list. Pesticides of interest (including their degradates) are pesticides that have been identified by the states as having the *potential* to occur in ground or surface water at

concentrations approaching or exceeding a human health or ecological reference points. These pesticides are to be periodically evaluated to determine whether a human health or environmental reference point is likely to be approached or exceeded. If an evaluated pesticide is found to pose a risk to water quality, then that pesticide must be actively managed. To date, no evaluated pesticide on the *State Pesticides of Interest* list has exceeded human health or ecological reference points that would require active management.

MDA has released the results of a Statewide pesticide use survey, the first such report since 2004. The report covers usage in 2011 but was conducted in 2012 by the U.S. Department of Agriculture National Agricultural Statistics Service (NASS). Results of the survey can be found on MDA's website at www.mda.maryland.gov.

This is the twenty-first year, of MDA's recycling program for empty pesticide containers. MDA, in cooperation with local government and private industry, inspects, stores, and chips clean, empty pesticide containers that have been offered for recycling. Collection centers are maintained in seven counties (Frederick, Harford, Kent, Talbot, Washington and Wicomico) with the assistance of county government agencies. A total of 24 collection days are held during June through September. In addition, sixteen pesticide dealers/custom applicators are participating in inspection and collection of containers at their own facilities. The program has been well received by different interest groups, including the agricultural community, EPA's Chesapeake Bay Program and environmental organizations. More than 740,000 empty pesticide containers have been collected and recycled since 1993, taking more than 315 tons of plastic out of Maryland's waste stream.

CONCLUSION

In FY 2013, MDE, continued to coordinate activities to characterize, restore, allocate, conserve and protect the State's groundwater resources. This past year, studies progressed to further a comprehensive understanding of Maryland's groundwater resources, including in the fractured rock region of Maryland. A number of reports published in FY2013 under the Fractured Rock Water Supply Study investigated aspects of water availability and withdrawal impacts in Maryland's western regions. Unfortunately, lack of funding precluded further significant activity on the Coastal Plain Groundwater Study.

Work advanced under the Marcellus Shale Safe Drilling Initiative to determine whether and how gas production from the Marcellus Shale in Maryland can be accomplished without unacceptable risks of adverse impacts to public health, safety, the environment, and natural resources. Legislation was passed in the 2012 and 2013 legislative sessions to establish liability standards for damages caused by gas exploration and production and to provide financial assurance requirements in cases of well abandonment. MDE and MDNR, in consultation with an advisory commission continue to study best management practices and evaluate recommendations from experts and organizations.

In FY 2013, MDE's Water Supply program continued to manage water withdrawals through the Water Appropriations and Use permitting process, and many different State programs contributed to the restoration and protection of water quality. The coordinated efforts of MDE programs, federal, and local agencies addressed drinking water contamination issues at a number of locations, including in the Salisbury-Morris Mills area of Wicomico County, and near the Pearce Creek Dredge Materials Containment site in Cecil County.

State programs to protect groundwater must be strengthened to ensure that safe and adequate water supplies are available to meet growing demands. Increased data collection and management for better decision making and planning related to groundwater use are among the top priorities for funding. Voluntary groundwater protection programs (e.g., wellhead protection, cover crop planting and voluntary cleanup programs) are realizing a positive impact as a result of funding opportunities; however, improvements are needed in the depth and scope of regulations to address more contaminants and improve protection measures to meet legal requirements. The costs associated with addressing the legacy of past contamination remain high. In addition, funding limitations have negatively affected program staffing needs and the ability to implement new groundwater protection activities.

The challenges to groundwater protection are daunting: water demand and the threats to groundwater quality and quantity will continue to increase for the foreseeable future. Maryland's varied hydrologic terrain works against a "one size fits all" solution for managing, protecting and restoring groundwater. While some areas of the State experience issues of quantity limitations, other areas experience problems due to naturally occurring and/or human induced contamination. In FY2014, the State's water protection programs will continue to integrate these water resource issues and work toward providing long-term protection and use of Maryland's groundwater resources.

APPENDIX

Description of Groundwater Protection Programs within MDE

TABLE OF CONTENTS

WATER MANAGEMENT ADMINISTRATION

Water Supply Program

website:

http://www.mde.state.md.us/programs/Water/Water_Supply/Pages/Programs/WaterPrograms/Water_Supply/index.aspx

Water Appropriation and Use Permitting

MDE's Water Supply Program (WSP) has the responsibility of controlling the impacts of groundwater withdrawal through the Water Appropriations and Use Permit process. Through the permit review process, the WSP attempts to assure that groundwater withdrawals do not exceed the sustained yield of the State's aquifers. The permitting process also ensures that public drinking water systems obtain the best possible source of water, with regards to quality and sustainability.

Evaluation of Water Appropriations and Use Permits can include demand analysis, aquifer testing, fracture trace analysis, water level monitoring, evaluation of water balance, and other similar investigations. MGS and USGS groundwater data and modeling are also used in the evaluation. Review criteria are applied to determine whether the amount of water requested is reasonable for the proposed use, and whether the proposed use will adversely impact the resource or other users. When issued, permits specify the water source, location of withdrawal, quantity of allowable use, purpose of use, and any other conditions including withdrawal measurements and reporting. Permits are valid for a period of up to twelve years.

Source Water Protection

The WSP places emphasis on preventative measures to avert public health incidents. These measures include source water (ground and surface) protection. Source water protection programs, such as wellhead protection and surface water protection, are used to identify sources of potential contamination and develop plans to prevent contamination incidents. MDE works closely with communities and local health departments to implement these plans, so that systems can protect their water sources before contamination occurs. In addition, counties are required by law to develop and maintain water and sewerage plans to provide for the orderly development and extension of community water supply and sewerage systems. The WSP routinely reviews county water and sewerage plans to identify and address issues that pertain to source water protection, water supply capacity, and Safe Drinking Water Act requirements. MDE may disapprove a plan if it is not consistent with existing laws, regulations or policies.

Safe Drinking Water Act Implementation and Technical Assistance

The federal Safe Drinking Water Act (SDWA) establishes requirements for public drinking water systems to ensure the quality of drinking water. MDE has primacy authority for enforcing the federal requirements of the Safe Drinking Water Act (SDWA). Routine activities performed by staff in MDE's WSP include regular on-site inspections of water systems to

identify sanitary defects, providing technical assistance to water systems, conducting routing monitoring of water quality, and ensuring that consumers are informed about their drinking water.

Public drinking water systems fall into three categories: community, non-transient non-community, and transient non-community. Community water systems (CWS) serve year round residents, non-transient non-community water systems (NTNCWS) serve non-residents (e.g. schools, businesses, etc.), and transient non-community water systems (TNCWS) serve different consumers each day (e.g. restaurants, campgrounds, etc.). The WSP directly regulates CWS and NTNCWS. TNCWS are regulated and enforced by local county environmental health departments through State-County delegation agreements, with the exception of systems in Montgomery, Prince George's, and Wicomico County, which are regulated directly by the WSP.

CWS and NTNCWS must test for over 90 regulated contaminants on schedules which vary based on source type, historical data, and population. Data are received by WSP throughout the year and are reviewed for compliance with the regulations. If systems are not compliant with the regulations, enforcement action will be taken.

Wastewater Permits Program

website: http://www.mde.state.md.us/programs/water/wwp/pages/index.aspx

Groundwater Discharge Permits

Groundwater discharge permits are required for discharges of treated wastewater to groundwaters of the State. Sources of groundwater discharges include spray irrigation land treatment systems, overland flow systems, rapid infiltration systems (infiltration ponds), large on-site sewage disposal systems (greater than a daily average flow of 5,000 gpd), seepage pits, dry wells, septic systems, and injection wells. The Code of Maryland Regulations provides performance standards for location, design, installation, construction and maintenance of the permitted facilities. Issuing a permit involves the review of plans, specifications and hydrogeologic reports, and the evaluation of soil and site suitability. In many cases, groundwater monitoring is a condition of the permit, requiring that a facility maintain primary or secondary drinking water standards in the groundwater at the point of discharge or at monitoring wells adjacent to the property boundary.

Underground Injection Control

EPA delegated authority for the Underground Injection Control (UIC) program to Maryland in 1984. There are six classes of UIC wells. Maryland has primacy for five classes of wells, but will be applying for primacy for Class VI wells. Class VI is a new class for carbon dioxide sequestration wells. In Maryland, UIC Wells are currently all Class V wells, which are essentially shallow subsurface treatment and disposal systems, such as septic systems.

Class V wells may receive treated industrial process wastewater or industrial wastewater commingled with domestic sewage. MDE's Groundwater Discharge Program issues permits for Class V wells. Large capacity septic systems, defined in the Code of Federal Regulations as serving greater than 20 persons, are also defined as Class V wells and are jointly permitted by the State's UIC Program and the county health departments. Disposal of hazardous waste by underground injection is not allowed in Maryland. Permitted Class V wells must meet primary and secondary drinking water standards.

The UIC Program maintains a data inventory of potential and known Class V wells. It also actively identifies unpermitted wells for regulation and inventory through unannounced site inspections by Program personnel that target un-permitted Class V wells. One inspector is dedicated to statewide inspections of facilities in un-sewered areas, which may be using shallow disposal practices for industrial wastewater. A second inspector works in coordination with the Water Supply Program to investigate potential dischargers in wellhead protection areas (WHPAs). Notices of Corrective Action are issued for facilities not in compliance with UIC Class V regulations. Corrective action is required for these facilities. Approximately 400 inspections are conducted each year. In addition, MDE compliance inspectors visit approximately 125 permitted facilities to monitor compliance with the conditions of groundwater discharge permits. The UIC Program also continues to provide information on best management practices and pollution prevention in all dealings with the regulated community, both during unannounced UIC and permit related inspections.

On-Site Sewage Disposal Systems

MDE has delegated the authority for administering on-site sewage disposal, land subdivision and well construction programs to either county health departments, which are part of the Maryland Department of Health and Mental Hygiene, or to a local county permitting agency. MDE personnel oversee the delegated programs, provide technical support, investigate potential public health threats and perform on-site evaluations of innovative and alternative sewage disposal system applications. A strong field presence and ongoing training are vital to the implementation of these important public health laws.

MDE actively promotes the use of advanced onsite sewage disposal systems. As a rule, advanced onsite sewage disposal systems better protect groundwater resources than conventional systems. Advanced systems used in Maryland include: re-circulating sand filters, advanced waste treatment units, sand mounds, waterless toilets and at-grade systems. Research on emerging on-site sewage disposal technologies continues, with emphasis on those technologies that reduce discharges of nitrogen.

The Bay Restoration Fund (BRF) was signed into law on May 26, 2004 because the Chesapeake Bay had been experiencing a decline in water quality due to over-enrichment of nutrients (mainly phosphorus and nitrogen). The goal of the Onsite Sewage Disposal System (OSDS) portion of the Bay Restoration Fund is to curtail the amount of nitrogen discharged from OSDS into the State's water. This benefits the State by restoring the estuarine environment and by providing better protection of drinking water supplies.

The law established a dedicated fund for improving the water quality of the Chesapeake Bay. In addition to financing wastewater treatment plant upgrades, the BRF finances onsite disposal system (septic system) upgrades and implements cover crop programs to reduce nitrogen loading to the Bay from runoff and groundwater. OSDS may be upgraded either by adding best available technology (BAT) or, subject to limitations, may be connected to sewage treatment plants achieving enhanced nutrient removal. The OSDS program evaluates and approves proprietary technologies as grant eligible BATs for removing nitrogen. All these technologies must also undergo field verification of performance in Maryland. Twelve Maryland installations of each technology must be sampled on a quarterly basis for four quarters. The results of this sampling must indicate a minimum of 50 percent nitrogen removal to successfully complete field verification.

Water Well Construction

Responsibility for permitting well construction is delegated by MDE to local county health officers or other county environmental officials. MDE employees direct this delegated program and provide technical assistance to county personnel. Only drillers licensed by the Maryland Board of Well Drillers may drill wells in the State of Maryland. The driller must file a well completion report for each well; well completion reports are stored in a central computer database at MDE. The Department processes approximately 12,500 well permits each year. An estimated 400,000 households in Maryland rely on individual wells. MDE's On-Site Systems Division conducts well construction inspections in the field, trains well drillers and county personnel, and has been instrumental in developing enforcement cases for violations of well construction laws.

Sediment, Stormwater, & Dam Safety Program

website:

http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/SedimentandStormwaterHome/Pages/Programs/WaterPrograms/sedimentandstormwater/home/index.aspx

Stormwater Management

Urban development has a profound influence on the quality and quantity of Maryland waters by altering the hydrologic cycle. When vegetation is stripped, soil compacted and impervious surfaces added during the construction process, rain is deflected over these hard surfaces instead of filtering through the soil on site and recharging groundwater supplies. Stormwater from developed sites rushes overland, gaining volume, and picking up soil and its accumulated pollutants, which may include oil, grease, and fertilizer from streets, roofs, parking lots, lawns, and bare ground. This large quantity of contaminated water rushes into the closest surface water. This accumulated runoff causes flooding, stream channel erosion, sedimentation, wildlife habitat deterioration, water pollution, and lower stream base-flows.

The goal of MDE's Stormwater Management Program is to maintain after development, the pre-development runoff characteristics. As a result of the passage of the Stormwater Management Act of 2007, environmental site design (ESD) is now required to meet this goal by replicating the runoff characteristics of woods in good condition. Since May 2010, all counties and municipalities have been implementing ESD practices to control stormwater from new and redevelopment projects using techniques like better site planning, alternative surfaces, rain gardens, infiltration landscaping, disconnected rooftops and impervious surface area, and micro-bioretention. These ESD practices allow runoff to be slowed, filtered, and infiltrated through the soil to recharge groundwater supplies.

Another way MDE controls stormwater runoff is through Maryland's implementation of the municipal separate storm sewer system (also known as MS4) permit program under the federal National Pollutant Discharge Elimination System (NPDES). Since 1990, MDE has issued NPDES MS4 permits to the State's most populated jurisdictions to require programs to be developed and implemented to control storm drain system pollution. Comprehensive in total, these permits contain conditions mandating pollutant source identification, storm drain system mapping, sediment control and stormwater management implementation, illegal dumping and spill prevention, runoff monitoring, and public education. One important aspect of MS4 permits is the restoration of impervious surface area that resulted from development that occurred prior to the passage of Maryland's original stormwater management statute in 1982.

LAND MANAGEMENT ADMINISTRATION

Land Restoration Program

website:

http://www.mde.state.md.us/programs/Land/MarylandBrownfieldVCP/Pages/programs/landprograms/errp_brownfields/default.aspx

State and Federal Site Remediation and Voluntary Site Cleanup

The Land Restoration Program (LRP) focuses on the cleanup of uncontrolled hazardous waste sites throughout Maryland. The program participates in the cleanup of both federal and non-federal waste sites. The federal "Superfund" program, authorized by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), was established to identify, prioritize and cleanup hazardous waste sites. The LRP ensures that State requirements are met during investigation and cleanup of sites designated for the National Priority List (NPL) and federal facilities under the federal "Superfund" program.

A similar program, the State Superfund Program, exists under State law to conduct investigations and oversee the remediation and cleanup of sites on the State Master List (SML) and Non-Master List that are not included on the NPL or are not owned by the federal government. Primary emphasis is on sites on the State Master List, which is a list of sites known or reported to be contaminated by hazardous waste. The Non-Master List includes sites that are currently under investigation or have been previously investigated but are not listed on the SML.

The program oversees assessment and cleanup of hazardous waste sites by responsible persons and conducts assessments and cleanup when no responsible person exists or when the responsible person is unable or unwilling to do the work. Required work is broken into three consecutive phases, including Assessment, Cleanup, and Operation and Monitoring.

The Voluntary Cleanup Program (VCP) was established by the state legislature in 1997 and is administered by MDE to provide State oversight for voluntary cleanup of properties contaminated with hazardous substances. The VCP provides a streamlined process for the remediation and redevelopment of former industrial or commercial properties; thereby, accelerating remediation while ensuring compliance with existing environmental regulations. Eligibility requirements for the program can be found at: http://www.mde.state.md.us/programs/Land/MarylandBrownfieldVCP/mapping/Documents/Revised_03_VCPdoc_Section_Overview.pdf. Upon successful completion of the program, including issuance of a Certification of Completion (COC) or No Further Requirements Determination (NFRD), participants are provided limitations on liability for the eligible property.

Hazardous Waste Management

MDE's Land Management Administration (LMA) supervises hazardous waste generators and treatment, and storage and disposal facilities through both State regulations and a federally mandated permit program. LMA's Waste Diversion and Utilization Program (WDUP) manages the hazardous waste permit program and implements the requirements of the federal Resource Conservation and Recovery Act (RCRA) as well as the requirements of State law. To be regulated as hazardous waste, a substance must meet specific requirements as defined by COMAR 26.13.

LMA's Operational Services Program relies on record-keeping to maintain a "cradle-to-grave" tracking system for all hazardous waste generated. Proper management and pollution prevention techniques ensure against contamination of groundwater. LMA's Solid Waste Program oversees the enforcement of hazardous waste requirements. If there is improper management of hazardous waste, the program requires that actions be taken to remedy the situation and to restore, to the extent possible, the quality of the affected groundwater. A strong oversight and enforcement effort is maintained to provide high visibility as a deterrent against future violations.

Permitted hazardous waste treatment, storage, and disposal facilities whose operations would present a greater potential for groundwater contamination if an unforeseen incident occurs are placed under more stringent permit conditions. Permit conditions in this case would include the requirement that a groundwater monitoring system be deployed. The Solid Waste Program is charged with the responsibility of inspecting these systems and initiating enforcement action should the need arise. Permit requirements are tailored to address the potential for contamination presented by each facility using requirements for groundwater protection defined in State regulations. At a minimum, semi-annual reports are submitted by facilities required to monitor groundwater. Failure to meet permit requirements results in an enforcement action designed to both bring the facility into compliance and to remediate any contamination.

The Land Restoration Program maintains the Federal Installation Restoration Program (IRP) Support Section that is responsible for supporting cleanup at Federal Facilities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or the federal "Superfund" program. MDE maintains a Department of Defense/State of Maryland Memorandum of Agreement, which provides federal funding to support the Section's activities. The focus of the Section's activities at Department of Defense sites is on groundwater contamination. Evaluation of the extent of contamination, remedial alternatives, and ultimate cleanup criteria is conducted through the CERCLA process. The Federal IRP Support Section directly supports EPA Region III in the CERCLA cleanups.

Oil Control Program

website:

http://www.mde.state.md.us/programs/Land/OilControl/OilControlProgram/Pages/Programs/LandPrograms/Oil_Control/pollutionmanagement/index.aspx

Oil Control and Underground Storage Tanks

The Oil Control Program (OCP), within MDE's Land Management Administration, is the unit responsible for the implementation of the Underground Storage Tank (UST), Leaking Underground Storage Tank (LUST), and Aboveground Storage Tank (AST) programs. These programs provide for preventive actions to minimize ground and surface water pollution from the storage of petroleum products.

Underground Storage Tanks (USTs) remain a major source of groundwater contamination. The Oil Control Program (OCP) within MDE has established stringent regulations and provides strict oversight of tank operations within Maryland. Releases from USTs are required to be investigated and those with groundwater impacts are required to define the vertical and horizontal extent of the contamination. Once defined, a Corrective Action Plan is implemented to mitigate the impact of the contamination. The effectiveness of remediation systems is normally evaluated through groundwater monitoring.

The OCP has enacted a specialized tank inspection program to ensure the protection of groundwater resources and public health from the release of chemicals stored in underground storage systems. An owner of an underground motor fuel storage system in Maryland is required to have the system inspected by a MDE Certified UST System Inspector. The inspector visits the storage tank facilities and completes a detailed site inspection. The inspector evaluates tank and piping release detection, overfill/spill prevention, system corrosion protection, as well as facility housekeeping and other compliance concerns. After the initial inspection, follow-up inspections occur every three years to confirm continued compliance with Maryland regulations. The OCP requires additional release detection methods for motor fuel facilities operating within the High Risk Groundwater Use and Well Head Protection Areas of Baltimore, Carroll, Cecil, Frederick and Harford County. Facilities that fail to perform these tests face MDE enforcement actions and the loss of their fuel supply.

Solid Waste Program

website:

http://www.mde.state.md.us/programs/Land/SolidWaste/Pages/Programs/LandPrograms/Solid_Waste/index.aspx

Solid Waste Management

Within MDE's Land Management Administration, the Solid Waste Program regulates through permitting, monitoring and compliance activities, the management and disposal of non-hazardous waste such as municipal solid waste, industrial waste, construction and demolition waste, land-clearing debris and natural wood waste, and also performs enforcement activities for scrap tires, sewage sludge, and Controlled Hazardous Substances. The program's comprehensive permitting requirements for facilities accepting waste are directed at protecting ground and surface water, while assuring the safe management and disposal of waste.

Program activities include significant enforcement efforts to stop and clean up illegal dumps before they can significantly impact groundwater resources. Permitting requirements include liners and leachate collection/treatment systems for landfills (except land clearing debris or "stump dump" landfills), groundwater monitoring systems, landfill gas monitoring and management systems, and other environmental protection systems that serve to protect groundwater. The Solid Waste Program is also tasked with the permitting and enforcement of any new industrial landfill for the disposal of Coal Combustion Byproducts (CCB) such as coal flyash, and helps enforce MDE's CCB storage and transportation regulations.

Waste Diversion & Utilization Program

website:

http://www.mde.state.md.us/programs/Land/recyclingandoperationsprogram/pages/programs/landprograms/recycling/index.aspx

Waste Diversion & Utilization

Within MDE's Land Management Administration, the Waste Diversion and Utilization Program regulates the utilization of sewage sludge that is applied as a soil amendment to farmland or used for the reclamation of land such as mined sites. Most of the sewage sludge generated in Maryland is applied to farmland here, or out of State. The beneficial use of this material is regulated by State statute and permit conditions that require buffers and nutrient management plans for farmland where sewage sludge is to be applied. By limiting the amount of nutrients applied to land to those actually required by crops, excess amounts of nutrients can be controlled and ground and surface water protected.

The Waste Diversion and Utilization Program also regulates the discharges from Animal Feeding Operations (AFO) in Maryland. Together, the regulations and General Discharge Permit are designed to control nutrients from Maryland's largest agricultural animal operations and are a significant step forward in protecting the Chesapeake Bay, local waterways, and our drinking water. The AFO regulations and General Discharge Permit are just one part of a comprehensive, statewide effort to address all sources of pollution that are impairing our waterways: wastewater treatment plants, industrial discharges, septic systems, urban/suburban stormwater runoff, and air emissions from power plants, vehicles, and trucks.

By eliminating unpermitted tire dumps and providing a regulatory program for the management, transportation, and recycling of scrap tires, the LMA's Waste Diversion Utilization Program prevents a serious source of pollution, caused by "tire dump" fires, thus protecting both ground and surface water.

Mining Program

website:

http://www.mde.state.md.us/programs/Land/mining/Pages/programs/landprograms/mining/index.aspx

Mining Permits

The mission of the Mining Program is to protect the public and the environment from the potential impacts of active mining; and promote the restoration and enhancement of active and abandoned mine lands and water resources. The program oversees the reclamation of mine sites to ensure that no adverse impacts to public health or the environment occur. Two divisions exist within MDE's Mining Program, including the Maryland Bureau of Mines and the Minerals, Oil & Gas Division. The Maryland Bureau of Mines regulates and oversees coal mining, its associated impacts (e.g. acid mine drainage), and abandoned mine sites. The Minerals, Oil & Gas Division regulates non-coal mining. The Mining Program provides expertise to aid with activities for the Marcellus Shale Safe Drilling Initiative, which was established by Executive Order in June 2011.