Maryland Water Policy: What Does the Future Hold?

Maryland Water Resources Research Center
Department of Civil and Environmental Engineering
University of Maryland

January 2004

On October 24, 2003, *The Maryland Water Resources Research Center* sponsored a 1-day conference on *Maryland Water Policy – What Does the Future Hold?* Seven eminent speakers participated, highlighted by Professor W. Gordon Wolman of The Johns Hopkins University. Topics discussed included: What are Maryland's current water policy issues? What policies govern water suppliers, i.e., river basins and utilities? How will we allocate future water supplies between agricultural and urban users? How will continued urban sprawl affect future water needs? The Conference was supported by the U.S. Geological Survey and the Colleges of Agriculture and Natural Resources, Engineering and Life Sciences at the University of Maryland.

Enclosed are papers from five of the speakers, highlighting their talks.

Maryland Water Policy - What Does the Future Hold?

Sponsored by The Maryland Water Resources Research Center

October 24, 2003
Margaret Brent Room
Stamp Student Union Building
University of Maryland
College Park, MD 20742

8:30 - 8:40	**Welcome + Opening Remarks**
8:40 - 9:25	**Keynote Speaker -** ***Speculation on Water Issues and their Policy Implications*** **-M. Gordon Wolman (Director) and Herbert Sacks, Division of Environmental Health Engineering, The Johns Hopkins University**
9:25 - 9:55	***Linkages between Agricultural, Urban and Environmental Water Concerns.*** **Doug Parker, Agriculture and Resources Economics University of Maryland**
9:55 - 10:10	***Break***
10:10 - 10:40	***Water Supply as a Factor in Local Growth Management*** **-James Cohen, Urban Studies and Planning, University of Maryland**
10:40 - 11:10	***Public Policy Water Issues*** **- Matthias Ruth, School of Public Policy, University of Maryland**
11:10 - 11:40	***Policy Implications of Water Supplied from the Susquehanna River Basin*** **-Paul Swartz, Executive Director- Susquehanna River Basin Commission**
11:40 - 1:00	***Lunch and Poster Session - Prince Georges Room***
1:00 - 1:30	***Current Maryland Water Policy Issues*** **- Robert Summers, Maryland Dept of the Environment**
1:30 - 2:00	***Maryland Utilities and Water Supply Policy*** **- Roland Steiner, Washington Suburban Sanitary Commission**
2:00 - 3:00	***Panel Discussion*** **Moderator -Dr. Donald Boesch, Director Center for Environmental and Estuarine Studies**

Maryland Water Policy: What Does the Future Hold?

M. Gordon Wolman and Herbert Sachs
Division of Environmental Health Engineering
The Johns Hopkins University

Context

The landscape of Maryland, although a small area, includes great diversity. The transect from Coastal Plain through Piedmont, Blue Ridge, Valley and Ridge to Appalachian Plateau encompasses diverse rock types and landforms from sea level to mountain tops. These varied landscapes experiencing different climatic conditions display distinctive hydrologic regimes. Thus the natural water systems of the State are similarly varied. Through history, a growing population has utilized water and other resources of the State to develop thriving agricultural industrial and commercial enterprises at successive periods appropriate to the technology, economy and values of each age. A coastal state adjacent to the nation's capitol, Maryland's population continues to grow. More people, changing interests and values place new and intensive demands on the water resources of the State. These demands are influenced by both the quantity and the quality of fresh water that is available at different locations.

Speculations about potential policy directions must recognize the varied hydrologic background, historical evolution, and current trends in population and economy in the State. With average precipitation of roughly 45 inches per year, all of Maryland would be deemed as "well watered". As the last 4 years have demonstrated, however, the hydrologic cycle is characterized by great temporal as well as spatial variability. Last year's severe hydrologic drought followed by this year's roughly 60 inches of rain illustrate the point dramatically. Similarly, the geology and physiography of the State, combined with the history of settlement and development result in some populations heavily dependent on groundwater and others on surface waters for their sustenance. Similarly, landscape, history and emerging interests in the use of water set the background for consideration of appropriate management options.

Given this varied background many potential water resource issues can be identified. Four illustrative examples are noted that must be addressed in a geographic context. A fifth fundamental issue relates not to place but to policy formulation and implementation.

Geographically Placed Water Resource Issues

Major Population Centers

Metropolitan growth in both the Washington and Baltimore regions continues to place increasing demands upon water resources used by each. A concatenation of elements including fine leadership, computer models, and hydrology several decades ago led to the low flow allocation agreement for the Potomac River involving the major purveyors of water in the metropolitan region. Burgeoning development in the region coupled with covetous glances at the river from riparian communities upstream suggest the need for continuing review of potential

demand and supply. Such a periodic review has recently been completed by the Interstate Commission on the Potomac River Basin. Given growing demands from an expanding region, additional discussion of appropriate institutional designs for water management may be warranted. Pending a decision by the Supreme Court in the dispute over the Potomac River in Virginia vs. Maryland it is premature to speculate over the consequences of that legal escapade, but it may well impact the structure needed for effective management. Baltimore has recently reached agreement with the Susquehanna River Basin Commission on the conditions under which the City will withdraw water from the river. In the metropolitan region however, several counties receive water from diverse sources including the city, local ground water and other surface water systems. Some areas have been experiencing serious problems in meeting demands for rapid development. Patterns of growth will markedly impact water management decisions and perhaps vice versa, the old issue.

The Coastal Plain: Western and Eastern Shore

Groundwater has been the principal source of water supply for both communities and agriculture in the Coastal Plains of Maryland. Over time in some areas, wells have tapped deeper aquifers as shallow ones have provided insufficient quantity or water of poor quality contaminated by natural or anthropogenic sources. The latter include contaminants from the surface as well as salt water intrusion in selected areas. Aquifers in southern Maryland are being increasingly called upon to supply water to rapidly developing areas. Similarly, as Ocean City and surroundings maintain higher populations year round, well field management must become increasingly sophisticated. To the extent that irrigated agriculture also expands, more sensitive management programs may be needed.

Extremes: Drought and Floods

Both metropolitan water systems handled the recent droughts (summer 2001, 2002) well. The same cannot be said of all municipalities in the state. It is not clear the extent to which all systems in the state have adequate and current drought management plans. Anecdotal evidence indicates that some communities were poorly prepared. To be sure the problem of supplying good water supplies and wastewater facilities to small communities exists, drought or no drought. So too, the problems of individual households and farms, while of a different character, demand consideration. It is by no means clear precisely what policies of government at the local, state, or federal level are appropriate to the mitigation of potential damages from drought, a guaranteed hydrologic visitation.

Power outages caused by tropical storm Isabel made us acutely aware of the consequences of the interruption of water and wastewater services. What might be reasonable responses to expected but episodic interruptions?

Water Quality

In reality, of course, water quality is inseparable from water quantity. Both overpumping a coastal well leading to saltwater intrusion or degradation of surface water quality from point and non-point sources affect the value and potential uses of the water resource. The evidence

suggests that while progress has been made in enhancing the quality of the waters of the Chesapeake Bay, not unexpectedly the task of continuing improvement remains daunting, particularly in an uncertain economic environment. Controlling non-point sources of pollution is relevant not only in the context of the Bay but at many watershed scales, whether one is interested in protecting the watershed source of a water supply or the ecology of an urban stream. Political and social barriers are perhaps more difficult to overcome than technological ones in achieving clean streams, a social goal on which presumably everyone agrees. Although no comprehensive report on the quality of the waters of the State has been issued, the Maryland Water Monitoring Council represents a remarkable coordination effort among the diverse agencies needed to provide a substantive appraisal. The record shows that protection even of trout streams with the highest quality water is difficult in the face of development pressures, particularly where the protecting agency may be a party to the pressure.

Information and Institutions

Proper management of Maryland's water resources requires policy direction, institutions designed to translate policy into action, skilled manpower, adequate information on which to base policy decisions, and the power to act. Maryland, of course, has many of these requisites. Federal and state laws governing drinking water quality and the discharge of pollutants are far ranging. Unlike most states in the eastern region of the country, Maryland also has a system of water permits, an important management tool. At the same time, administrative responsibility for water quality, for wastewater control and for basic information on surface and groundwater supply and quality is dispersed among a number of agencies. Similarly while observations of well levels and water quality in wells is extensive, more information may be needed as demands expand. The state may be only marginally meeting the knowledge needed to assess trends and competing demands essential to proper water management.

There is much evidence that the belief of scientists and engineers that policy decisions demand good science is both naïve and untrue. Nevertheless, the notion must remain a pillar of these professions if we are to be at all useful. From this vantage point, it is important to note that for a number of decades there has been an attrition of firm support in three areas essential to achieving effective water resources policies; information on the state of the resource, skilled individuals devoted to analyzing trends and characteristics in the behavior of the resource, and equally skilled personnel to carry out the mandates for assistance and enforcement of regulations already on the books. Individual entities of various kinds can carry out specific tasks required in the management of water resources. Government, however, has the responsibility for assuring the quality and continuity of basic observational networks defining the status of the resource in space and time. Computer models are not self-verifying, the behavior of the hydrologic cycle must be observed over time to provide a base for verification as well as a grist for understanding. Assessing the impact of alternative management options on the highly variable behavior of the water resource is often exceedingly difficult. It is more so in the face of competing, and changing, objectives of society – the usual case. This is not a claim for "perfect knowledge" before action. It is a call for information that can guide effective, and even more efficient, management. Policy and management are a bit thin in the absence of information and competent analysts.

Water Supply as a Factor in Local Growth Management in the U.S.

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Introduction

In February of 2002, as aquifers, streams and reservoirs in many parts of Maryland reached record lows, 72 members of the state's General Assembly signed a letter to Governor Parris Glendening requesting that he create a special commission to investigate ways of stemming the decline of water supplies. What was particularly striking about the General Assembly's letter is that, even in the state that has earned a national reputation for its pioneering environmental programs and "Smart Growth" initiatives, Maryland local officials appeared to have scant information on the adequacy of water supplies to support future development. This led the author to ponder the two main questions. 1) What is the state of the science in determining how much water is available to support additional growth in a given area? 2) What is the state of the planning practice in using the results of such water supply analyses, in making local growth management decisions? The author was particularly interested in the nature and degree of coordination between water supply planning and local land use planning, in states that have earned reputations for growth management.

Four states were selected for case study: Oregon, Maryland, Florida and New Jersey. Over the past decade, these have arguably been the most frequently mentioned in review articles and other literature on state growth management efforts. Key statutes, regulations, state and regional plans and reports, selected local plans and ordinances, and other official documents on growth management and on water supply planning in each of the four states were examined. Interviews were conducted with relevant state officials and with other knowledgeable stakeholders and analysts (such as hydrologists and land use attorneys) to gain perspectives pertinent to the two research questions. Additional information was derived from relevant books, journals, newspapers and websites. Some of the report's major findings, and the implication of those findings, are presented below. The full report will be retrievable shortly on the internet; please e-mail the author at the above address for information on the website and date of availability.

Summaries of the Four Case Studies

Oregon. Oregon has statewide land planning goals that must be addressed in local land use plans. One of the goals requires each municipality to establish and maintain urban growth boundaries -- revised every five years to contain a 20-year supply of land -- within which all projected growth is to be accommodated and outside of which nearly all growth is prohibited through zoning. As in the other three states reviewed, Oregon state water officials base decisions on the issuance of new water permits on whether minimum water flows and levels will be maintained. For example, o*ut-of-stream* appropriations for consumption (such as municipal use, irrigation and livestock) and any in-stream demands (for tribal water rights and scenic waterway requirements) cannot be more than the 'live" natural stream flow occurring at least 80 percent of the time. However, in many parts of Oregon there is more water use permitted than is available to meet established water flow and levels during dry periods

Since 1994 Oregon has required all municipal water suppliers to prepare "water management and conservation plans (WMCPs)" that are supposed to be consistent with local land use plans, and in 2002 the state strengthened the water planning requirements. However, several key informants for this study, including the Oregon Water Resources Department (OWRD) official in charge of reviewing WMCPs, question whether the state has the political will to deny new water rights and permits requested by municipal suppliers. It remains to be seen whether: the required WMCPs will contain realistic alternatives to current surface and groundwater withdrawal practices; whether OWRD will apply pressure to municipal providers that do not provide adequate reasons for failing to meet required 5-year progress benchmarks; and whether local jurisdictions will base growth management decisions on WMCPs and other water supply plans.

In fact, there may be an inherent conflict between the state's growth management policies and its water supply planning, even though several of Oregon's statewide planning goals implicitly or explicitly call for coordination between land use and water supply planning. For example, the city of Bend case study illustrates that two of the major strategies proposed to obtain water needed for additional growth have consequences that undermine other growth management goals and produce politically controversial results. First, buying groundwater rights from agricultural landowners could result in the loss of productive farmland. Second, lining irrigation canals and using other mitigation accounting practices could result in depletion of surface water flows in some critical parts of a river -- due to the connection of groundwater and surface water – leading to declines in water levels and damage to native fish populations and scenic recreational uses.

Florida. Since the 1970s, Florida has been in the national forefront with regard to both water planning and growth management. Florida has regional water districts with extensive water supply planning and permitting responsibilities, and the state requires coordination between local land use plans and the districts' water supply plans. Florida's growth is largely occurring in the southern part of the state, where overuse of groundwater has led, in some cases, to sinkholes and intrusion of saltwater into aquifers. Tampa Bay has recently completed a desalinization plant. In late September of 2003 a developer lobbying group recommended to Governor Bush that that he allow the transfer of water from the state's northern regions to its far more populous south.

In terms of land use planning, Florida has state and regional policy statements with which comprehensive plans must be consistent, and requires local governments to ensure that the provision of services (including water) is "concurrent" with new development. However, a spokesperson for a regional water district echoed the sentiments of many key informants by stating that, despite "concurrency" requirements, Florida's local governments are approving development proposals "regardless of whether or not water is available to serve them".

New Jersey. New Jersey has water supply challenges caused by pollution of water resources from industrial and wastewater discharges, and from development-induced, large-scale disruption of surface and groundwater recharge. Fully one-half of the water that New Jersey uses leaves the state, much of it in the form of stormwater and treated wastewater that is dumped into the ocean. The state's Department of Environmental Protection prepares a six-year water supply plan that forecasts water supply and demand in each of 23 planning areas. Since 1992,

the state had a growth management system that features a State Development and Redevelopment Plan (SDRP), containing a map that identifies those regions in the state where local officials should channel growth and those in which land should be preserved. However, there is a weak connection between water supply planning and the local land use planning that has been relied upon to protect water sources. Local government compliance with the SDRP is voluntary, and planning and zoning powers reside in the state's 566 townships and municipalities.

Although the state's New Jersey local government are not required to include conservation element in their local plans, by state law a municipality's subdivision and/or site plan regulations must include provisions ensuring "adequate *water supply*, drainage, shade trees, sewerage facilities, and other utilities necessary for essential services to residents and occupants" (emphasis added, N.J.S.A. 40:55-D38). Thus, a municipality is not required to have a plan in place to protect aquifer recharge areas or watersheds for surface waters, but it does need to verify that a proposed development within its boundaries has an adequate water supply. No definition of "adequacy", nor the length of time for which it is to be secured, is included in the legislation.

Maryland. Since the 1970s Maryland has passed a number of nationally-recognized laws aimed at protecting water *quality*, largely targeting the health of the Chesapeake Bay. Unlike Florida and New Jersey, Maryland does not have a comprehensive water supply plan prepared by MDE or other state agency. Some analysis is conducted by two of the interstate river commissions that administer water allocation from rivers serving Maryland jurisdictions. For example, in the year 2000 the Interstate Commission on the Potomac River released a 20-year water demand and availability forecast that addresses its service area. However, for the rest of the state, MDE's only water supply forecasting occurs when it reviews individual permit applications by certain categories of water users.

In terms of land use planning, under the 1992 Planning, Resource Protection and Planning Act, local governments' comprehensive plans must include a sensitive areas element, one if which is "streams and their buffers". In 1997 the state passed an incentive-based "Smart Growth" program that limits state infrastructure funding to cities, inner-beltway areas and priority funding areas (PFAs -- growth areas designated by counties using state criteria). Maryland law prohibits local governments from approving a subdivision plat unless (a) water facilities to serve the property will be completed in time to serve the proposed development; and (b) the development will not overload any water supply facility. However, the requirement is directed primarily at the *infrastructure* needed to serve individual developments rather than the long-range adequacy of water *supply* to serve all development contemplated under a comprehensive plan. Under Maryland law each county is required to prepare and submit for state approval a 10-year water and sewer plan, updated every three years. Many existing water and sewer plans were written prior to passage of the Smart Growth Areas Act, and were not created with PFAs in mind. Interviews with Maryland Department of Planning (MDP) staff members indicate that the water and sewer planning program has not been fully reviewed to (a) evaluate the degree to which it is actually coordinated with the Smart Growth initiatives in general and the PFA program in particular; and (b) identify ways in which such coordination could be improved.

Key Findings and Implications

The case studies from Oregon, Florida, New Jersey and Maryland reveal the following key findings related to the relationship between water supply planning and growth management. First, the resources devoted to state water supply planning reflect the relative differences in each state's perception of the severity of its water supply problem. Florida has the longest history of the four states in dealing with drought-related water supply problems, and this is reflected in the breadth and depth of the analyses conducted by its five water management districts. Maryland has had little drought-related crises relative to the other studied states, and this is reflected in the lack of a state water supply plan and in MDE's stated need for better water flow and level information. Water agency spokespersons in all four states underscore the need for more sophisticated modeling.

Second, in all four states, there is currently a poor level of coordination between water supply planning and growth management planning. A major reason for the poor level of coordination -- especially in Florida and New Jersey - - is that local government growth priorities often lead to local land use decisions that are inconsistent with water source limitations, even when knowledge of water scarcity is available. Also state agency officials frequently do not have the political will to restrict new water permits. State and local leaders are reluctant to acceptance limits to growth based on water supply factors. Reflective of this point is that rarely do water supply plans include forecasting scenarios that simulate long-term drought conditions and project the fiscal, economic and environmental implications of that drought forecast. Consideration of such consequences would allow for a wider range of planning alternatives to be considered at the state, regional and local level.

If their growth (and weather) trends continue, states like Oregon, Florida and New Jersey will soon have difficult policy choices to make. Sufficient water will not be available where most of these states' growth is occurring. It remains to be seen how high a price customers will be willing to pay to for desalinization, new pipelines, and other heroic solutions to their water supply problems; or what water users will tolerate in terms of water-use restrictions; or what trade-offs customers will allow between water for agriculture, versus development, versus wildlife; or how water will be rationed between current and future users. These are choices that are already being made by some states in the arid West. The next era of growth management in many other parts of the country may very well be shaped by these water-based dilemmas.

Public Policy Water Issues

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1. Introduction

As we proceed into the 21st century, our water resources are likely to be subjected to much greater pressures than in the past. With increasing pressures comes a need for new leadership to tackle the technical challenges surrounding increased demands on water supply, water quality and flood control as well as new societal demands such as for stakeholder groups to have a larger voice in the decision making process, and for the health of ecosystems to be recognized more in water policy making. The "new" management and leadership that are required inevitably will need to deal with the following issues, which are the focus of this presentation:

- Planning and Management: many issues are tied to the long time horizons over which the ramifications of actions (or inactions) will be experienced.
- Cross-cutting Nature of Water Issues: diverse viewpoints of, and agendas for the larger water system need to be addressed and reconciled.

From all this emerges a set of public policy opportunities and challenges, which I will discuss in more detail in the concluding part of my presentation.

2. Planning and Managing Complex Systems

2.1 The Legacies of Infrastructure

Much of past investment in infrastructure was to expand capacities to meet growing demands for water supply, high water quality and flood control. However, many of the water infrastructure systems in use today have exceeded their design life, and some are already unable to meet the demand placed on them. With changes in demand and altered environmental conditions, reliability increasingly emerges as a key goal. Yet, much of the water infrastructure put in place today follows design criteria based on past observations. For example, drainage systems are designed to cope with, e.g., 100-year flood events even though what it means to be a 100-year flood is likely to change over time.

Many flood control, water supply and water treatment systems we have put in place are "now locked in" implementing new, potentially more effective approaches is increasingly difficult. But not only are water systems influences by the physical and socioeconomic environment, but they in turn do affect the environment in many ways – e.g. development often "follows the pipe" into greenfields, resulting in sprawl and habitat loss. What is needed is a management approach that recognizes the interrelationships between environmental change and socioeconomic change within a regional context and how those relationships change over time. One set of potential inadequacies of existing water systems and water policy may be encountered under climate change.

2.2 The Vagaries of Climate

Many water infrastructure system reliability issues are exacerbated by climate change. The traditional presumption that we are climate-proofing society making ourselves less subject

to natural phenomena is being increasingly challenged as climate variability and climate change stress not only agriculture but also the water, electricity and transportation systems on which modern , urban life relies. When systems fail, we put in place committees to identify solutions that would have helped us avoid those very problems (examples include the "Governor's Task Force on the Flooding in Western Maryland 1996) and mechanisms to compensate for loss if things go wrong (such as the National Flood Insurance Program, in which all Maryland counties participate, or MDE's Flood Hazard Mitigation Program which works with communities in finding ways to reduce or eliminate risks to safety and property by establishing flood plain management programs to prevent flooding risks from occurring in the future). Little efforts are made to anticipate future insults that differ from the past.

2.3 Uncertainties about Economy and Technology

Though uncertainties about future climate are hotly debated, climatologists have been successful in assembling highly sophisticated, large-scale climate models that are telling a consistent and compelling story of warming trends and increases in the frequency and severity of extreme weather events. However, future climate assumptions – especially at the regional level – are significantly influenced by socio-economic and technological change. The uncertainties surrounding future economic conditions are often larger than those surrounding future climate conditions. And it is often the social issues (such as social acceptability of technology, environmental justice, etc.) that highlight limits of technology solutions that may be proposed to help us adapt to a variable and changing climate.

To better understand future stressors on water systems, we would need to know not only, e.g., the preferences of the region's households in the future and people's income levels (which together influence their demand for goods and services which directly or indirectly require water for production and distribution), but we would need to know the same also for other regions and foreign countries in part because their demand for goods and services influences local water demand and water quality. And if this weren't enough, we would need to know the likelihood that water markets and infrastructures will be privatized, and how extensive and successful that privatization may be.

Social scientists and policy analysts are just about beginning to systematically think about and model the complex socioeconomic and technological issues, and for them to be successful will require close collaboration with engineers, planners and natural scientists. However, in an era of shrinking research budgets, sound and comprehensive planning and managing become even more of a challenge.

3. Multi-sector Effects

How we manage water will have implications for transportation (e.g. flooding of roads and coastlines), energy (e.g. impact on conventional generation and cooling needs; need for electricity in water pumping and treatment), communication (e.g. to the extent that flooding disrupts electricity supply, it also impacts electronic communication and data storage), as well as ecosystem and public health. There is a need for integrated assessment of these multi-sectoral effects. Many pieces of the puzzle are known but need to be linked up with each other.

Various federal and state legislation mandate coordination of water policy across a jurisdictions, and the extension of the Chesapeake watershed across multiple states further calls for coordination of policies within the region. While much of this coordination is among different government agencies, it increases in complexity as local, state and regional decision

making increasingly involves public-private partnerships. Management complexities are further increased when stakeholders are involved in the decision making process. Stakeholder involvement is often motivated by the recognition that in a democratic society those individuals who are affected by a decision should be part of the decision making process, that those individuals often have valuable information that can improve planning and management of complex problems, and that monitoring and enforcement of laws and regulations are facilitated if there is up-front buy-in by the parties involved. However, stakeholder-based decision making can be tedious and requires lots of resources, can lead to "stakeholder fatigue", and its success frequently depends on the personalities of facilitators and participants. Unfortunately, there is a lack of comprehensive assessments of the do's and don'ts of stakeholder involvement across a range of water policy and investment decisions. Key questions to be answered are

- whom to get involved (depending on how the issue is phrased, everyone is potentially a stakeholder) and
- when to best bring stakeholders into the picture (in the problem-definition phase or later, after alternatives have been identified and need to be ranked).

To a significant extent, the answer must depend on the complexity and reach of the issues at hand. The longer the reach and the larger the complexity, the earlier stakeholders should be involved and the more diverse and larger the group of stakeholders should be.

4. Summary and Conclusion

In summary, this presentation identifies three main opportunities and challenges for public policy water issues. First, we need more research *that supports investment and policy making through better integration of engineering, natural science and social science*. This will require being in tune with the needs of decision makers for better – and better presented – information without compromising the science. Second we need to develop cross-institutional collaboration. While there is some overlap in water policy with transportation, energy, environmental and public health policy, there are many more real-system interrelationships than are recognized within the mandates of the respective institutions. We need to strengthen collaboration across institutions, and among the public, private and non-profit sectors.

Third, there is lots of talk in the scientific literature and in resource management communities about adaptive management – an approach by which continued data collection and analysis, information exchange and stakeholder participation are used to fine-tune plans and strategies to better deal with uncertainties and improve management decisions. The bulkiness of many water infrastructure systems, the long lead times between planning and system change, the long time horizons over which the systems are in place, their potentially long reach and high complexity, all require that we not only adapt, but that we anticipate future environmental and socioeconomic changes. We have the data and modeling tools, the necessary experience with stakeholder involvement, and there are pressing needs to do that. All that remains is to actually do it.

Policy Implications of Water Supplied from the Susquehanna River Basin

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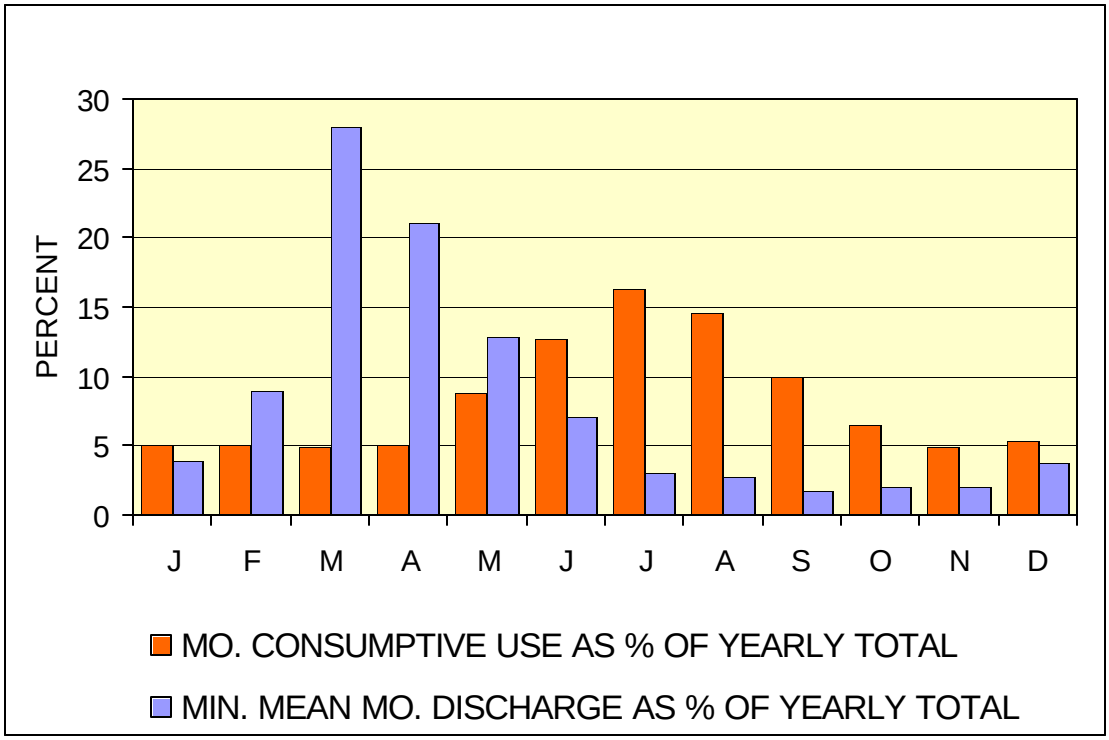
Background.

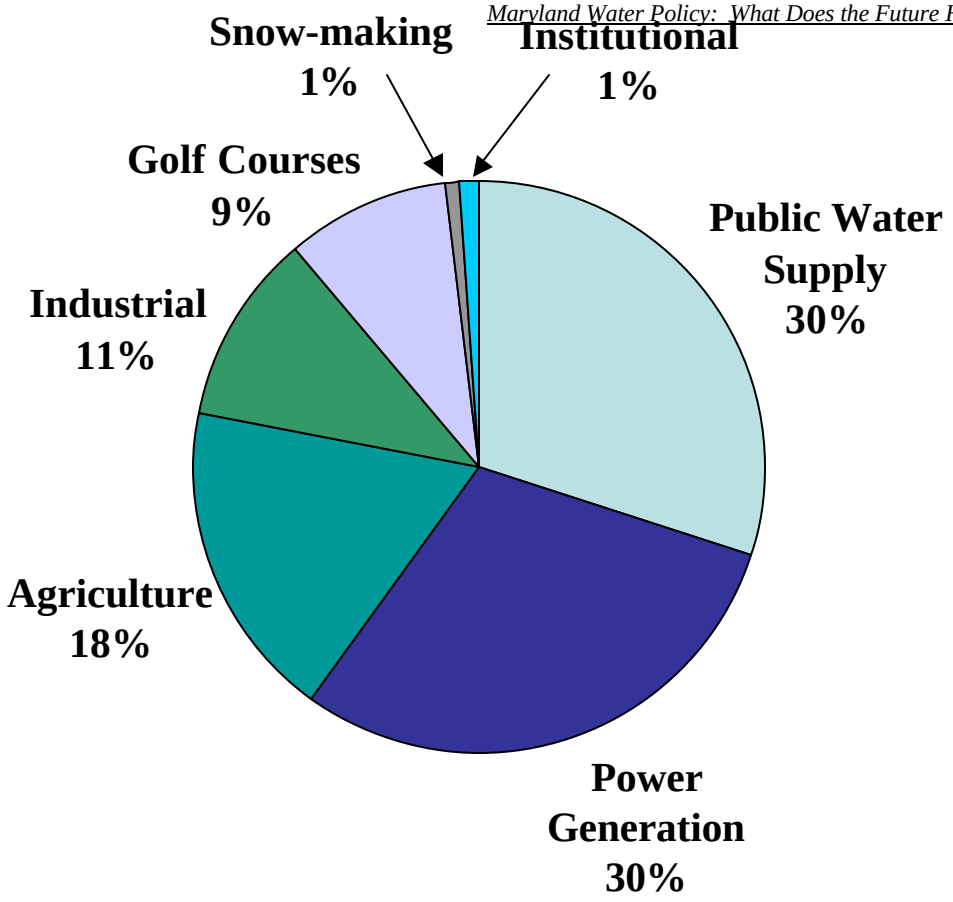
The Susquehanna River Basin drains an area exceeding 27,500 square miles, covering half the land area of Pennsylvania, and portions of New York and Maryland. This land mass encompasses over 43% of the Chesapeake Bay's total drainage area. The main stem of the river originates in the southern tier of New York, flows through central Pennsylvania before emptying into the Bay at an average rate of 18 million gallons per minute near Havre de Grace, Maryland. These average flows from the Susquehanna River comprise over 50% of the freshwater inputs to the Bay.

While the basin is noted as one of the most flood prone basins in the United States, there is increasing concern over the growing demand for the water both in and out of the basin as the population of more than 4.2 million people continues to accelerate. In the Lower Susquehanna sub basin, the most heavily populated area of the basin, census estimates predict a population increase of more than 16% over the next 20 years. Consumptive water use continues to increase throughout the basin with sector uses of power production, municipal supplies and agriculture sharing the highest demand. Of interesting note, the municipal supply sector is considered a consumptive use when it is diverted out of the basin. Although some of that diverted water may ultimately return to the Chesapeake Bay, once diverted, it is no longer available for use in the basin itself.

Given the population projections in the Lower sub basin, the pressures of urban sprawl in surrounding population centers, and increases in withdrawals and consumptive uses, it might be



instructive to more closely examine the role of the Susquehanna River Basin Commission in managing the water resources of the basin and take a closer look at some of the policies that guide that effort. This paper will address the Commission's compact and its general purposes, key regulations and policies, along with some of the ongoing and planned activities to address current and emerging water resources issues.



The Compact and key policies.

The Compact is the legal framework that forms the basis for all of the Susquehanna River Basin Commission's water management activities. Signed into law in 1971, this Compact has a duration of 100 years and was adopted by the Congress of the United States along with the legislative bodies of the states of Maryland, Pennsylvania and New York. Several general purposes stated in the compact guide the Commission's planning and water management activities. These general purposes include but are not limited to: promoting interstate comity, application of the principle of uniform and equal treatment to all users of water and of water related facilities; making secure and protecting developments within the states; and encouraging and providing for the planning, conservation, utilization, development, management, and control of the water resources of the basin.

Within these general purposes, the Commission has several regulations and policies that guide Commission actions to achieve the stated general purposes of the compact. The key regulations and policies include: procedures for review of projects, review of diversions of water from the basin, compliance and enforcement actions and technical guidance documents for issues such as pump tests and passby flow. As an illustrative example, the regulations and policies that guide project approvals and compliance activities allow the Commission to consistently apply equitable treatment to all water users and proactively manage the water resources today and into the future. The diversion policy touches all general purpose areas within the compact, but obviously has a strong emphasis on conservation and use of the basin's water to support the residents and ecosystem of the basin itself.

The SRBC Compact

•General purposes of the Compact:

–Joint exercise of sovereign rights/responsibilities
–Promote interstate comity
–Secure and protect developments within the states
–Apply the principle of equal and uniform treatment without regard to political boundaries.
–Encourage and provide for the planning, conservation, utilization, development, management, and control of the water resources of the basin

Putting the policies into action.

Rather than spend time discussing the policies themselves, perhaps it is more useful to see actions underway or planned for the near future that illustrate how these policies and general provisions of the compact translate into actions. Under the planning heading, the Commission has developed a Comprehensive Plan that addresses water quality and quantity needs and uses across the basin. This planning document forms the basis of a water resources program for the basin and concentrates on not only existing water resource projects, but those planned in the foreseeable future that would require coordination and management across watershed and political boundaries. In the area of quality, the Commission's compact specifies that primacy is left to the states to regulate water quality through appropriate management activities and controls.

A more targeted planning activity currently underway is the Conowingo Pool Management Plan. This plan is being designed to investigate and manage basin-wide resources that can offset potentially critical conditions encountered during droughts. The plan's focus on the Conowingo Pool (Pool) as the key water resource embodies the Commission's interest in promoting interstate comity and serving as a coordinator to prevent conflict over competing uses of the same shared resource. The plan is being developed with a group of more than 20 stakeholders who share use of the water within the Pool or have an interest in the implications of its operations. Modeling is underway to conduct "what if" scenarios to optimize operations throughout the basin. This planning document will also address future consumptive use estimates to asscess potential impacts to the Pool.

One other planning activity underway is a joint effort with the US Army Corps of Engineers to study and develop a low flow management plan for the basin that looks at water releases below reservoirs to meet water supply requirements and provide environmental enhancement as well investigating economic incentives to promote water conservation to preclude water shortages. A future plan of the SRBC is to investigate the dredging of sediments from behind the hydroelectric dams on the lower Susquehanna River. Essentially, this dredging of sediments becomes an additional measure for decreasing nutrient and sediment loading to the Chesapeake Bay. Further, an investigation of use of the dredged material in restoring abandoned mine lands affords the opportunity to dispose of the sediment in an environmentally sound and economically feasible way.

Putting the Policies Into Action

•Planning
–Conowingo Pool Management Plan
•In anticipation of increasing withdrawals and potential for conflict during droughts
•Interstate water resource (PA and MD)
•Multiple stakeholders with competing interests
•Hydrologic model routes flows, tracks demands and inputs to system over time
–Over 70 years of flow and precipitation data
–Allows "what if" modeling across basin
–Comprehensive Plan
–USACE Low Flow Management study
•Investigate low flow solutions basin-wide
•Develop reservoir storage management plan to complement existing release concept
•Characterize environmental flow regime to sustain or enhance aquatic systems and support water quality parameters
–Sediment Management Feasibility Study
•Linkage to Chesapeake Bay quality
–Develop sediment management strategy for lower Susquehanna River hydroelectric dams (dredging/disposal)
–Optimize land reclamation (WIN-WIN)
•Conservation
–Standard Docket conditions
•Compliance with water conservation requirement
–Interagency Drought Coordinating Committee
–Agricultural Consumptive Use Study
•Livestock watering
•Crop irrigation
•Economic incentives (regulatory)

The SRBC actively manages water conservation through the application of its project review process. Each time a water use is approved under the project review regulations, conditions are added that require the project to apply conservation standards in accordance with the Commission's regulations. While all major water users are addressed in the regulation, the Commission recognizes that industry and municipal water purveyors are two of the most aggressive water users in striving to not only meet, but often exceed conservation standards. The SRBC has also undertaken a three year study to investigate specific conservation techniques for agricultural uses and will promote application of these techniques throughout the basin as well as consider regulatory incentives that might encourage additional agricultural-related water conservation.

As the Commission continues to focus on the increased demands building for water, it becomes increasingly more important to manage the use of the water and gain an understanding of where sources are constrained or limited. The SRBC has undertaken a special study in Pennsylvania to assess water inputs and demands in a specific watershed within Lancaster County. This assessment will allow development of a water budget for the watershed and lead to recommendations for future management plans as demands of the watershed's water resources continue to increase. On a more local basis, the SRBC also investigates water use for individual projects and quantifies possible impacts to surrounding or downstream users. For groundwater applications, the SRBC specifies the completion of a pumping test done in accordance with specific engineering principles and guidance. This published policy ensures uniform and consistent treatment of all water users across the basin and allows the SRBC to determine what impacts are likely and how to mitigate these impacts to avoid downstream or adjacent landowner conflicts.

Policies

•Procedures for the review of projects
•Out of basin diversions
•Compliance and enforcement actions
•Technical guidance documents
–Pump tests
–Passby flow
•Emergency withdrawals

Putting the Policies Into Action

•Utilization
–Project Review Process
•Detailed review of the water needs associated with individual projects
–Cumulative impact analysis
•Water Budget study in Lancaster County, PA

Water resource development and management is accomplished in large part by focusing on the basin's needs and uses first. If out of basin needs arise, the SRBC has a specific policy for addressing these needs and carefully assessing whether or not these demands for basin water could impact the ability of the basin to meet its own needs. The project requesting a diversion must document that it is the most economically favorable alternative available for addressing water supply issues as well as demonstrate the impact within and out of the basin.

Future Plans

•Conowingo Pool Management Plan
–Goal: Optimize operations to satisfy multiple stakeholders who share Pool resources
–Computer aided scenario and flow analysis sessions begin this fall
•Explore alternative management strategies
•Seek optimal flow management plan
–Management Plan completed by Jan 2005
•Water Budget Studies as needed in areas where demand has potential to exceed supply
–Local basis
–Big picture

As the water resource needs of the basin increase, the SRBC stands ready to proactively manage these growing demands while protecting the environmental and economic vitality of the basin. The policies and compact that guide commission activities cover a broad spectrum of issues and have endured the test of time to provide a solid foundation for planning and managing the basin's water resources. It remains the Commission's goal to facilitate coordinated water resource management across state and political boundaries and promote sound use practices throughout the basin.

Maryland Utilities and Water Supply Policy

Roland C. Steiner
Washington Suburban Sanitary Commission

Water supply has been viewed as the "silent service" because of its low visibility and high reliability. Thus, most policy issues have been concerned with meeting consumer demand for safe water. With regard to meeting demand, efficient regional surface water resources development evolved in the greater Baltimore region, in the George's Creek valley of western Maryland, and in the Washington metropolitan area (now extended to Rockville, Frederick County and Mirant Power Company). Most demand in the coastal plain is met from wells that tap ground water aquifers. In order to fulfill the policy of meeting consumer demand for safe water, a number of issues arise: conservation, improved operations, expanded resources, and indirect issues.

Conservation

Conservation is accomplished by using less water (or no water) to meet a particular need or perform a particular function. It involves everything from carefully estimating how much to water lawns to buying and carefully using water-saving fixtures and appliances. Water utilities realize that water conserved is water that does not have to be supplied to consumers. A number of Maryland water utilities and other agencies have joined together to fund a program which provides water conserving information to consumers for use in any weather and in all seasons of the year. However, even more complete programs which include incentives and audits have their limitations on the amount of water subject to conservation. The Washington suburban Sanitary Commission sponsored a study of potential conservation effectiveness specifically for its area of supply. The results of the recommended plan indicate that 4.2 million gallons per day (mgd) could be saved by the year 2009 (only 2.5 percent of current supply). The potential for conservation in other utilities would vary. The District of Columbia Water and Sewer Authority estimates that its water conservation plan will save 6 mgd by the year 2012.

An issue related to conservation is that of drought response restrictions. These differ from conservation by being applied only in times of water shortage as voluntary or mandatory limits on the use of water by consumers. They affect the planning for water supply infrastructure by recognizing limits to the level of service, and are a recognition of the balance between providing fully reliable water resources and some degree of inconvenience. To be efficiently used, their effectiveness must be carefully estimated.

The move toward regionalism, with multiple sources serving wide areas, improves reliability and reduces the need for restrictions during drought. However, with growth of demand and occasional severe droughts, it should be recognized that not all demands can be met. Since the drought of 1999, the Maryland Department of the Environment (MDE) has reorganized its response to very dry conditions. It now recognizes the different degrees of reliability of resources in different regions of the state, especially with regard to the need to impose water use restrictions. An important policy issue for the immediate future should be that water utilities

work with MDE to reconcile the multiple overlapping criteria that determine the threshold for imposing restrictions (Consumptive Use Regulation, Potomac River Low Flow Allocation Agreement, Metropolitan Washington Water Supply and Drought Awareness Response Plan, and Water Appropriation Permit language). Current references to the Restriction Stage of the Potomac River Low Flow Allocation Agreement are practically irrelevant.

Improved Operations

For more than 20 years studies have been conducted in order to determine how to best use the mix of river and reservoir resources available to the Baltimore water supply system and that of the Washington Suburban Sanitary Commission which serves most of Montgomery and Prince George's counties. However, the best studies and resource utilization models are only as good as the information upon which they rely. In recent years, one of the most important elements in managing the Washington regional system (the time of travel for water released from up stream reservoirs to reach the river intakes) was significantly adjusted by experience gained in real time drought operations. Also, recent accounting for water withdrawn but not returned to the river (consumptive use) has had an impact on improving water supply operations.

Actual experience has also improved operations by demonstrating the effectiveness of providing frequent status reports of water supply conditions during drought operations. During the drought of 1999 citizens and elected officials seemed somewhat unaware of the implications of releases from low flow augmentation reservoirs in the Potomac River basin. However, operations proceeded much more smoothly with frequent wide-spread information provided by the utilities during the drought of 2002. Continued close coordination among the utilities and the regulatory agencies should be an on-going policy with high priority.

Expanded Resources

Water resources are limited by natural occurrence and competition among users. The reliable yield of small streams and reservoirs becomes exceeded as municipal, industrial and agricultural demands grow. Larger (likely regional) resources are sought. Even with conservation and improved operations, new users and growth in demand of existing users reduces the reliability of the resource. Eventually, expansion of resources is required. Baltimore developed the Gunpowder and Liberty reservoir systems, and expanded to the Susquehanna River.

The Washington region made use of the Potomac River, developed local reservoirs, and expanded with up stream reservoirs. Current demand projections indicate the need for expanded resources with in the next 2 decades. In order to reduce environmental and social impacts of resource expansion, initial investigations for potential new resources have focused on feasibly convertible land uses. These include: the restoration and enlargement of an existing disused reservoir, the enlargement of one or more existing active reservoirs, the use of rock quarries when they have reached their economic limit of extraction, and the treatment of estuarine water. Each of these options also has serious economic and operational considerations.

Indirect Issues

An important policy issue is: how to meet the request for more water from resources that are already strained by existing demand in times of drought? A case in point is the cumulative impact of many water withdrawals which are not entirely returned to the source. This is a particular problem when water is released from up stream reservoirs for downstream users in the Potomac River basin during times of low flow. Most water withdrawn for municipal and industrial purposes is treated and returned to the source for use further down stream. Therefore, a policy of encouraging the development of up stream surface water reservoirs would actually add to base flow during times of drought. However, most if not all water withdrawn for irrigation of agricultural fields and golf courses is fully consumed. Among all categories of water use, that portion which is not returned to the Potomac River up stream of Washington, D.C. is expected to increase by more that 20 percent during the first 3 decades of this century. The issue is addressed in Maryland's consumptive water use regulations, was the subject of a study conducted recently for MDE, and is acknowledged among the cumulative environmental impacts noted by the state Power Plant Research Program.

The control and accounting for withdrawals from the Potomac River to the south (Virginia and West Virginia) is seriously threatened by the case currently before the U.S. Supreme Court. If the Court sides with Virginia (in not requiring withdrawal permits from Maryland) the management of the flow in the river may be reduced by half, and decades of carefully nurtured cooperation may be dashed.

Maintenance of the significant inventory of infrastructure will become an increasingly important issue as its elements reach the ends of their useful lives. To this end, the Washington Suburban Sanitary Commission is rebuilding or refurbishing its water filtration plants (including processes to meet the current and anticipated requirements for safe water). Also, more than $300M is planned to be spent by the year 2010 on their water reconstruction program.

Another important water policy issue for the state is the maintenance of flow in the Potomac River at or above prescribed minimum values for preserving aquatic habitat below water supply intakes at Great Falls and at Little Falls. The determination of any change to existing recommendations for the appropriate minimum flows and how to meet them will be very important in the future. Ensuring those minimum flows with releases from Water Quality storage in Jennings Randolph Reservoir would reduce the reliance on Water Supply storage to meet that environmental objective.

Summary

Most water utility policy issues have been concerned with meeting consumer demand for safe water. They may be seen to include conservation, improved operations, expanded resources, and indirect issues. Conservation is the first way to meet growth in demand. Among other methods, it may take the form of public information programs and incentives for the installation of low water using fixtures and fittings. Restrictions on water use are voluntary or mandatory measures of a temporary nature. They need to be applied in a rational manner with respect to relevant sources of supply. Water supply operational improvements have been developed from modeling

studies and direct experience. There is likely much more that can be accomplished through improved operations. When conservation and operational improvements are insufficient to meet future growth in demand, resource expansion will be relied upon. Water supply policies should assist in the development of resources from feasibly convertible land uses such as existing reservoir sites, quarries, and estuaries. Other policy considerations for the future should include the importance of accounting for consumptive water use, coordinated management of the Potomac River if the U.S. Supreme Court sides with Virginia, infrastructure management and maintenance, and determining the appropriate river flow required to sustain aquatic habitat in balance with other uses of water resources.

Speaker Information

2003 Conference on Maryland Water Policy – What Does the Future Hold?

Sponsored by Maryland Water Resources Research Center
University of Maryland, College Park, Maryland

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Dr. Wolman has been a professor of Geography and Environmental Engineering at The Johns Hopkins University for more than 40 years and is a renowned expert in the field of physical geography and environmental policy. Dr. Wolman is a native of Baltimore, earned a Bachelor of Arts degree in geology from Johns Hopkins in 1949, then masters and doctoral degrees in geology from Harvard University. He began his career as a hydrologist with the U.S. Geological Survey before returning to Johns Hopkins. He chaired the Department of Geography and Environmental Engineering from 1970 to 1990. Dr. Wolman, who twice has served as Acting Provost of the University, has published numerous articles and papers on his research, and is the co-author of two books, including *Fluvial Processes in Geomorphology* (1964). It is considered among the most insightful and scholarly contributions to the field ever written and remains a landmark in modern geoscience development.

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Dr. Parker is Director of the Center for Agricultural and Natural Resource Policy, in the Department of Agricultural and Resource Economics, University of Maryland. His research interests include water quality and land use, land/water linkages in the Chesapeake Bay, water resources management, agriculture and resource economics and biotechnology in agriculture. He has published 20 referred papers, numerous articles on his research, and edited a number of books. He has been the principal investigator or Co-PI on 32 research projects and grants in his area of expertise. Doug Parker earned a bachelor's degree from the University of California, Santa Barbara in 1984 and a PhD from the University of California, Berkeley in1990. He has taught numerous courses on water policy and management, biotechnology and management information systems

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Dr. Cohen is Director of Graduate Studies for the Urban Studies and Planning Program at the University of Maryland. He teaches courses in planning history and theory, planning process, and growth management, and has been faculty supervisor for several community planning studios. His 1999 planning studio course, "Smart Growth for Perryville", is one of 12 cases to be profiled in a book to be published in 2004 by the U.S. EPA and the Lincoln Institute of Land Policy, about "best practices" in university provision of technical assistance to communities in implementing smart growth. In the last eight years Dr. Cohen has also received grants from the U.S. Department of Education and the Fannie Mae Foundation to support his program's provision of technical assistance to community-based revitalization efforts in several Prince George's County neighborhoods. Dr. Cohen was a principal founder of, and the Interim Director for, the National Center for Smart Growth Research and Education on the College Park campus. He is currently a faculty affiliate with the center and co-facilitates the Maryland Smart Growth Leadership Training Program. In conjunction with the Maryland Department of Planning, he facilitates the Planning Commissioner Certificate Program that is held four times a year in different locations in Maryland. He holds a B.A., University of Michigan-Ann Arbor, 1969; M.R.P in 1985 and PhD in 1991 from Cornell University.

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Dr. Matthias Ruth is the Director of the Environmental Policy Program at the School of Public Affairs, University of Maryland and Professor of Environmental Economics and Policy. His research focuses on dynamic modeling of non-renewable and renewable resource use, industrial and infrastructure systems analysis, and environmental economics and policy. His theoretical work heavily draws on concepts from engineering, economics and ecology, while his applied research utilizes methods of non-linear dynamic modeling and adaptive management. Over the last decade, Professor Ruth has published 6 books and over 60 papers and book chapters in the scientific literature. He collaborates extensively with scientists and policy makers in the USA, Canada, Europe, Asia and Africa.

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Paul O. Swartz is the Executive Director of the Susquehanna River Basin Commission (SRBC). The Commission is a regulatory, federal/interstate compact commission vested with the responsibility for management and control of the water resources of the 27,500 square mile Susquehanna River Basin, which drains portions of New York, Pennsylvania and Maryland. Swartz directs all activities of the Commission, including a water supply program which helps ensure that adequate supplies of water will be available to domestic, municipal, industrial, agricultural and in-stream users in the future. In addition, Swartz is responsible for Commission programs in the areas of flood protection, flood plain management and restoration of migratory fish to the Susquehanna River. He also directs the Commission's water quality program, which benefits the Chesapeake Bay. The Susquehanna River supplies nearly half the fresh water entering the Chesapeake Bay. Swartz has served as a member of several Chesapeake Bay Program committees and has chaired the Monitoring Subcommittee. Before joining the SRBC in 1992, Swartz directed the Bureau of Soil and Water Conservation in Pennsylvania's Department of Environmental Resources. In this capacity, he managed the Commonwealth's Chesapeake Bay Program. Swartz is a 1970 graduate of Gettysburg college with a B.A. in psychology and has done graduate work in public administration at Pennsylvania State University.

Robert M. Summers
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Dr. Robert M. Summers was appointed Director of the Maryland Department of the Environment's (MDE) Water Management Administration in 2001. The Water Management Administration includes 340 employees working in seven different programs, with a $29 million operating budget and a $25 million capital budget. The Water Management Administration's mission is to restore and protect the quality of Maryland's surface and ground waters in order to protect the public health and the environment. The Administration includes programs for the control of wastewater discharges, protection of the State's water supply, protection of tidal and non-tidal wetlands and waterways, oversight of State and local government sediment and erosion control and storm-water management programs, and the regulation and mitigation of mining activities and abandoned mines. The Administration also provides technical assistance and financing through grants and loans to local governments for wastewater, water supply, storm-water management and environmental restoration projects.

Dr. Summers serves as the Governor's representative on the Interstate Commission on the Potomac River Basin, the Susquehanna River Basin Commission, and the Ohio River Basin Commission. He also represents Maryland on the National Association of State and Interstate Water Pollution Control Administrators. Dr. Summers has held various positions at the Maryland Department of the Environment and the Maryland Office of Environmental Programs since 1983. Most recently, he has served as the Director of MDE's Technical and Regulatory Services Administration, which provides scientific and technical support to the Department's environmental restoration and regulatory programs. He has worked on many aspects of Maryland's Chesapeake Bay restoration effort, hazardous chemical, oil and nuclear power plant emergency response activities and environmental and public health issues.

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Dr. Steiner holds the position of Regional Water and Wastewater Manager at the Washington Suburban Sanitary Commission (WSSC) where he is responsible for technical and financial arrangements concerning water supply or wastewater facilities shared between WSSC and other organizations. These include the Interstate Commission on the Potomac River Basin and the District of Columbia Water and Sewer Authority. Prior to this position, he worked at the Interstate Commission on the Potomac River Basin for 17 years on issues involving water supply, water quality, and associated land resources. He focused on water resource allocation and utilization among the three major water supply utilities serving the Washington, DC metropolitan area. His work included coordinating projects to: develop watershed management plans, implement methods to efficiently use water supplies, forecast future water demands and analyze potential new sources. Dr. Steiner holds Bachelors and Masters degrees in Civil Engineering from the University of Pennsylvania and Stanford University, respectively, and a Ph.D. in Environmental Engineering from The Johns Hopkins University. In previous positions, he taught Mathematics at the University of Baltimore; and worked in England and Wales for national and regional water and wastewater management agencies. Mr. Steiner is a registered Professional Engineer in the State of Maryland.

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