Water for Maryland's Future: What We Must Do Today

Final Report of the Advisory Committee on the Management and Protection of the State's Water Resources

M. Gordon Wolman
Chairman

VOLUME 1: FINAL REPORT

July 1, 2008

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This Report and the previous two reports of the Advisory Committee on the Management and Protection of the State's Water Resources are available at MDE's web site under the heading of "More Publications."

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Acknowledgments

As this report makes clear, Marylanders are well served by many competent, dedicated men and women in the civil service of the State. This is evident in the number of contributors from many agencies who have assisted the Advisory Committee in its deliberations. On behalf of the Committee, I wish to extend our special thanks to those who have provided staff support to the Committee and its Sub-committees and participated in writing and rewriting innumerable drafts of Committee reports. It must be understood by readers of those reports and many who may find them useful, that the staff work in support of the Committee was above and beyond the already overflowing basket of responsibilities carried by each of the individuals involved. The Committee is in their debt.

As Chairman I also wish to express my appreciation to the members of the Committee for their commitment to the task, for their many contributions to the work, and for their unfailing good humor during lengthy deliberations. Thank you.

M. Gordon Wolman
Chairman
July 1, 2008

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INTRODUCTION

The Advisory Committee on the Management and Protection of the State's Water Resources was charged with assessing the condition of the State's water resources management program, recommending steps to assure that the program will provide for the long-term use and protection of Maryland's water resources, and recommending a strategy and appropriate funding for sustainable management of these resources.[1] In its earlier reports,[2] the Committee addressed many of these issues. In this, its Final Report, the Committee urges the State to develop and fund a more robust, comprehensive, fully-integrated State water resources management program, and that it begin this effort by increasing staffing, making critical improvements to the monitoring program, providing for scientific assessments, and beginning the long-range planning necessary to ensure a sustainable water supply for Maryland's future.

A Vision

Imagine it is Midsummer 2030.

Since 2028, rainfall in the Mid-Atlantic region has been far below average, creating ongoing major drought conditions. In states around Maryland, the crisis is causing restrictions on residential water use, devastating aquatic life, limiting recreational opportunities, and crippling the economy. Maryland is weathering the drought well, however, because leaders of the State took bold and farsighted action in the first decade of this century to improve management of both land and water resources.

Despite a more than 25 percent increase in the State's population since 2000, Maryland is thriving in 2030 because the Governor, the General Assembly,

[1] The 2005 Executive Order re-establishing the Advisory Committee is in Appendix A.
[2] The *Final Report of the Advisory Committee on the Management and Protection of the State's Water Resources* (May 2004) and the *Interim Report of the Advisory Committee on the Management and Protection of the State's Water Resources* (July 2006) are available at www.mde.state.md.us.

State agencies, and local governments, with strong citizen support, coordinated the management of land and water resources, obtained essential data, secured adequate funding for water resources planning and management, prepared a Statewide plan, and embraced water conservation. With the help of its citizens, the State's leaders created a sustainable Maryland for future generations, with healthy aquatic ecosystems, successful agriculture, vibrant communities, and a thriving economy.

The Reality

Now back to reality – July 2008.

The very successful water resources management program described above does not yet exist. Water is a precious and finite resource, which must be carefully managed to assure that future human needs can be met with sustained supplies while also supporting healthy aquatic ecosystems. State and local governments have roles in water resources management; the functions are varied and are distributed within and among agencies. The responsibilities include water resources planning, land use planning, permitting, technical assistance, outreach, coordination, data management and enforcement. The Maryland Department of the Environment (MDE) is specifically charged with developing a general water resources program.[3]

Maryland's investment in water resources management, however, has been inadequate. Despite the combined efforts of federal, State and local agencies, information on surface water, ground water, and ecosystem health is incomplete. Furthermore, the available data have not been completely analyzed or integrated to ensure that current and proposed future water uses do not exceed the available supplies.

In some areas, the current pattern of water use may already exceed the sustainable yield.

[3] § 5-203 of the Environment Article (2007 Repl. Vol.). The Water Management Administration within MDE administers many of the relevant programs, and its Water Supply Program is primarily responsible for assuring safe and adequate supplies of drinking water and issuing water appropriation permits.

The result is that Maryland does not have an accurate picture of the long-term viability of the State's water resources. Wells have gone dry due to lowered water levels during droughts and studies have shown that in some areas of concentrated water demand, the current pattern of water use may already exceed the sustainable yield. The situation will only get worse as the demand on Maryland's water resources increases due to growth in population, agricultural irrigation and power production.

If Maryland continues to under-invest in its water resources programs, severe droughts such as those Maryland experienced in 1999 and 2002 will likely result in threats to public health, parched aquatic systems, building moratoria, stressed communities, stagnation of irrigation-dependent farming on the Eastern Shore, and fewer new water-using commercial and industrial facilities in the State. If Maryland acts now, however, it can improve and integrate water resources management programs to ensure adequate safe drinking water, healthy aquatic ecosystems, successful agriculture, vibrant communities, and a thriving economy for Maryland's future. The Committee believes that an intensified focus on water supply, including long-range planning, is needed immediately.

The Committee believes that an intensified focus on water supply, including long-range planning, is needed immediately.

Maryland's water supply program has not received the funding and support necessary to ensure a sustainable use of water resources for the future. The limited resources of MDE's Water Supply Program have been focused on meeting mandated federal Safe Drinking Water Act requirements to protect public health rather than water resources analysis, management and long-term planning. With projected increases in population, water use will increase significantly. Since a long lead-time is necessary to obtain the data, develop predictive models, and make infrastructure improvements, the Committee recommends that Maryland move as quickly as possible to:

- Prepare Statewide and regional long-term plans with federal, State and local government agencies and utilities working collaboratively;

- Establish a broader and more reliable network of monitoring stations;
- Fully fund two major hydrologic studies: the Coastal Plain Aquifer and Fractured Rock Water Supply Studies;
- Improve the analytical tools for assessing the impacts of proposed new water uses;
- Integrate those new tools into allocation and permitting decisions;
- Develop comprehensive guidance and incentives to increase water conservation in all sectors;
- Provide all interested parties with ready access to all the water resources data;
- Strengthen enforcement programs for permit requirements to ensure that the interests of all water users are protected; and
- Establish adequate funding for the water supply program to properly manage water resources for future generations.

In addition, water resources management must be integrated with the growth management and land use responsibilities delegated to local governments and the water resource responsibilities of other State agencies. Implementation of Maryland's water resources program will require increased and sustained support from elected officials, agency leaders, the regulated community and the public to create the institutional structure for successful programs and to provide adequate funding. This report outlines a strategy that, if implemented, will support a flourishing Maryland for years to come.

The Committee's findings and recommendations are presented under the following major headings:

I. Maryland must develop a more robust water resources program based on sound, comprehensive data.

II. The staffing, programmatic and information needs of water supply management programs must be adequately and reliably funded.

III. Specific legislative, regulatory and programmatic changes should be implemented.

FINDINGS AND RECOMMENDATIONS

I. Maryland must develop a more robust water resources program based on sound, comprehensive data.

A. Maryland faces new challenges in attempting to manage water sustainably.

The State's water supply program has been successful to date in its primary mission of ensuring that all citizens have a safe, reliable supply of drinking water. The pressures on Maryland's water resources continue to rise, however, leaving no room for complacency.

1. Maryland's population will continue to grow.

Domestic water demand generally increases in proportion to population growth. Maryland's population grew from 3.9 million in 1970 to 5.3 million in

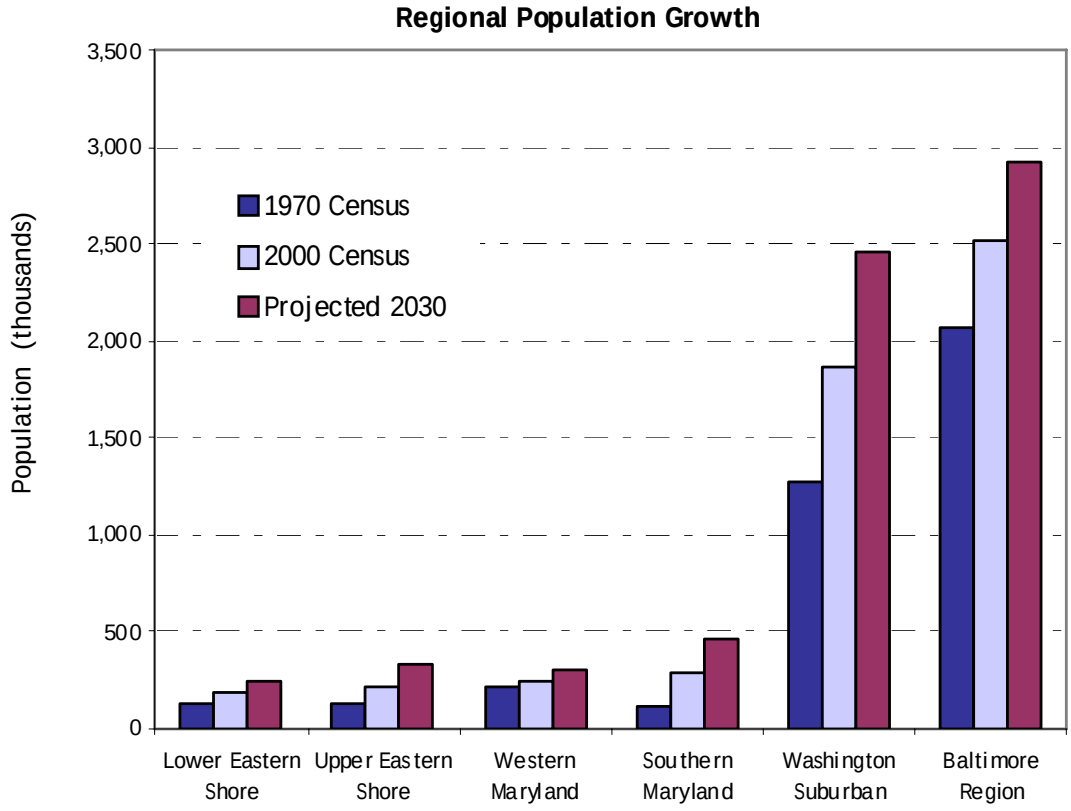

Figure 1. Regional Population Growth. All regions of the State are expected to grow, but not uniformly.

2000, a 35 percent increase. The Maryland Department of Planning forecasts that the State's population will increase by another 1.4 million Marylanders between 2000 and 2030, an additional 27 percent. Growth will not be uniformly distributed throughout the State. For example, an influx of new residents in certain areas is expected as a result of the Base Realignment and Closure (BRAC) Commission recommendations of 2005.[4]

Caroline, Carroll, Cecil, Charles, Frederick, Queen Anne's and St. Mary's Counties are expected to grow by 50 percent or more between 2000 and 2030. These fast-growing areas, predominately rural in the past, now must determine whether the available water supplies and infrastructure can accommodate the projected growth and, if not, whether development plans must be adjusted to reflect resource limitations.[5]

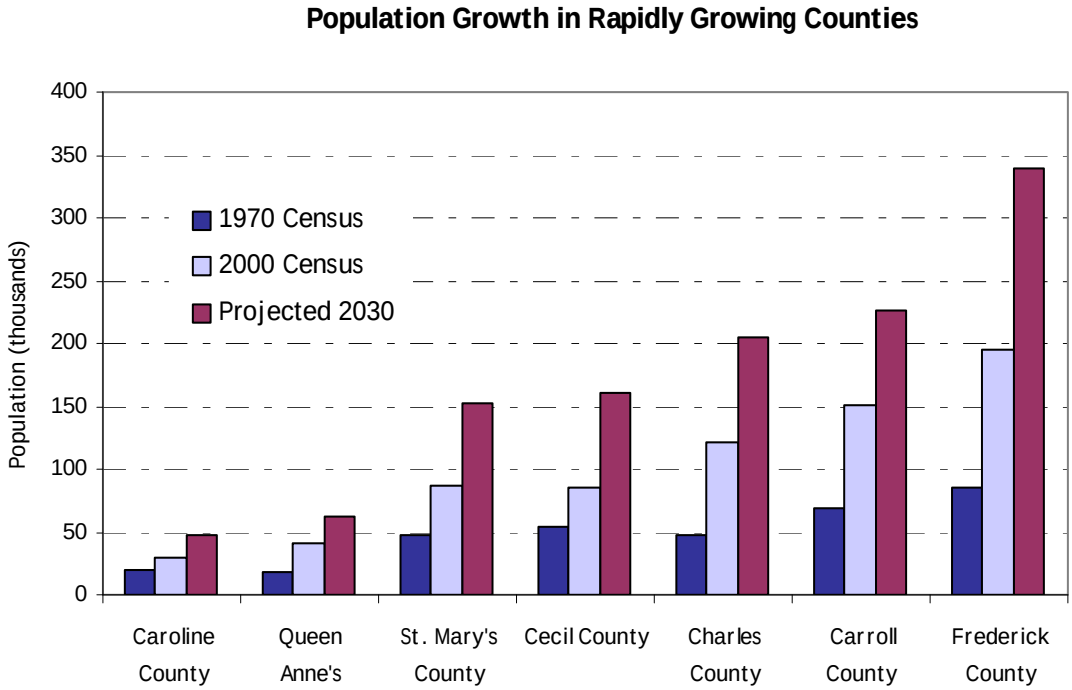

Figure 2. Population Growth in Rapidly Growing Counties. These seven counties are are expected to grow by more than 50 percent between 2000 and 2030.

[4] The Maryland Department of Planning predicts that there will be more than 25,000 new BRAC-related households in Maryland.
[5] If water is not available to support planned development in an area of the State, building moratoria might be necessary.

2. Patterns of land use could threaten the availability of clean water.

The projected growth will result in about 670,000 new Maryland households between 2000 and 2030. If the land is developed under current land use patterns, more than 650,000 acres[6] could be converted from farm, forest and other rural uses to residential and urban uses, and about 30 percent of the new households would be served by individual wells as opposed to public water systems. In contrast, if Smart Growth principles[7] are followed, only about 150,000 acres would be developed, and the number of homes served by individual wells would be dramatically reduced. Both factors – the amount of acreage and the number of individual wells – are important. As more acres are developed, there is a greater risk of encroachment on source water areas. Development also increases the amount of impervious surfaces, which can reduce recharge, degrade water quality and impair streams.[8] More compact communities can be served by public water systems, which are regulated under the Safe Drinking Water Act and provide better protection for public health.

3. Agricultural water use is expected to increase.

Although Statewide water use for irrigation comprises only three percent of total water use, about 36 percent of the water withdrawn on the Eastern Shore is used for irrigation during an average year. In 2007, a moderate drought year overall but a significant agricultural drought year, total fresh water use on the Eastern Shore was about 140 to 180 million gallons per day (mgd), and the amount used for irrigation was between 50 percent and 60 percent of the total demand.[9] As these facts demonstrate, use of water for irrigation increases sharply during a drought. Even as the total number of acres in farms and cropland has decreased, the number of irrigated acres has increased from

[6] Six hundred and fifty thousand acres is about ten percent of Maryland's total land area.
[7] Ten principles of Smart Growth can be found at the web site http://www.mdp.state.md.us/smartintro.htm.
[8] Individual septic systems also create a risk of ground-water pollution.
[9] Personal communication, John Grace, June 2008.

40,000 to 70,000 acres over the past 20 years.[10] Recently, the number of applications for appropriation permits for irrigation water has increased substantially. In a nine month period ending in May 2008, MDE received approximately 80 *new* permit applications for agricultural use on the Eastern Shore, requesting *additional* withdrawals totaling 11.9 mgd (annual average demand), representing approximately 50 mgd of *additional* withdrawal during the peak irrigation period.[11] The seasonal peak irrigation periods can place extreme pressures on aquifer systems.

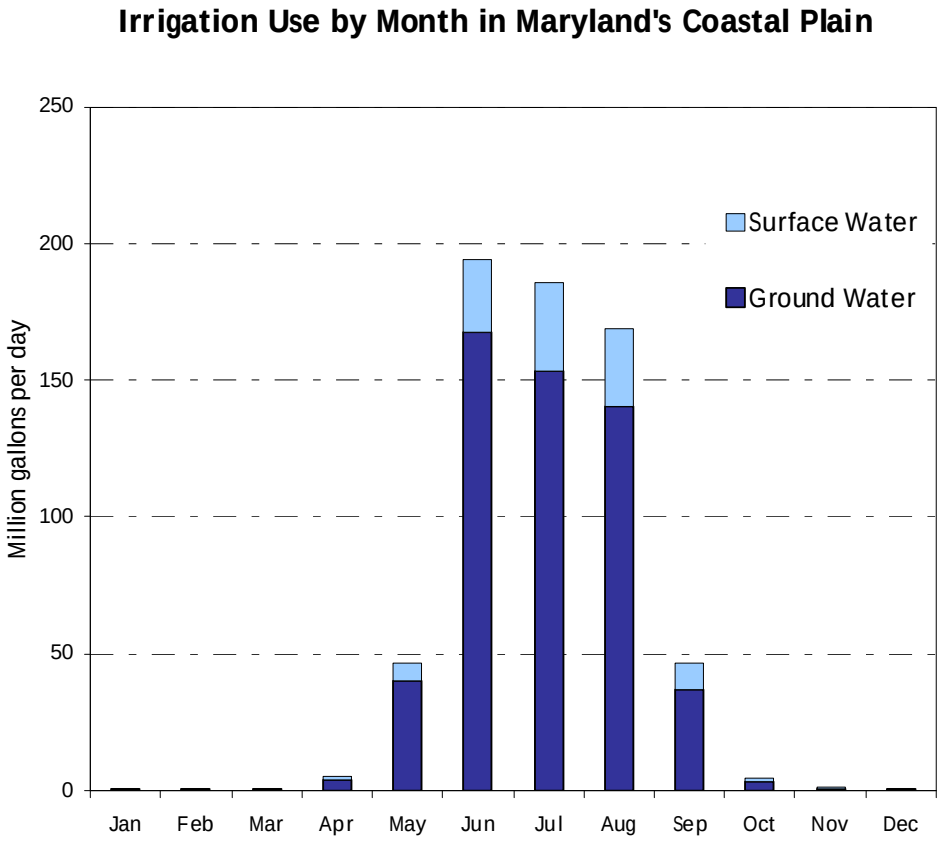

Figure 3. Irrigation Water Use, 2002. This figure illustrates the seasonality of irrigation demand as well as the predominance of ground water use in the Coastal Plain areas.

[10] Farmers are understandably motivated to irrigate. Corn yield generally varies from 120 to 180 bushels per acre when not irrigated. It has been reported that in a drought period, the yield of corn will drop to 40 bushels per acre on non-irrigated fields, but remain at 200 bushels per acre on irrigated fields. Presentation at State Soil Conservation Committee meeting by Gary Felton, University of Maryland (May 15, 2008).

[11] Personal communication, John Grace, June 2008.

4. Marylanders will compete for water.

Increased demands on limited water supplies will result in conflicts among users throughout the State. In many areas, domestic, agricultural, industrial, recreational and power-producing users may compete to use water from the same source. Already, staff of some Maryland counties have expressed concern that other jurisdictions are intercepting "their" ground water before it reaches them, depriving them of their "rightful share" of water. Communities in need of more water have requested to use water underlying State-owned lands, which were set aside for recreational or ecological purposes.[12] Although the State has adopted an explicit policy to manage water in the best interests of all the people of Maryland, it has provided only limited guidance for regulators in setting priorities for water use beyond the standard of "reasonable use." [13]

Figure 4. Potomac River, 2007 Great Falls Race. Recreational boating and fishing depend on adequate water flow.

[12] See App. B for the Advisory Committee's position on the subject.

[13] See COMAR 26.17.06.02B and .05B. Section 5-502(d) of the Environment Article (2007 Repl. Vol.) sets forth priorities for water use but only when "the Department determines that a water supply emergency exists and available water supplies are inadequate in an area to meet the needs of all person who have permits." In addition, Chapter 198 of the 2008 Laws of Maryland allows MDE to give priority to public water systems serving certain municipal areas and priority funding areas in three counties, provided natural resources are protected, but does not set forth generally applicable priorities.

5. Water quality concerns may reduce the available supply of water.[14]

Arsenic, cadmium and radium occur naturally in ground water in some parts of the State at levels that may exceed increasingly stringent drinking water standards. In other areas, human activity has contaminated ground water with substances such as perchlorate and solvents, causing public health concerns. Ground water in some parts of Maryland, particularly in limestone regions, is extremely vulnerable to contamination from the surface, including spills of hazardous materials and contamination by disease-causing organisms. Salt-water intrusion from the Chesapeake Bay and the Atlantic Ocean can render ground water non-potable. Existing communities in all of these regions might need alternative supplies in the future. Concerns have also been raised about pharmaceuticals and personal care products measured at trace levels in some water supplies.

6. Climate change poses an additional challenge.

Although there is scientific consensus that climate change and global warming are occurring, there is significant uncertainty about the impact that unmitigated climate change will have on water resources in specific areas. It is clear, however, that climate change has the potential to affect both water quantity and quality through changed patterns of precipitation, increased evaporation, sea level rise that causes salt-water intrusion, and warmer temperatures that cause increased demands for drinking water, irrigation and power production. In its Interim Report, the Maryland Commission on Climate Change noted that if greenhouse gas emissions continue to grow on the present trajectory,

> *air temperatures will increase in Maryland more than the global average, resulting in average winter temperature increasing by about 8°F by the end of the century. Average summer temperature would also increase by about 7°F and the number of days with temperatures greater than 90°F is likely to quadruple, with 25 or more 100°F days.*

[14] See the Water Quality Report, App. C.

and

> *Precipitation during the winter and spring is likely to increase 10-15 percent, coming mostly in heavy rainfall events, but the summers and falls are likely to be drier as increased evaporation depletes soil moisture.* [15]

The State's water resources management program must have the ability to keep abreast of the effects of climate change. The State needs current and historic data, and it also needs to anticipate that the future may not resemble the past.[16]

B. Critical basic data must be obtained.

Maryland's water supply program must have accurate, comprehensive data to support management and permit decisions. Maryland's current monitoring network is inadequate to assess the health of its water resources in all areas of the State, with its varied and complex natural settings. A broader and more reliable network[17] of monitoring locations is needed for stream flows, ground water levels and water quality parameters. An enhanced monitoring network will provide data to determine water availability and to track the effects of development and climate change on water resources. It is also essential to conduct the Coastal Plain Aquifer Study and the Fractured Rock Water Supply Study - two major hydrologic studies that will cover most of the State.[18] Enhanced programmatic support is also indispensable to the proper application of the results of the two studies.

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[15] Maryland Commission on Climate Change, "Interim Report to the Governor and the Maryland General Assembly: Climate Action Plan" (2008) p. 1. The report is available at www.mde.state.md.us.

[16] Water resource engineering has long used the concept of "stationarity," the idea that natural systems fluctuate within unchanging limits of variability. Given the relatively short time (geologically speaking) for which there are instrument data, and the possible impacts of unmitigated climate change, some are questioning the validity of the concept. "Stationarity Is Dead: Whither Water Management?" P.C.D. Milly *et al*., *Science* Vol. 319, pp. 573 – 574 (1 February 2008).

[17] The expanded network design recommended by the Committee is described in Appendix D. It was produced by interagency workgroups sponsored by the Maryland Water Monitoring Council and has wide support.

[18] The Fractured Rock Water Supply Study will include all fractured regions of the State west of the Fall Line. Descriptions of the Coastal Plain Aquifer Study and the Fractured Rock Water Supply Study can be found in Appendices E and F, respectively.

The monitoring network and the two hydrologic studies will produce critically needed data and tools. Ground water levels are declining at points in Southern Maryland and on the Eastern Shore. The Coastal Plain Aquifer Study will provide methods for integrating the impacts of concentrated local withdrawals on the larger regional aquifer system. It will also provide insight into the observed lowering of water levels, and on the effects this phenomenon may have on surface streams and aquatic life. Similarly, the Fractured Rock Water Supply Study will provide tools for predicting the seasonal impacts of ground water withdrawal from fractured rock on the water resource and on the health of stream biota. The Coastal Plain Aquifer Study and the Fractured Rock Water Supply Study will provide the comprehensive Statewide data and scientific tools needed to ensure that water is allocated and used in a sustainable fashion, without causing ecological damage.

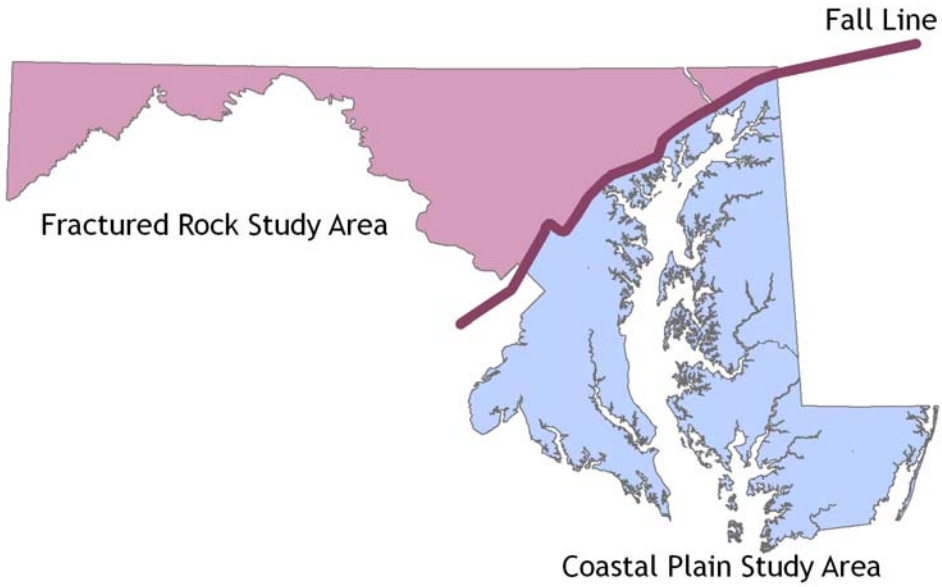

Figure 5. Geographic extent of the two hydrologic studies.

There are additional data needs. Fair enforcement of permit conditions depends on accurate reporting of actual water use by permitted users. Water quantity and quality data are necessary to provide local officials and planners

with a sound basis for determining where, when and how to allow growth, and to help them weigh the costs and benefits of current practices against alternatives. In order to facilitate State and local planning, the data should be maintained in an accessible database and made available to all interested persons. Additional staff and data management systems will be required.

C. A Statewide water supply plan should be developed.

Currently, Maryland does not have a comprehensive strategy that addresses water supply needs from a Statewide perspective. Local jurisdictions are required to add a Water Resources Element (WRE) to their comprehensive plans by October 1, 2009, and update the WREs every six years;[19] however, local jurisdictions are not required to address water needs or supplies outside their jurisdictional boundaries. A Statewide water supply plan (Plan or Statewide Plan) would describe the overall water resources management program and articulate the State's policies and priorities, including funding priorities, as they relate to water supply management. A Statewide Plan would help local governments integrate their local comprehensive plans and county water and sewerage plans with Statewide goals and priorities.

Working with local governments and utilities and using the local plans and the State's own data, the State should identify in the Plan regions where new water supplies will likely be needed.[20] The Statewide Plan should address important water resources issues, such as sustainability, conservation, source protection, equitable allocation principles, inter-basin transfers, ecological integrity, and water reuse. It should integrate water quantity, water quality and ecological values. The planning horizon should be several decades, even

[19] During the 2006 Maryland legislative session, House Bill (HB) 1141 was adopted and signed into law. (Chapter 381, 2006 Laws of Maryland.) It requires that all counties and municipalities that exercise planning and zoning authority adopt a Water Resources Element in their comprehensive plans by October 1, 2009. MDE is to provide available data and review each local jurisdiction's Water Resources Element "to determine whether it is consistent with the programs and goals of the Department reflected in the general water resources program required under § 5-203 of the environment article." § 1.03 of Article 66B.

[20] As noted in Part I.D, the State could play an important role developing regional solutions.

though the Statewide Plan should be reviewed periodically and revised when necessary.

To communicate the importance of the Statewide Plan to citizens, Maryland should develop a strong outreach and education program. The public and important constituencies, such as local governments, farmers, landowners, developers, utilities and power producers, must understand the critical importance of water management and their respective roles in protecting and conserving water resources for future generations. Outreach to the public is particularly important because public support, and the cumulative effect of the choices each individual makes, will determine the success or failure of any water management plan. With few exceptions, water supply issues capture the public's attention only during a drought or after some calamity, and then interest quickly disappears until the next event. A long-term public commitment is essential for successful water management.

The cumulative effect of the choices each individual makes will determine the success of the water management program.

D. State and local governments should coordinate and plan on a regional basis.

Authority for critical planning and decision-making for water supply is generally entrusted to local governments, while the State has a somewhat limited role.[21] Until the enactment of the Water Resources Element law[22] in 2006, there was no requirement that local governments address the relationship of planned growth to the capacity of their water supply and wastewater systems in their comprehensive plans. It is too soon to evaluate the effectiveness of the new WRE requirement, but no new funding was provided for its implementation,

[21] The Maryland Department of Planning reviews county water and sewerage plans and amendments and advises MDE whether they are consistent with the county's comprehensive plan. MDE reviews county water and sewerage plans and amendments and can approve, modify, or deny them. MDE analyzes water appropriation permit applications and can issue a permit for the amount requested or some lesser amount, impose conditions on the appropriation, or deny the permit.

[22] See note 19, above.

and disparities in expertise and resources among local governments immediately became apparent. MDE and the Maryland Department of Planning shifted resources from other programs to provide as much assistance as possible to local governments. The State should devise a method for providing financial and technical assistance to local governments to strengthen their technical capabilities and encourage them to integrate water resources considerations into comprehensive planning, zoning, subdivision and development approval, building codes, building permits, water and sewerage plans, and water conservation plans.

Political boundaries are largely irrelevant to surface and ground water supplies.

In addition, State and local governments must work together to overcome the deeply entrenched preference for planning along jurisdictional lines rather than by region, by watershed, or by aquifer. Political boundaries are largely irrelevant to surface and ground water supplies, and water use by one jurisdiction can affect water availability in another. Additionally, source water protection areas often fall within multiple jurisdictions. Many small water systems do not own or have control over the use of land in the recharge areas that contribute water to their wells or the watershed areas that contribute to their surface water sources. A regional approach that focuses on safeguarding watersheds, recharge areas, or wellhead areas would provide better protection from contamination for all citizens. MDE should lead Statewide and regional water supply planning efforts in cooperation with local governments and other State agencies.[23]

Local jurisdictions could reap a number of benefits by broadening their perspectives and planning on a regional basis in cooperation with neighboring jurisdictions. This approach could be especially helpful to smaller municipalities and counties where planning staff and resources are very limited. In areas of the State where existing water supplies may be inadequate to meet future demand despite strong land use controls and conservation

[23] Comprehensive Statewide and regional data on both water quantity and quality will be essential for this effort.

efforts, this regional approach could offer an alternative to limiting growth. Larger regional water treatment plants are more efficient and cost-effective, and the costs of planning and developing new water sources, building surface water impoundments or other storage facilities, or implementing alternative water supply solutions, could be spread among the users in multiple jurisdictions.

Obviously, implementing the foregoing recommendations will require substantial funding. As the Committee pointed out in its Interim Report, no entity in Maryland has been required to pay the full cost of withdrawing or using water – a precious, public, natural resource. Moreover, the State has failed to fund water supply planning adequately at either the State or local level. Planning is not a luxury, yet it is often the first function to be cut in any budget reduction. The Committee's second major recommendation addresses funding.

II. The staffing, programmatic and information needs of the water supply management program must be adequately and reliably funded.

The Water Supply Program (WSP) at MDE has been under-funded and understaffed at least since the functions were transferred from the Department of Health and Mental Hygiene and the Department of Natural Resources.[24] Since then, the responsibilities assigned to the program have increased dramatically while the number of staff remained constant.[25] As a consequence, the water appropriation permit program has a 3-year backlog of permit applications and other tasks, such as planning, have been deferred.

If Maryland invests now in its water resources programs, it can ensure adequate, safe drinking water and healthy streams for the future.

Since 1999, the WSP has operated with about 50 permanent and contractual staff. A recent MDE internal analysis showed that the WSP is working with a staffing deficit of approximately 30 positions. In addition, uncompetitive salaries and hiring freezes have created high turnover of staff and hindered the recruitment of qualified staff.[26]

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[24] Some functions were transferred to MDE from the Department of Health and Mental Hygiene in 1987; others were transferred from the Department of Natural Resources in 1995.

[25] The Maryland legislature provided some relief in 2007 by eliminating the permit requirement for most ground water appropriations of 5,000 gallons per day or less; however, this reduction in workload has been more than offset by the increasing number and complexity of new applications. Other increases in responsibilities include the following. The number of EPA drinking water standards that the Water Supply Program must adopt, implement, monitor and enforce has increased from 80 to more than 100. Since the drought of 1999, the Water Supply Program has been responsible for drought monitoring. Since 2001, water security issues have become more prominent and require substantial planning efforts. Rapid growth in rural communities has created a very large workload for the water appropriation permitting division. HB 1141 (see note 19, above) created additional work as MDE tried, with no additional resources, to provide data and guidance to the roughly 130 local jurisdictions that must prepare Water Resources Elements, and to review and comment on the submitted plans.

[26] In general, State salaries cannot compete with those in the private sector. While recent improvements have been made to the State salary structure for geologists,

Footnote continued.

The existing water supply program must be strengthened, and its capacity expanded, to enable the State to carry out the essential tasks of managing Maryland's water supply, yet present staffing and funding are inadequate to fulfill even the current responsibilities. The Committee believes very strongly that, unless a Statewide Plan is prepared and the water supply program is properly funded and staffed, there will be little if any progress made toward addressing the critical water resource management issues. To remedy deficiencies in the current funding of the water supply program and to implement the Committee's recommendations, the program will require increased funding of approximately $72 million over an 8-year period, or an average of $9 million annually over current appropriations.[27] The $72 million will fund the development of a Statewide Plan, additional staff, contractual services, two major hydrogeologic studies, the expansion and operation of a monitoring network, grants to local governments and outreach activities. A proposed budget is included in this Volume and in Appendix G of Volume 2.

Regarding funding needs and sources, the Committee makes the following recommendations:

A. Establish a permit fee to fund the cost of administering the permitting system.

The Committee believes that all water users should, at a minimum, contribute enough to fund the costs of the water supply program that relate to administering the water appropriation permit system. The Committee therefore recommends that Maryland enact legislation authorizing MDE to develop an equitable appropriation permit fee based on water withdrawal, consumptive use, or a combination of the two. The fee should be adequate to fully fund the existing permitting program as well as the new and enhanced

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engineers and natural resource planners, salaries have not been adjusted for other classifications. It will take time to redress the past damage.

[27] This increase addresses the needs of several State agencies, including MDE, for improvements in the overall water supply program, including State and regional planning, technical assistance, and outreach. It will not eliminate funding deficiencies in the other programs of State agencies or in other MDE programs. The Committee notes that federal funding is available for other WSP positions. The Committee urges the State to authorize these positions and exempt them from the State hiring freeze.

activities recommended in this Final Report that relate to permitting.[28] The Committee notes that general funds will continue to be necessary, and in fact should be increased, for aspects of the water supply program not specifically related to permitting.

B. Fund the hydrologic studies with a separate appropriation.

The State should assure that an uninterrupted source of funding is provided to complete the Coastal Plain Aquifer Study and the Fractured Rock Water Supply Study, with or without federal assistance. These are multi-year studies, which must follow a prescribed sequence of activity (*e.g.*, test well installation, monitoring, and then development of computer models). Having to suspend activities while waiting for funds would result in costly inefficiencies. Costs for the two studies together are estimated to be approximately $18 million over six years. Because of the magnitude of the costs, the Committee recommends that a separate general fund appropriation be made for the studies.

C. Fund an expanded monitoring network.

The State should expand the network[29] of stream and ground-water-monitoring for both water quantity and quality and should compile the data and make the information available to all interested parties. The costs to establish the expanded network and to fund the operations and maintenance for the first eight years are approximately $9 million. Of course, the State should also take full advantage of any available federal funding.

D. Provide funding for local governments.

Public drinking water systems should adjust their rate structures to cover the costs of operation and maintenance, projected infrastructure needs, long-term planning and the identification and development of new water sources for the

[28] The specific costs would be determined by MDE in advance of any legislation, and would likely include the development of the Statewide Plan and the expansion and operation of the monitoring network, in addition to the actual technical evaluation and processing of the permit applications.
[29] The expanded monitoring network is described in Appendix D.

future. New development should be assessed fees sufficient to cover the infrastructure and other costs of providing water.

Because some communities will be unable to adjust their rate structures enough to cover planning needs, the State should fund grants and provide technical assistance to local governments for water resources planning. To promote the management of water resources on a regional scale, preference for such funding should be given to multi-jurisdictional collaborations seeking regional solutions. The Committee has insufficient information at this time to determine the cost of the grants and technical assistance. Initially, the Committee recommends an annual appropriation of general funds of $2.2 million to support this activity.

E. Improve the recruitment and retention of personnel.

The Committee recognizes that the water resources management program will not succeed unless MDE and other State agencies are able to hire and retain a cadre of professional staff on a permanent basis, especially as more sophisticated planning and analyses are incorporated into the routine managerial functions of MDE and other State agencies. The State agencies will also need staff of various disciplines (engineers, geologists, resource and land use planners and outreach specialists) to provide the technical assistance needed by local governments. The Committee recommends that the State's human resource agencies study the staffing needs and support changes to the recruitment and retention procedures to address these personnel needs. Where uncompetitive salaries are a major problem, the State should adjust the salaries. The cost is unknown.

III. Specific legislative, regulatory and programmatic changes should be implemented.

In addition to the major recommendations above, the Committee believes that the following specific recommendations should be implemented to improve the State's water resources program.

A. The State should take specific steps to promote collaborative local planning and to facilitate regional planning.

Until the passage of HB 1141, some jurisdictions made little attempt to address water and sewer availability when preparing their comprehensive plans.[30] As a result, there have been situations where developers proceeded with their plans when water supplies were not adequate to support the proposed developments. Building moratoria were imposed in some areas. HB 1141 is intended to encourage local governments to consider water availability and source water protection issues when determining land use and zoning, and to involve State agencies early in the development process, in order to avoid situations where development must be halted at a late stage due to water-related issues.

In preparing the WRE, a local jurisdiction is not required to consider regional issues. On the other hand, planning on a watershed or aquifer basis has practical advantages, and State law[31] directs MDE to develop the water resources program for appropriate geographical units. To encourage cooperation among State agencies and local jurisdictions and to encourage regional planning, MDE should in cooperation with other State agencies:

1. Coordinate with the Maryland Geological Survey and the United States Geological Survey to provide local governments with the hydrologic and geologic data from the Coastal Plain Aquifer Study, the Fractured Rock Water Supply Study and the monitoring network.

[30] See note 19, above.
[31] § 5-203 of the Environment Article (2007 Repl. Vol.)

2. Develop regulatory changes and financial incentives that make regional and inter-jurisdictional cooperation more attractive for local governments.

3. Review current regulations for water and sewerage planning, water appropriation permitting and other applicable requirements, and modify these regulations as necessary to ensure that local comprehensive plans and other activities related to land development are properly integrated with water supply planning.

4. Offer technical assistance to local governments to help them develop appropriate plans, identify new or alternative sources, and implement source water protection and demand management plans. MDE should consider a "circuit-rider" approach to provide this technical assistance and coordinate inter-jurisdictional cooperative efforts.

5. Elevate the importance that local jurisdictions place on water supply planning by increasing public awareness of water resources issues, and assisting local governments as needed to educate residents about issues specific to their jurisdictions or regions.

6. Provide a forum for and facilitate coordination among local jurisdictions by holding regional workshops, providing feedback to local jurisdictions on areas where inter-jurisdictional coordination would be beneficial, assisting with large planning efforts such as development of regional water treatment facilities, new sources, or storage facilities, and providing incentives, such as faster permit processing, to encourage regional projects.

B. MDE should codify its water allocation policies.

One of MDE's functions is to approve permits for the withdrawal of ground and surface water for public supply as well as commercial, industrial, agricultural and other uses. It is critical that the methodology is adequate to ensure that seasonal variations, drought conditions, cumulative withdrawals and differing use scenarios do not adversely impact aquifers, streams or stream biota. Decisions about water withdrawals must be made equitably, using methods

based on sound data and science, such that adverse impacts on the quantity and quality of the State's waters are minimized.

Each permit application is evaluated for the reasonableness of the amount of water planned for a particular use and the impact of that use on the resource and other users of the resource. Aquifer testing, fracture trace analysis, water level monitoring, the development of a water balance and other investigation techniques are part of the evaluation. Through the permit review process, MDE's WSP attempts to avoid adverse impacts to other water users, to assure that water withdrawals do not exceed the sustained yield of the State's surface water and aquifers, and to protect stream ecology.

The WSP uses two primary methodologies for allocating water. In the confined aquifers of the Coastal Plain regions of the State, allocations are based on the "80 percent management level." This methodology is described in detail in the Code of Maryland Regulations,[32] and applied to confined aquifer withdrawals.[33] For areas underlain by unconfined aquifers, the WSP evaluates water appropriation permit applications using watershed-based, "water balance" methods. These methods are intended to determine if sufficient ground water or surface water is available to supply the requested appropriation without unreasonable adverse impacts on the streams in the watershed. The evaluations are conducted by WSP staff using statistical analyses and analytical tools, and are based on hydrologic and other data from a variety of databases and published reports. Although the "water balance" policy has been in effect since the early 1990s, the methodology has not been adopted into regulation.

The Coastal Plain Aquifer Study and the Fractured Rock Water Supply Study will provide critical data and computer models that will improve the State's ability to make allocation judgments. Following completion of these two studies, the State should revise, as appropriate, the 80 percent rule and the water balance method, and codify these or other science-based methodologies into regulations.

[32] COMAR 26.17.06.05D.
[33] The 80 percent rule is not currently applied to outcrop areas of confined aquifers.

C. The State should require local jurisdictions to protect source waters.

Figure 6. Signs designating source water protection areas.

MDE has programs that address the need to protect source water from contamination. There is an MDE program that provides technical assistance, information and funding to local governments so they can manage the land surface around a well where activities might affect the quality of the water. MDE has also prepared a model wellhead protection ordinance for use by local governments. In addition, in 2006, MDE completed assessments of all public water systems in the State. The assessments delineated the source water of each water system, evaluated the vulnerability of the source water to contamination, and made recommendations for protecting it. The assessments addressed both surface water and ground water. The reports have been provided to water suppliers and local governments, and made available to the public. Although many jurisdictions have acted on the information and developed source water protection programs, not all have.

To assure that programs are developed and implemented to protect all source waters, the State should require that local jurisdictions adopt wellhead and source water protection provisions as a condition of approval of future county water and sewerage plans and amendments. If a jurisdiction's program cannot be implemented immediately, the State should determine an appropriate implementation schedule for the jurisdiction to follow.

D. State and local governments should strengthen their programs for water conservation, water reuse, and demand management.

Managing water demand, *i.e.* reducing the amount of water use, can be more readily implemented and less expensive than identifying and developing new sources. Water efficiency technologies, water reuse, and behavioral changes can result in reducing a water system's demand by 10 percent to 20 percent or more, effectively extending existing water supplies and in some cases even eliminating the need to develop alternate sources. Maryland law already requires that MDE consider whether public water systems that apply for a new or expanded water appropriation permit or State financial assistance have instituted or plan to institute best management practices for water conservation.[34] MDE and local jurisdictions should require the use of best management practices and develop an effective program to encourage other water suppliers and end users to make continuous improvements in use reduction.

Demand management strategies can include a variety of options. Potential strategies 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, and developing comprehensive public outreach and education programs. The use of reclaimed water from wastewater treatment plants can provide another significant way to reduce demand. The State should encourage the use of water conservation and water reuse technologies, while ensuring the protection of public health. The State should also explore regulatory or other strategies that could provide incentives for water suppliers and end users to increase efficiency and reduce water use.

[34] Title 5, Subtitle 5B of the Environment Article (2007 Repl. Vol.)

To foster water conservation, water reuse and demand management, the Committee recommends the following:

1. MDE should require the use of best management practices to the extent practicable before issuing a water appropriation permit for a new or increased appropriation.

2. State and local agencies should explore possible regulatory or other strategies that could provide users with incentives to conserve, reclaim and reuse water.

3. MDE should review existing laws and regulations on the use of reclaimed water, which focus on public health protection, to determine what changes could be made that would better encourage water reuse projects without compromising public health protection.

E. Maryland should strengthen the regulation of individual wells to better protect public health.

Figure 7. An individual well.

Citizens using individual private wells are responsible for operating and maintaining their own potable water supply systems, and are not required to comply with the same regulations as public water systems. Water quality sampling is typically required only at the time an individual well is constructed, and usually only for a limited number of water quality constituents. Individual wells are not sampled regularly after the well is constructed unless the owner takes the initiative to do so. In contrast, public water systems must comply with federal and State requirements for periodic sampling and must treat their source water to meet federal and State drinking water standards. In addition, source protection programs have been directed primarily to community wells, not individual wells.

Ground water can be rendered non-potable by natural phenomena or it can be contaminated by human actions, such as improperly handling hazardous substances or animal wastes.[35] Citizens using private wells are at risk for exposure to disease-causing organisms and contaminants.

To better protect Maryland residents who obtain their drinking water from individual private wells, the Committee recommends the following:

1. Maryland should consider requiring the testing of individual wells for an expanded array of specific contaminants before a well is put into service. Retesting should be required when occupancy of the property changes.

2. State and local governments should provide increased resources for local health departments to support training, technical assistance, and public outreach efforts tailored for owners of individual domestic wells.

3. State and local agencies should review current regulations aimed at preventing or remediating ground water contamination to identify possible ways to improve public health protection for users of individual wells.

4. The General Assembly should raise the maximum fee that can be charged for a well construction permit to more closely reflect the costs incurred by counties in administering more comprehensive programs.

F. State and local governments should discourage the use of individual wells in areas at high risk for well contamination.

Contamination of individual wells is a serious problem. Cleanup is costly and takes a long time to complete. A better approach is to avoid permitting individual wells in areas at high risk of well contamination. Of particular concern are wells that are installed in limestone aquifers. As water flows through these aquifers, it can dissolve the limestone, leaving large cracks and

[35] Contaminated ground water and storm water runoff can also degrade surface water and harm stream life.

fissures, and even producing sinkholes. These pathways allow surface water to travel so rapidly to the aquifer that the water is not filtered through soil, and microbiological organisms can survive. Various types of fecal bacteria, viruses, and oocysts of *Cryptosporidium* and *Giardia* can be found in the water obtained from wells located in this vulnerable setting. Limestone aquifers are particularly prevalent in Frederick and Washington Counties, and are also found in parts of Allegany, Carroll, and Garrett Counties. Ground water in these settings is considered to be under the direct influence of surface water.

Laws, regulations, policies and procedures are in place to ensure that public water systems using ground water under the direct influence of surface water employ appropriate treatment to address the potential health threats, but these requirements do not apply to individual wells. It is unlikely an individual homeowner could manage this problem: typical homeowners do not have the technical expertise or financial capability to maintain and operate such treatment systems, which are extremely complex and difficult to manage and maintain.

The Committee recommends the following:

1. MDE should strengthen current regulations for issuing water appropriation permits to require comprehensive water quality testing for new subdivisions.
2. Maryland's laws and regulations should be modified as necessary to require construction of public drinking water systems instead of individual wells for new developments where ground water testing or the presence of specific geologic conditions indicate serious threats to water quality.[36] These systems should be transferred upon completion to a responsible entity, such as a local government utility or the Maryland Environmental Service.

[36] Public water offers greater protection, but the Committee recognizes that a better policy may be to direct development dependent on ground water away from these areas entirely.

G. MDE should make greater use of Water Management Strategy Areas.

A provision of Maryland law gives MDE the authority to designate Water Management Strategy Areas (WMSAs) where a specific water resource problem has been identified and for which the Department has adopted specific use restrictions or criteria for permit approval in order to protect the water resource or existing water users.[37] This ability to tailor restrictions and criteria allows MDE to more effectively protect the water resource.

To date, WMSAs have been identified for areas experiencing salt-water intrusion, excessive drawdown, and contamination. The restrictions in some cases prohibit any new water appropriations in the WMSA or from a particular aquifer. Other requirements include ongoing monitoring for chloride levels or additional water level monitoring in areas where excessive drawdown is a concern. In some areas, permit applicants for large new and or increased water appropriations in the management area are required to perform stringent pumping tests to gauge the potential for well interference.

There is an opportunity to designate new WMSAs to address additional problems and prevent others. For example, MDE could establish WMSAs for watersheds contributing to Tier II or Tier III streams,[38] which are not specifically addressed in the water appropriation regulations. Methods and standards for data collection, analysis, monitoring and flow-preservation thresholds designed to protect Tier II and Tier III waters could be developed and used to guide water appropriation permit decisions.

[37] §§ 5-101 and 5-502 of the Environment Article (2007 Repl. Vol. and 2007 Supp.)
[38] Tier II streams are high-value streams which have quality characteristics significantly better than the numeric water quality criteria, or which have a high index of biological integrity. Maryland has not yet designated any Tier III streams; the classification is intended for Outstanding National Resource Waters such as waters of national and State parks and wildlife refuges, and waters of exceptional recreational or ecological significance. COMAR 26.08.04-1 and -2. Tier II and Tier III streams are required to be protected from degradation.

H. The General Assembly should authorize administrative penalties for violations of water appropriation permits.

A regulatory program that depends largely on self-monitoring and reporting will not be successful if there is no effective sanction against those who fail to comply. Water appropriation permits routinely contain conditions limiting the average daily withdrawal and provisions requiring a permittee to report an estimate of the total water use for each month of the preceding calendar year. Some water systems have submitted this information late or not at all, and this has handicapped MDE in its efforts to manage the resource and evaluate applications for new permits. Furthermore, recordkeeping violations undermine the integrity of any regulatory program.

Currently, MDE must go to court to obtain penalties against violators of water appropriation laws or permits. Judicial enforcement actions are very time-consuming and resource-intensive for MDE and its legal staff, and are therefore usually reserved only for egregious violations and behavior. Administrative penalty actions are more efficient than judicial proceedings as a means of ensuring compliance, especially for less serious but nonetheless disruptive violations. Having administrative authority would result in a more efficient use of agency resources and ultimately in better protection of water resources. The General Assembly should give MDE the authority to assess penalties administratively against those who violate the water appropriations law, as it has in other permit programs.

I. Maryland should develop an effective water supply outreach program.

Because water supply crises have occurred only sporadically in recent years, there has been little incentive to address the issues in a sustained manner. The first two reports of the Committee and this Final Report very clearly indicate that water supply problems will become more frequent and more intense in the coming years. The reports also advise that implementation of remedial measures will be time-consuming and very costly. Yet, as this Final Report indicates, the State is not prepared to meet these challenges. Implementation of the Committee's recommendations to ensure the long-term

sustainability of Maryland's water supplies will require the establishment of an adequately funded water supply program fully supported in its mission by the Governor, the General Assembly, and the public. A well-informed constituency is necessary. At this time, unfortunately, no outreach or education function exists within the water supply program. The Committee believes that one reason no action has been taken on some of the recommendations of its earlier reports[39] is that there was no mechanism to disseminate the information and provide interpretative support. The assumption of course is that if the public knew more about the State's water supply situation, it would be more receptive to taking a proactive role including the solicitation of support from their elected officials.

The collective work of many State, federal and local agencies involved in water resources management produces a wealth of information that would provide the basis for an exceptional outreach and education program. This material, however, must be presented in a manner that can be readily understood by diverse audiences. Further, the effort must be supported by staff that can meet with interested public officials, citizen groups or other interested parties to provide more detailed information and answer questions. Broad public understanding and support will be needed for State and local governments to build a stronger, more effective water resources program. Additionally, every opportunity must be taken to meet directly with elected officials to elicit their support. Creating an outreach and education program should be accomplished promptly so that efforts to mobilize support can begin as soon as possible after the release of this Final Report of the Advisory Committee.

[39] See Appendix H for a report on the status of progress on previous recommendations.

CONCLUSION

With this Final Report, the Committee has completed its tasks, but the work will bear fruit only if there is increased and sustained support from elected officials, agency leaders, the regulated community and the public to create the institutional structure and to provide the funding for a robust water resources program. The members of the Committee hope and trust that action will be taken so that our children and grandchildren can enjoy a sustainable Maryland with ample supplies of safe drinking water, healthy aquatic ecosystems, successful agriculture, vibrant communities, and a thriving economy.

PROPOSED BUDGET

(This proposed budget is also included in Volume 2 as Appendix G)

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Water Resources Advisory Committee Recommended Funding Needs

SFY 2010 - 2017 Proposed Budget (in thousands of dollars)	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**8 Yr Total**
1. Watershed Assessment and State Plan									
* Contractual (Coastal Plain aquifer study)	1,375	2,350	2,850	2,400	1,800	1,000			11,775
* Contractual (Fractured Rock water supply study)	986	1,397	1,164	1,114	1,051				5,712
* Contractual (Hydrologic monitoring of ground water and surface water - expansion of network and O&M)	1,095	1,420	1,760	1,960	910	937	965		9,047
* Technical personnel (to oversee contracts with other study agencies, review data, coordinate development with existing program, update and maintain modeling system) (2 MDE positions)	136	142	149	156	163	170	178	186	1,280
* Technical personnel to conduct biological studies and develop policies for protection of instream biota (2 DNR positions)	124	130	136	142	148	155	162	170	1,167
* Contractual services (develop State Water Supply Plan)	100	100	100	0	0	0	0	0	300
* Administrative personnel to assist with fiscal activities such as grant applications, contract oversight (1 MDE position)	60	63	66	69	72	75	79	82	565
* Date entry personnel (1 MDE position)	39	41	43	45	47	49	51	53	367
* Operational support	33	12	12	20	25	12	20	12	146
Total 1	**$3,948**	**$5,655**	**$6,279**	**$5,905**	**$4,216**	**$2,399**	**$1,455**	**$504**	**$30,359**
2 Support to Local Govts/Regional Facilitation									
* Contractual (grants to local governments)	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	17,600
* Technical personnel (to provide technical support for WREs, review and comment on WREs and capacity management plans, facilitate regional planning, and manage Water Supply Plan after development) (6 MDE positions)	435	455	476	498	521	545	570	596	4,095
* Technical personnel (to provide technical support for WREs, review and comment on WREs and capacity management plans and facilitate regional planning) (2 MDP positions)	136	142	149	156	163	170	178	186	1,280
* Administrative personnel to support technical personnel (1 MDE position)	47	49	51	54	56	59	62	64	442
* Operational support	70	41	41	50	61	41	50	41	395
Total 2	**$2,888**	**$2,887**	**$2,917**	**$2,957**	**$3,001**	**$3,015**	**$3,059**	**$3,088**	**$23,813**
3 Water Allocation and Permit Enforcement									
* Contractual services (database development and maintenance, with incorporation of GIS capabilities)	500	100	100	100	100	100	100	100	1,200

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SFY 2010 - 2017 Proposed Budget (in thousands of dollars)	2010	2011	2012	2013	2014	2015	2016	2017	8 Yr Total
* Permitting - Technical and administrative personnel to enhance turnaround times for appropriation permits, coordinate permit issuance with reviews of water and sewerage plans and other regulatory programs, adopt new regulations, fulfill regulatory requirements such as triennial reviews of permits and Public Information Act requirements and work individually with permittees to resolve special situations)(13 MDE positions)	937	980	1,025	1,072	1,122	1,173	1,227	1,284	8,821
* Enforcement - Technical personnel (to conduct enforcement activities, including reviewing and evaluating compliance with permit limits, special conditions, and reporting requirements, and preparing enforcement actions (4 MDE positions)	261	273	286	299	312	327	342	358	2,457
* Operational support	129	60	60	89	100	60	89	60	647
Total 3	**$1,827**	**$1,413**	**$1,471**	**$1,560**	**$1,634**	**$1,660**	**$1,758**	**$1,801**	**$13,124**
4 Source Water Protection									
* Technical personnel (to assist local governments with development and implementation of source water protection programs) (2 MDE positions)	140	146	153	160	168	175	183	192	1,318
* Operational support	8	4	4	8	4	4	8	4	44
Total 4	**$148**	**$150**	**$157**	**$168**	**$172**	**$179**	**$191**	**$196**	**$1,362**
5 Interstate Coordination									
* Technical personnel (to participate in interstate planning and coordination with ICPRB, SRBC, etc) (1 MDE position)	77	81	84	88	92	96	101	105	725
* Operating costs	3	2	2	3	2	2	3	2	19
Total 5	**$80**	**$83**	**$86**	**$91**	**$94**	**$98**	**$104**	**$107**	**$744**
6 Outreach/Education									
* Contractual Services (to develop outreach program for MDE's water resources programs)	200	10	10	10	10	10	10	10	270
* Contractual Services (printing, distribution, advertising costs)	150	150	150	150	150	150	150	150	1,200
* Contractual services to promote good agricultural practices	50	50	50	50	50	50	50	50	400
* Administrative personnel to manage and oversee the program (1 MDE position)	72	75	79	82	86	90	94	99	678
* Operational support	3	2	2	3	2	2	3	2	19
Total 6	**$475**	**$287**	**$291**	**$295**	**$298**	**$302**	**$307**	**$311**	**$2,567**
Annual Total	9,366	10,475	11,201	10,977	9,415	7,653	6,875	6,007	
8-YEAR NEED TO ENHANCE PROGRAMS									**$71,969**

1. Monitoring costs are based on adding 16 gages per year for 3 years and 25 wells per year for 4 years. Cost estimates include installation plus operation and maintenance, but do not include laboratory analytical costs.

2. Personnel costs include salary, fringe, and indirect costs. 2009 salaries were used with an estimated 4.6% increase per year.

3. Operational costs include vehicles, reference materials, computers, office supplies, technical equipment, printing, travel, etc.

4. Fractured Rock study estimates based on preliminary project proposal.

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Martin O'Malley, Governor

Anthony G. Brown, Lt. Governor