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Water Supply Management In the District of Columbia: An Institutional Assessment

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WATER SUPPLY MANAGEMENT IN TI-M DISTRICT OF COLUMBIA:
AN INSTITUTIONAL ASSESSMENT

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ERRATA

The following errors should be corrected as follows:

Page V-5, Line 11	-	The diameter of the conduit from Great Falls is 9 ft. not 90 ft.
Page V-6, Line 18	-	The operation of the water department of the District is not under the Chief of Engineers.
Page V-8, Figure 14	-	The line of supply to the Federal Government in Virginia is through the D.C.-DES, not through Arlington County.
Page VI-8	-	Mr. Jean B. Levesque was the Administrator of the Water Resources Management Administration of the Department of Environmental Services.

DISCLAIMER

"Contents of this publication do not necessarily reflect the views and policies of the United States Department of the Interior, Office of Water Research and Technology, nor does mention of trade names or commercial products constitute their endorsement or recommendation for use by the United States Government".

ABSTRACT

This study defines the District of Columbia's water management structure, explains how it operates, delineates the issues it will have to deal with in the 1980's, and assesses how the District is prepared to deal with these issues.

The study begins with a description of the Potomac River Basin and the physical environment water managers in the Washington Metropolitan have to deal with.

It then discusses the legal and institutional arrangements for managing water supply in the Washington Metropolitan Area for the District of Columbia. The report describes how each water supplier in the Area, including the District, provide water to their customers.

Finally, the report presents a discussion of the major water resource management issues facing the District of Columbia. These problems include: adequacy of future supplies; regional cooperation; water supply urgency and drought management; rehabilitation of water supply system; water billing and collection; and, rate increases and conservation pricing.

The report also includes a list of research questions under each of the major items discussed in the report as a means of guiding future research efforts on water supply in the District of Columbia.

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PREFACE

Few subjects have been more thoroughly investigated than providing water supply for the Washington, D.C. metropolitan area (WMA). Report after report has been published, volume after volume has been compiled, *and* meeting after meeting has been held.

The result is a collection of policy, technical and scientific research related to nearly every aspect of water resources in the WMA. [1]

Given this history of prolific writing, why do we need another study? Is there something left unsaid or not investigated?

The answer to both questions is: "Yes."

Too often in a rush to investigate problems, we don't stop to look closely at the tools we presently have at our disposal to solve problems. Before launching out in an effort to solve problems, we should thoroughly understand what resources we have and whether these resources are sufficient to correct the problems.

This report takes that approach. The report seeks to gain a better understanding of the water problems of the District of Columbia and to see how existing institutions are dealing with those problems. As a result, this report does not contain any clarion warnings about an impending water crisis. Neither does it call for any new programs, regulations, compacts, or massive reorganizations.

Rather, this report is intended to describe and assess has the District of Columbia and *surrounding* jurisdictions are organized to provide water supplies. The objective is to understand how the present system works and to assess whether the organizations supplying water appear prepared to meet the

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[1]Despite all this activity, there are no comprehensive bibliographies or compendiums of literature on this subject.

The author would like to thank all the water officials in the Washington, D.C. metropolitan area who generously consented to interviews and were most willing to provide information. As always, the conclusions drawn in this report do not reflect the views of any institution, organization or government; they remain solely those of the author.

CHAPTER I

INTRODUCTION

> The people of the United States are in no danger of any early shortage of water--the facts just do not bear that out. But we are going to have to work out new methods of managing water. -Gilbert F. White[1]

> Probably nothing is more intrinsically political than the allocation of water among different regions and competing uses.
> -Robert E. Reinhold[2]

The Water "Crisis"

Water is a fundamental prerequisite for life, and as a result, it has always been a central concern of every society. Man has constantly struggled to adapt and/or control the water resources of a given environment. And in many respects, it is no different today than it was thousands of years ago. It has been fashionable in the popular press to speak of an impending "water crisis" similar to the energy crisis which has plagued the United States for nearly a decade.[3] Yet the water problems the United States faces have only reached "crisis" proportions in isolated areas and for only short periods of time. Despite repeated warnings of a "crisis," the United States is endowed with bountiful supplies that should be adequate to support the

[1]As quoted in R. Reinhold, "Nation's Water Is Bountiful, but Supplies Are Squandered," New York Times, August 9, 1981, p. 1.

[2]Ibid., p. 48.

[3]The literature on the "water crisis" is extensive. A good summary is found in "The Browning of America," Newsweek, February 23, 1981, pp. 26-37. Other sources include: N. Wollman and G. Bonem, The Outlook for Water Quality, Quantity and National Growth (Baltimore, Md.: Johns Hopkins Press, 1971); U.S. Congress, Senate, Comnittee on Environment and Public Works, State and National Water Use Trends to the Year 2000, 96th Cong. 2nd Sess. (Washington, D.C.: GPO, 1980); U.S. National Water Commission, Water Policies for the Future (Washington, D.C.: GPO, 1973); U.S. Congress, Senate, Committee on Environment and Public Works, Subcommittee on Water Resources, Priority Setting for Water Resources Projects and Programs, 96th Cong., 2nd Sess. (Washington, D.C.: GPO, 1980); and U.S. General Accounting Office, Water Resources Planning, Management and Development: What Are the Nations Water Suppler Problems and and Issues?, Pub. No. CED-77-100 (Washington, D.C.: GAO, 1977).

nation for generations.[4] Nevertheless, the United States does have a water problem.

As the Water Resources Council has observed:

> There is no denying that without renewed dedication to careful management of water resources, pressures from the population of our technological society will seriously deplete and foul the water to the extent that it threatens the very survival of the United States....
>
> Except for some sections of the country, there is now no water crisis. However, without nationwide coordinated management and planning, and without special efforts to involve all levels of government and attain support of the individual citizens, serious trouble is a clear threat by the turn of the century.

While a major national water crisis may not be an immediate prospect, when we consider all the water problems we face, the possibility of a very serious national problem appears imminent by the "turn of the century." Indeed, some portions of the country are already approaching this stage. Major eastern cities have recently experienced severe droughts and their antiquated water supply systems appear incapable of delivering needed future supplies. Groundwater depletion in Florida, the Midwest and West has threatened some agricultural crops, caused subsidence and limited supplies for municipal and industrial purposes. Shortages and increased competition for the water in the West threaten to cause intense conflicts between agricultural and energy users. Finally, continued interest in protecting environmental values has caused sharp controversies between environmentalists and water users.

[4]The most comprehensive assessment of water supplies is contained in: U.S. Water Resources Council, Second National Assessment (Washington, D.C.: GPO, 1978). An excellent brief review of this assessment and others can be found in W. Viessman et al., The Nation's Water Outlook to the Year 2000 (Washington, D.C.: Library of Congress, Congressional Research Service, Report No. 78-26 ENR, 1978). This document was reprinted by the U.S. Congress, Senate, Committee on Environment and Public Works, 96th Cong., 2nd Sess., as Committee Print No. 96-19, December 1980.

[5]As quoted in: L. Wilson, State Water Policy Issues, (Lexington, KY: The Council of State Governments, 1978), p. 1.

Shortages of available surface supply for existing users, depletion of subsurface reservoirs, point and nonpoint pollution, obsolete urban supply of the systems, inflation, rising energy costs, and the growing water demands of a expanding and increasingly affluent and mobile population are major aspects of hi of the overall problem. The response to any one of these specific problems the F may require the investment of substantial amounts of private and public dollars and the sacrifice of present livelihoods, communities, and deeply ingrained habits of behavior. Moreover, the institutional framework for dealing with these issues is, at times, frayed, lacking the kind of organizational structure planning capability, and intergovernmental processes necessary to approach water resource management in a coherent fashion.

National Policy Initiatives

All these problems and observations led to a flurry of national activity focused on improving water resources policies in the 1970's. In 1973, a national study commission thoroughly investigated our water resources policies and recommended a wide range of initiatives designed to correct the major problems.[6] These recommendations, for the most part, went unheeded.

Five years later, President Carter undertook a comprehensive review of national water resources policies. His special message to the Congress which outlined his recommendations and actions indicated the importance of water problems to the nation.[7] His recommendations shed light on the diverse nature of our water problems and the critical need to improve federal, state and local policies.

[6]U.S. National Water Commission, Water Policies for the Future (Washington, D.C.: Government Printing Office, 1973).

[7]U.S. House of Representatives, Message from the President of the United States, "Federal Water Policy Initiatives," House Document No. 95-347, (Washington, D.C.: Government Printing Office, June 6, 1978). See Appendix A.

President Carter's message was unique in that it pointed out that many of the problems and solutions used in the past may not be appropriate given present economic and political conditions. Even more important, the thrust of his message recognized that many of the problems and solutions used in the past may not be valid as we approach the turn of the century. Following the 1980 election, President Reagan and his Cabinet Council on Natural Resources recognized the need to examine the issue of national water resources policy. The Cabinet Council, under the direction of Interior Secretary Watt, is currently undertaking a national policy review.

This consistent set of national policy initiatives and actions is not without reason. Water problems have become much more complex as we have learned more about the interrelationships of natural and social systems.

The traditional solutions which worked in the past have become more expensive, and in some cases, have side effects which are publicly unacceptable today. Finally, public attitudes and opinions have changed. our society. no longer accepts solutions which only a few years ago were warmly endorsed. Changing conditions in our society necessitate a reexamination of both the priorities and the institutional arrangements which have governed water policies in the past.

Two problems indicate the difficulties water resource experts in this country face. First, the cost of traditional government programs and policies is rising rapidly. The Corps of Engineers spends on an average $2.5 billion each year and the Bureau of Reclamation about $700 million on all phases of water resources develorment.[8] With inflation exceeding 15% for these activities, policy leaders feel all the projects currently authorized or anticipated can't be built. Second, there has been a significant change

[8]Ibid.

in environmental values, especially as they relate to water resources programs. Thus, projects which were acceptable ten years ago are no longer acceptable to a large and politically sophisticated section of the electorate.

National Policy Shift

Both the National Water Commission report and the Carter policy message embody an important shift in policy direction: A recognition that future water policies need to concentrate on improved management of existing supplies rather than concentrating on construction of additional storage capacity.

This shift away from water supply solutions toward increased water supply management recognizes that existing supplies are being poorly managed and that inefficient use is a major reason for short-run supply shortages.

As a recent New York Times series concluded:

> ...supplies are being squandered through poor management and inefficient use to such a degree that water is running short in many areas. The waste is encouraged by outdated laws, by government subsidies and by the complex political rivalries that have long surrounded water use....
>
> The experts maintain that the solutions to the water problem, exacerbated in recent months by persistent drought in many areas, are not ultimately technological, though there are many things that can be done to stretch resources, but are political and economic.

As the noted water resources expert Gilbert F. White has commented:

> The people of the United States are in no danger of any early shortage of water -- the facts just do not bear that out. But we are going to have to work out new methods of managing water. The shortage is related to lack of planning to meet forecasted demand. It is not basically a matter of shortage of supply."

Thus, there is a growing recognition that emphasis must shift away from water supply solutions -- such as dams and reservoirs --- to increased attention to improved water supply management, such as pricing policies, conservation and other measures.

[9]Reinhold, p. cit., p. 1. 1OIbid.

This doesn't mean that future dams and reservoirs won't need to be built. Rather it means that experts at all levels are recognizing future water supply problems can be solved through means other* than construction of large darns and reservoirs. Improved management offers an opportunity to solve future supply problems without expensive structures which may encounter strong opposition from citizens or cost-conscious legislatures.

The Reagan Administration, while it has not announced any final policy decisions, gives every indication of continuing these trends. More important, they appear to have added some new, and possibly more dramatic, directions. The Reagan Administration is seeking to cut federal spending, including funds for water resources projects and programs. In addition, it is moving to end subsidies for many water programs, require increased local and/or state cost-sharing, and place greater responsibility for problem solving on state and local governments. While the Federal government won't be going out of the water "business," its role could rapidly change in the 1980's. The Federal role could be lessened in favor of a greater role for state and local governments.

Thus, policy changes at the Federal level portend important new conditions for local governments to deal with. The Nation's capitol will certainly be impacted by these changes, and possibly in very critical ways. That is one important -- almost critical -- reason for preparation of this report.

Water Supply Studies

Despite abundant rainfall, Washington, D.C. continues to suffer from periodic water shortages. In both the mid-1960's and mid-1970's, water sup plies to jurisdictions in the area were curtailed. Equally important, based on several recent studies, the long-term outlook for water supplies is bright.

but only if some significant changes take place in existing management practices and policies.

The Washington, D.C. metropolitan area (WMA) has been the focus of many water supply studies and investigations. In January 1956, the Congress requested the Corps of Engineers to review the earlier reports on the Potomac River with a view "to preparation of a comprehensive plan for control of floods and development and conservation of the water-related resources of the basin, with emphasis on present and future needs for water supply and pollution abatement."[11] This directive led to a series of basin-wide plans published in February 1963 as the Potomac River Basin Study. Contained in the study were recommendations for construction of six reservoirs, as well as further investigations of the Potomac Estuary as a supplemental source of water supply.

Controversy over the recommendations in this report led to a reformulation of the study which was published in 1973; this report was entitled "Potomac River Basin Water Supply -- An Interim Report."[12] Three recommendations were made in this report: (1) authorization and construction of the Sixes Bridge and Verona projects; (2) authorization and construction of a prototype advanced water treatment plant to test the feasibility of using the Potomac Estuary as a permanent supplemental water supply source; and (3) continuing studies by the Corps for meeting the MWA's water needs.

At the same time, the Northeastern Water Supply Study (NEWS) was nearing completion by the Corps.[13] Begun in 1965 and published in November 1975, the

11 As quoted in U.S. Congress, Senate, Committee on Government Affairs, Subcommittee on Government Efficiency and the District of Columbia, District of Columbia Water Supply, 96th Cong., 1st Sess., October 10, 1979, p. 118.

[12] 1bid., p. 119.

[13] U.S. Department of the Army, Corps of Engineers, Northeastern U.S. Water Supply Study, Summary Report (Washington, D.C.: GPO, July 1977).

study contained a number of controversial recommendations for correcting water supply needs in the WMA. Among the more controversial was a recommendation to proceed with construction of the Verona and Sixes Bridge projects. Congress had previously expressed reservations about these projects,[14] and, according to the Corps, they encountered strong public opposition.

Metropolitan Area Water Supply Study

Opposition to the recommendations in the NEWS and Potomac River Basin Study led the Congress to direct the Corps to undertake another, more comprehensive study. In the Water Resources Development Act of 1974, the Congress did authorize Phase I design for the Verona and Sixes Bridge projects.

However, prior to any further authorization, the congress directed the Corps to make a full and complete investigation o£ the future water resources of the WMA,

> "...including but not limited to the adequacy of present water supply, nature of present and future uses, the effect water pricing policies and use restrictions may have on future demand, the feasibility of utilizing water from the Potomac estuary, all possible water impoundment sites, natural and recharged ground water supply, wastewater reclamation, and the effect such projects will have on fish, wildlife, and present beneficial uses....

the Congress also requested the National Academy of Sciences to review the report and comment on the "scientific basis for the conclusions reached by the investigation and study of the future water resource needs of the Washington metropolitan area, and the pilot project for the treatment

[14]In 1972, the Conference Report on S. 4018 directed that the Sixes Bridge and Verona projects be re-evaluated without the calculations of benefits for low flow augmentation. The concern in the Congress was that the benefits calculated for these projects were inflated. See District of Columbia Water Supply, 1979, p. 119.

[15]1bid., p. 124.

[16]Public Law 93-251, Sec. 85(b) (1), 88 Stat. 36. See Appendix B.

of water from the Potomac estuary."[17]

The Corps has developed and implemented a challenging study process to meet these Congressional directives.[18] While the final report will not be available until late 1982, the Corps has recently published a draft progress report and several appendices which provide a wealth of material on the issues to be considered.[19] More important, the draft report has reached several conclusions.

The major conclusion is that by proper management and by sharing existing water supplies, all of the Washington metropolitan area can have ad equate water supplies through the year 2030. The problem is not so much short supply, the Corps observed, as it is that water is unevenly distributed. Thus, the Corps has tentatively concluded that the need for the construction of augmentation facilities -- such as Verona and Sixes Bridge -- in the long run is not as critical as it was once thought to be.[20] This finding, as the National

[17]Public Law 93-251, Sec. 85 (b) (3), 88,Stat. 37.

[18]A brief description of the Corps' study process can be found in U.S. Department of the Army, Corps of Engineers, Baltimore District, "Water Forum Notes," No. 1, November 1978; or District of Columbia Water Supply, 1979, pp. 124-31.

[19]The draft report was published in eight volumes. All were published *by U.S.* Department of the Army, Corps of Engineers, Baltimore District under the, title Metropolitan Area Water Supply Study for the Potomac Water Users (August, 1979). The volumes were published with the following titles:

- o Draft Progress Report, Main Report
- o Draft Progress Report, Institutional Analysis and Economics Appendix
- o Draft Progress Report, Finished Water Interconnections and Regulation Specialty Appendix
- o Draft Progress Report, Public Involvement Appendix
- o Draft Progress Report, Conservation and Demand Reduction Specialty Appendix
- o Draft Progress Report, Raw Water Interconnections Specialty Appendix
- o Draft Progress Report, Background Information and Problem Development Appendix
- o Draft Progress Report, Supply and Demand Specialty Appendix

[20]1bid., Main Report, p. 1.

Academy of Sciences has indicated, was the consequence of the reanalysis of water supply and demand figures which disputed findings of previous studies and long-standing public opinion.[21]

Meeting Future Needs

The task of supplying the needs of local governments in the MA will not be easy, despite the somewhat encouraging assessment in the Corps' report. Even the Corps observed that meeting needs through 2030 will require improved management and sharing of existing supplies through several methods, including: reformulating release plans for Bloomington Reservoir; constructing and enlarging intakes on the Potomac River; constructing interconnections between the Potomac and Patuxent Rivers or from the Potomac to Occoquan Reservoir; regulating finished water supplies; and implementing water conservation measures to achieve a 10 percent reduction in use by 2030.[22]

In brief, however, the solution to future water supply needs lies in the hands of local governments through improved cooperation. As Robert S. McGarry, General Manager, Washington Suburban Sanitary Commission has said, the "solutions to our regional water supply problem can be implemented locally."[23]

Thus, meeting the water supply needs of the future will require effective cooperation and coordination of actions taken by and between various local governments in the region. There are some indications that improved cooperation is taking place and the Carps estimates might prove correct.

[21]National Academy of Sciences, National Research Council, Assembly on Engineering, Committee to Review the Metropolitan Washington Area Water Supply Study, Water for the Future of the Nation's Capitol Area (Washington, D.C.: National Academy Press, 1980), p. 11.

[22]See Corps' Water Supply Study, 1979, Main Report, p. 2.

[23]Letter from Mr. Robert S. McGarry, General Manager, Washington Suburban Sanitary Commission, to Mr. R. Scott Fosler, President, Montgomery County Council, January 2, 1981.

The recent low-flow allocation agreement for sharing Potomac River water brings new hope for dealing with droughts and other periods of low flow. Agreement on management of the rate of releases from Bloomington Reservoir by the Interstate Commission on the Potomac River Basin is another encouraging example of improved cooperation.

History of Local Cooperation

Despite these encouraging steps, the history of intergovernmental cooperation on local water supply issues teaches caution. The existing supply system is comprised of a complex network of agencies and relationships that has developed over decades. Given this system, there is a built-in desire to maintain the status quo. Any attempt to substantially change the structure inevitably raises strong opposition. Thus, while regional cooperation offers real benefits, there is considerable weight against it and progress to date has been modest. Professor Edwin Haefele has pointed out why regional cooperation is problematic. "If the Washington area cannot agree on regional cooperation in water," he observed, "it is likely to be because we are in a prisoner's dilemma on this issue."[24] The prisoner's dilemma is when each local government "could gain by regional cooperation but no way exists to insure that all would cooperate."[25]

Local Problems

Any effort by local governments to overcome the "prisoner's dilemma" will involve greater efforts toward effective management of the area's water supplies.

24 E. Haefele, "D.C. Area Free-For-All Over Water Can Only Lead to Cost and Thirst," Washington Star, April 15, 1979, p. D-1.

[25]Ibid.

And this improved management effort will require overcoming a number of short-comings present in the existing water supply system.

Yet as Professor Haefele indicates, there is an added incentive for governments in the Washington area to succeed. Unless the area governments can resolve their differences, the only alternative is "for cooperation to be mandated from outside -- in our case by an agency of the federal government."[26] And that is a solution which none of the local governments wants. In summary, the MA can meet its water supply requirements over the next 50 years without additional storage facilities or large augmentation programs only if the existing government institutions improve their coordination and cooperation. For this to happen, the local governments will have to overcome a number of built-in institutional impediments.

Resolving Local Problems

It may be possible to overcome these impediments if each unit of government understands what the concerns of the other are and how each unit operates. Through better understanding and communication, the chances for improved cooperation increase. It is important for all parties to understand how each element of the water system operates so that acceptable recommendations can be developed. To paraphrase Professor Haefele's prisoner's dilemma, all will cooperate once we understand the problems each "prisoner" faces.

District Water System and Its Problems

The least discussed and often most overlooked element in the Nb3A water supply picture is the District of Columbia. This is probably because of the dominant historical role the Federal government has played in the water sup ply picture, as well as other government services. Yet with enactment of

[26]Ibid.

home rule legislation, the role the District will play in the regional water supply picture will be enhanced.

The District of Columbia, like every jurisdiction in the Metropolitan area, faces important water supply problems. These problems can be grouped as either internal or external in nature.

One example of an internal problem the District faces-is the deterioration of its delivery system. Like many large urban areas, the District's water delivery system will require extensive rehabilitation over the next few decades. The Federal City Council recently observed that cutting corners on maintenance to save money would only set the stage for "above-ground and subterranean nightmares by allowing water pipes, sewer lines, road and bridges to deteriorate faster than they can be repaired."[27] The Council also observed that some of the city's 1,436 miles of cast-iron water pipes were more than 160 years old; one-third of the 27,500 valves in the water distribution system have outlived their life expectancy of 75 years; and nearly one-third of the fire hydrants were installed in the last century and should be replaced.

The Council recommended that core than $100 million a year be spent during each of the next 10 years to overcome the existing backlog of deferred repairs and to sustain a regular program of preventive maintenance.

Yet these heavy expenditures will have to be made during a period of critical budgetary crisis. The District government, which must operate on a balanced budget each year, faces tremendous funding problems and investments of $100 million in a program of "regular repairs" appears optimistic.

In the face of these problems, the District also must give attention to other water resources issues. Promoting water conservation and improved billing and collections, for example, are just two other examples of problems

[27]Federal City Council, Local Public Infrastructure in the District of Columbia (Washington, D.C., 1980), p. 19.

which are important to the District as well as to neighboring jurisdictions. The District also faces a number of external water problems. The District is an important ingredient in the solution of area-wide water supply management issues with the Federal government, Virginia, Maryland, and the affected regional entitites such as the Interstate Commission on the Potomac River Basin and the Metropolitan Washington Council of Governments. The District will be expected to be actively involved in area-wide decisions concerning: *construction* of new facilities; implementing low-flow agreements; promoting water *conservation;* improved interconnection of supply facilities; and groundwater management.

Reconciling Problems

How the District will be able to reconcile these external and internal problems will be a key factor in whether the Metropolitan area meets its water supply needs over the next 50 years. Unlike other governments, the District is required to act, depending on the circumstances, in a number of different capacities and roles. The District operates as a Federal entity, a state, a county, and a city. Because of its multi-faceted roles, the District has a very complex set of relationships with the Federal government, regional and interstate bodies, Maryland and Virginia, and the local governments.

In addition, the District government itself is complex and multi-faceted. It has both a long history and a short history. Some agencies and relationships are long, such as the relationship with the Washington Aqueduct Division. Yet other agencies, such as the Department of Environmental Services, are quite new. Moreover, the District has only recently been granted home rule and the city government is still struggling with many of the new responsibilities it has been given.

Understanding the System

There is no doubt that balancing the external and internal priorities and problems will be a serious challenge to the District water management structure. Yet exactly how all the various components of the District's water management system operate, interact with one another, and with other governments has not been investigated. Indeed, there is no accurate definition and description of all the various elements that make up the District's water management, system.

A draft five-year water resources research plan for the District was recently completed by the University of the District of Columbia.[28] Although the plan has not been formally adopted, it does give insight into some of the higher priority water research needs for the District. As the report indicates, one of the major problems deals with obtaining a better understanding of the District's water management system. "An important contribution towards increasing the effectiveness of the District government's participation in area-wide processes," the report notes, "would be to better define the District's water management structure and responsibilities."2[9] As indicated previously, because the District operates at various times in the capacity of city, county or state, its role in the area-wide processes for water resources management sometimes becomes confused.

Equally important, preliminary research has indicated there is little information available on how the internal water management processes within the District government operate. Although a description of the various elements of the system will be helpful, it will only provide a beginning. More

[28]University of the District of Columbia, Water Resources Center, The District of Columbia's Five-Year Water Resources Research Plan. 1982-1981 (Washington, D.C.: WRRC, 1980).

[29]1bid., p. VI-5.

important, there is a need to analyze the relationships which exist between the various elements which make up the District's water management system. At the same time, it is important to gain a better understanding of how the District's water management system deals with the Federal government, the States, local governments, and regional bodies. What is the relationship between MD and the various District agencies? How are major decisions on area-wide issues resolved by the District government?

Study Organization

This study defines the District's water management structure, explains how it operates, delineates the issues it will have to deal with in the regional context, and how the District appears to be prepared to deal with these issues.

Chapter II begins the study with a description of' he Potomac River Basin and the physical environment with which water managers have to deal.

Chapter III presents a discussion of the legal and institutional arrangements for managing the waters of the Potomac River. This discussion focuses on those water supply systems which are outside the District of Columbia. This chapter is intended to provide the first-time reader with an understanding of the water supply system in the region.

Chapter IV takes up where Chapter III leaves off and presents a discussion of the water supply management facilities in the Washington metropolitan area. This chapter is intended to provide a firm foundation in order to better understand the District of Columbia's water supply management system present and future problems in the regional context.

Chapter V discusses both the legal and physical facilities in the District's water supply management system. In addition, the chapter discusses how the District of Columbia water management system is organized, including the financing of the system.

Chapter VI presents a taxonomy of critical issues, both present and future, which the District will likely have to confront over the next 10 years that have a regional context. As the major water supply "consumer" in the region, the District is vitally affected by how regional water supply issues will be resolved. This chapter will explore the problems that are present and can be expected to occur and presents an analysis of what the role of the District will be in these issues. This chapter will not attempt to criticize existing or even anticipated management practices in the District or metropolitan area. Rather, the intent is to identify issues which are present or expected to arise and indicate what the District has at stake and how they can play an active role in their resolution. This analysis will be helpful in improving regional understanding of water supply problems and solutions. Finally, throughout this chapter, suggested research topics will be highlighted to guide future research work in this area.

As indicated earlier, there is no definitive outline and interpretation of the District's water management structure and system. This study is intended to fill that gap and provide some immediately useful information.

CHAPTER II

THE POTOMAC RIVER BASIN

> ...the Potomac. It is remarkably unspoiled in its setting, more so than nearly all tether rivers in the nation comparably located, and it is a river of outstanding beauty and charm.... Along no other river are the steps of American history so readily traceable.
>
> -U.S. Department of the Interior

This chapter will describe the physical characteristics of the Potomac River system since the Potomac is the primary water supply source for the Washington metropolitan area.

Tributaries

The Potomac River Basin (Figure 1)°drains the eastern slopes of the Appalachian Highland and the Coastal Plain in the Mid Atlantic region. The Basin covers 14,670 square miles, of which 5,723 are in Virginia, 3,818 in Maryland, 3,490 in West Virginia, 1,570 in Pennsylvania, and 69 in the District of Columbia. Of the Basin total, 3,090 square miles are drained by the Potomac River tidal estuary below Washington, D.C.2

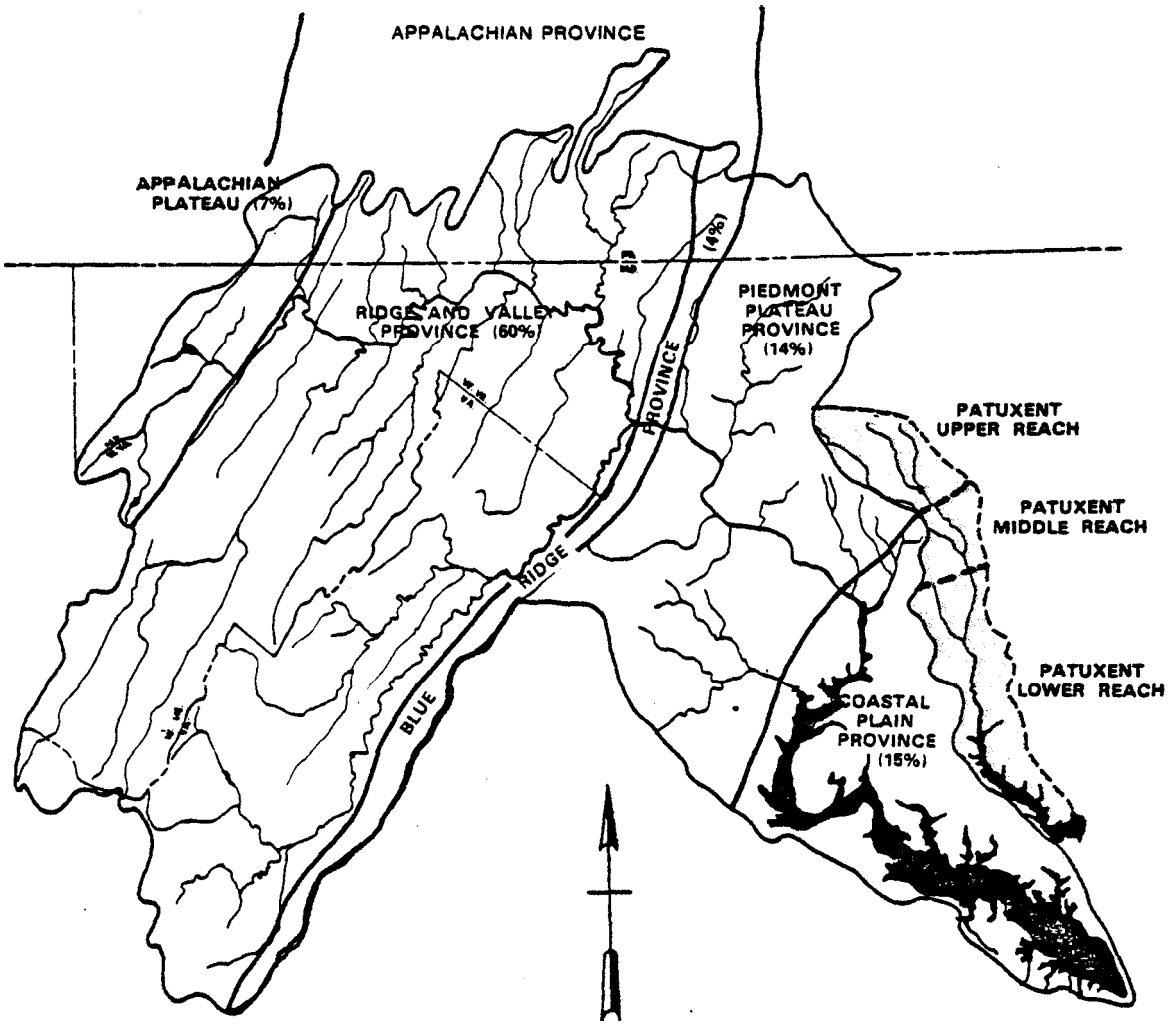
The Potomac River, which is the second largest tributary of the Chesapeake Bay, begins at Fairfax Stone on the Maryland West Virginia border and flows for nearly 400 miles until it reaches the Chesapeake Bay. During its course, it flows through six different physiographic regions: Allegheny Plateau, Ridge and Valley Province, Great Valley, Blue Ridge, Piedmont and Coastal Plain (Figure 1). Yet the river course can be divided into two distinct

[1]U.S. Department of the Interior, The Potomac: A Report on Its Imperiled Future (Washington, D.C.: GPO, 1967), p. 18.

'U.S. Department of the Army, Corps of Engineers, Potomac River Basin Report (Washington, D.C.: GPO, 1970), p. 50. Published as U.S. Congress, House of Representatives, Document No. 91-343, 1970. Most of the description of the physical environment of the basin was provided by this report.

Figure 1

PHYSIOGRAPHIC PROVINCES OF THE
POTOMAC AND PATUXENT RIVER BASINS



Source: U.S., Department of the Army, Corps of Engineers, Baltimore Division, Draft Progress Report, Metropolitan Washington Area Water Supply Stud for the Potomac Water Users, Su l and Demand Specialty Appendix, Baltimore: Corps of Engineers, January, 1979), p. 3.

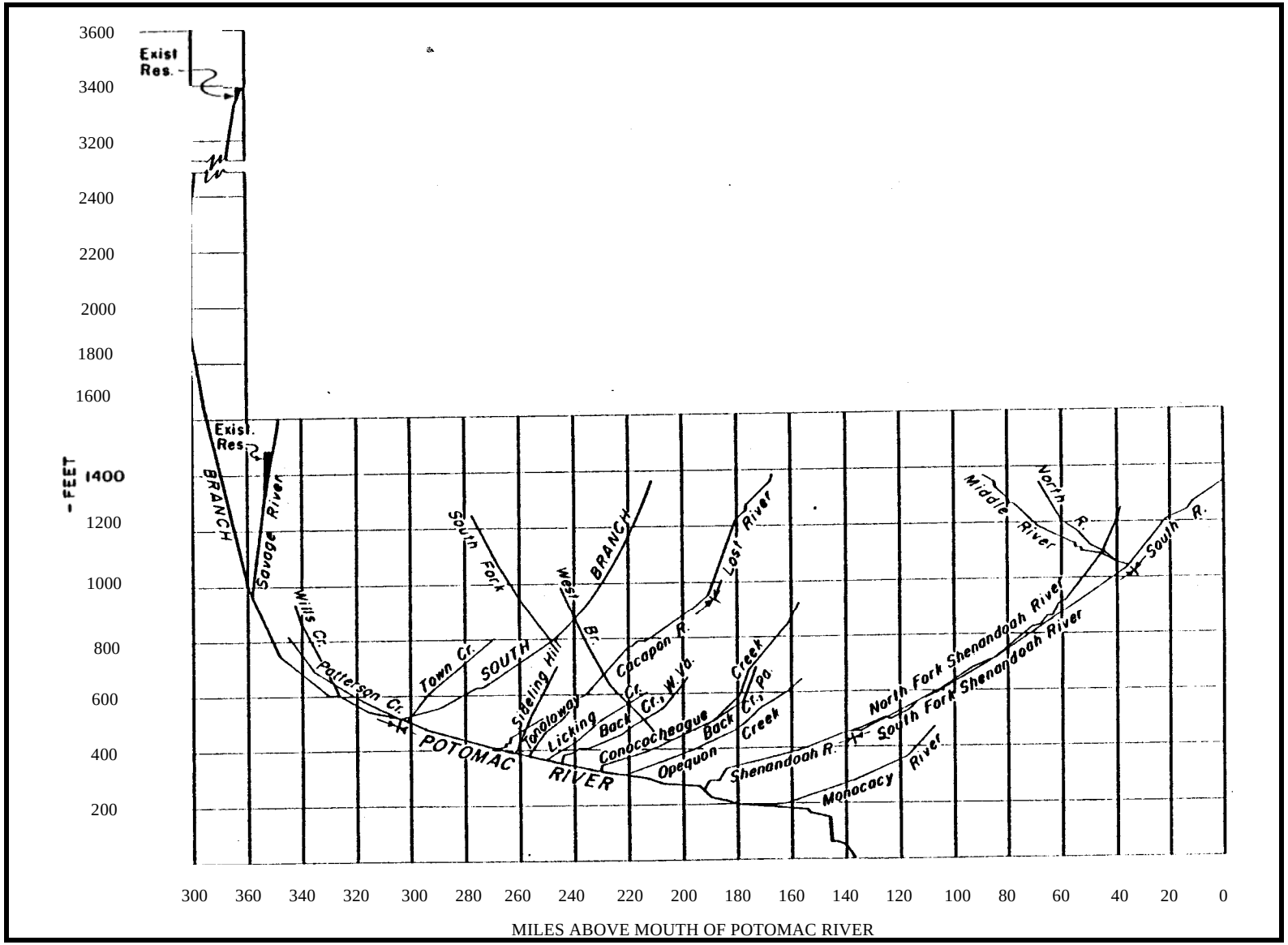
parts. The first is its journey through the mountainous regions of the Allegheny Plateau, Ridge and Valley Province, Great Valley and Blue Ridge. In these areas, the river falls from 3,400 feet above sea level to 200 feet above sea level (Figure 2). The second part is the river's journey through the Piedmont and Coastal Plain. The Piedmont region extends from the foot of the Blue Ridge to the Fall Line at Washington, D.C. where bedrocks of the Appalachian Mountains dip beneath the sediments of the Coastal Plain which extends to the Bay. Above Washington, D.C., the rolling terrain ranges in elevation from 200 to 1,000 feet above sea level and the relatively flat region below Washington varies from sea level to 250 feet above sea level.

The Potomac River has a length of 285 miles below the confluence of the North and South Branches near Green Spring, West Virginia. The three major tributary basins are: The North Branch, with a drainage area of 1,328 square miles; the South Branch, draining 1,493 square miles; and the 3,054 square miles of the Shenandoah River Basin (Figure 3). In addition to these principal branches, three other large tributaries enter the main stem below Cumberland, Maryland: the Cacapon River, Conococheague Creek and the Monocacy River, with a combined drainage area of 2,216 square miles.

Precipitation and Runoff

Average annual precipitation throughout the Basin ranges from 35 to 45 inches, and up to 55 inches at higher elevations. Like most humid subtropical climates, rainfall is distributed rather evenly throughout the year with the monthly average approaching four inches in the summer and three inches or less in the winter. The winter weather patterns distribute rainfall rather uniformly throughout the region, but summer thunderstorms bring locally heavy showers, and as a result, an uneven pattern of rainfall distribution.

Figure 2
Profile – Potomac River and Major Tributaries



Source: U.S., Congress, House of Representatives, Potomac River Basin Report, House Document No. 91-343, 91st Cong., 2nd Sess., p. 53.

Figure 3

Drainage Characteristics of Potomac River and Principal Tributaries

POTOMAC RIVER

Reach	Drainage Area (sq mi)	Length (mi)	Average Fall (ft per mi)	Average Width (ft)
Confluence North and South Branches ...	2,821			
to Hancock, Md.	4,073	46	2.9	340
to Harpers Ferry, W. Va.	9,371	66	1.7	500
to Brunswick, Md.	9,420	7	7.9	1.350
to C&0 Canal Feeder Dam 412	11,390	32	1.2	1,300
to 1/ Washington, D. C.	11,580	18	9.8	900
to Mouth of Potomac R. .	14,670	116	2/	15,000

PRINCIPAL TRIBUTARIES

Stream	Drainage Area (sq mi)	Length (mi)	Average Fall (ft per mi)	Confluence above Mouth of Pot. R. (mi)
North Branch	1,328	97	21.3	285.1
South Branch	1,493	133	11.0	285.1
Cacapon River	683	113.5	11.8	247.9
Conococheague Creek.	563	80	18.1	210.7
Shenandoah River. ..	3,054	181	6.4	171.4
Monocacy River	970	53	3.2	153.4
Anacostia River	170	9.2	2/	107.8

1/ At Chain Bridge

2/ Water level affected by tide

3/ Waynesboro, Virginia, to mouth

Source:U.S.,Congress, House of Representatives, Potomac River Basin Report, House Document No. 91-343, 91st Cong., 2nd Sess., p. 54.

The average annual runoff varies from about 13 inches in the lower reaches of the Potomac River to about 23 inches in the upper North Branch. Records from the gauge at Point of Fucks, Maryland show an average annual runoff of 13 inches, which is about 35 percent of the average annual precipitation. The months of greatest runoff are generally March and April while the month of least flow is usually August or September. About 43 percent of the annual runoff in the Basin occurs during the three-month period from March through May, while only 12 percent occurs during the three-month period from July through September.

Average rates of stream flow range from 0.7 to almost 2 cubic feet per second (cfs) per square mile, with the maximum occurring along the North Branch. The average rate of flow along the main stem of the Potcanac River is about 1.0 cfs per square mile.[3]

Flood-producing storms can occur in all seasons of the year in the Basin, although floods in the summer and fall months are often related to tropical disturbances. Spring and winter floods tend to be more general in nature and the sustained rainfall at these times can contribute to large floods;. The flood of March, 1936 was the greatest on record along the main stem of the Potomac with a peak discharge of 480,000 cfs at Point of Pocks, Maryland. This figure was five times greater than the long term average and 889 greater than the observed low flow.[4]

Unseasonably low flows or drought *conditions* have been known to occur throughout the Basin and the Potomac River is subject to periods of low flow. The worst conditions took place in 1930-32 with other droughts occurring in 1968, 1966, 1964, 1963, 1959? 1957, 1954, 1941, 1922 and 1914. Figures 4 and

[3]Ibid., p. 51. 4Ibid., p. 58.

5 present low flow frequency data which are helpful in obtaining an understanding of how often such conditions can occur.

Water Quality

In the upper one-third of the North Branch, water quality is affected by acid mine drainage, originating from both active and abandoned coal mines. However, as the water flows down the North Branch, it is neutralized some quality water from the Savage River.

A pulp and paper industry located in the middle reach of the North Branch injects a lime effluent into the river water, further decreasing the acidity. The middle and last reaches of the North Branch contain major industrial areas which reduce dissolved oxygen, biological oxygen demand, and increase total dissolved solids.

A recent Corps of Engineers report summarized water quality in the South Branch in the following manner:

> ...the South Branch near Oldtown, Maryland contains iron, manganese, and bacteria. Water of better quality from large tributaries, including the South Branch and the Cacapon River, helps to dilute these undesirable substances. However, same subreaches do have high algae production. Dilution and self-purification make the water quality acceptable for the level and type of uses presently made of the river between Oldtown and Williamsport, Maryland.... Surface runoff and wastewater from several small communities constitute the only waste sources[5]

In addition to these sources, there are some industrial developments located on the South Fork of the Shenandoah River and on the Potomac River from Conococheague Creek at Williamsport to Little Falls near the District of Columbia. As the Potomac River flows toward the District, residential, commercial and industrial developments of all kinds become more intense, especially in the tributaries, causing a concomitant deterioration in water quality.

[5] U.S. Department of the Army, Corps of Engineers, Baltimore District, Metropolitan Washington Area Water Supply Study for the Potomac Water Users, Draft Progress Report, Supply and Demand Specialty Appendix (Baltimore, Md., August 1979), p. 16.

Figure 4

Maximum and Minimum 1-Day Flows, Potomac River

Observed[1]	near Point of Rocks	Washington, DC
Maximum daily 1-day	434,000 cfs (280,000 mgd)	426,000 cfs (274,839 mgd)
Date:	19 March 1936	19 March 1936
Minimum daily 1-day	540 cfs (348 mgd)	601 cfs (388 mgd) includes diversion of 449 cfs (290 mgd
Date:	10 September 1914	10 September 1966
Instantenous[2]		
Maximum 1-day	480,000 cfs (309,677 mgd)	484,000 cfs (312,258 mgd)
Date:	19 March 1936	19 March 1936
Minimum 1-day	530 cfs	data not available
Date:	11, 12 September 1966	

(1) Observed - average discharge recorded over 24-hour period.

(2) Instantaneous - discharge at a particular instant of time.

Source: U.S. Department of the Army, Corps of Engineers, Baltimore Division, Draft Progress Report, Metropolitan Washington Area Water Supply stud for the Potomac Water Users, Supply and Demand Specialty Appendix, Baltimore: Corps of Engineers, January, 1979), p. 12.

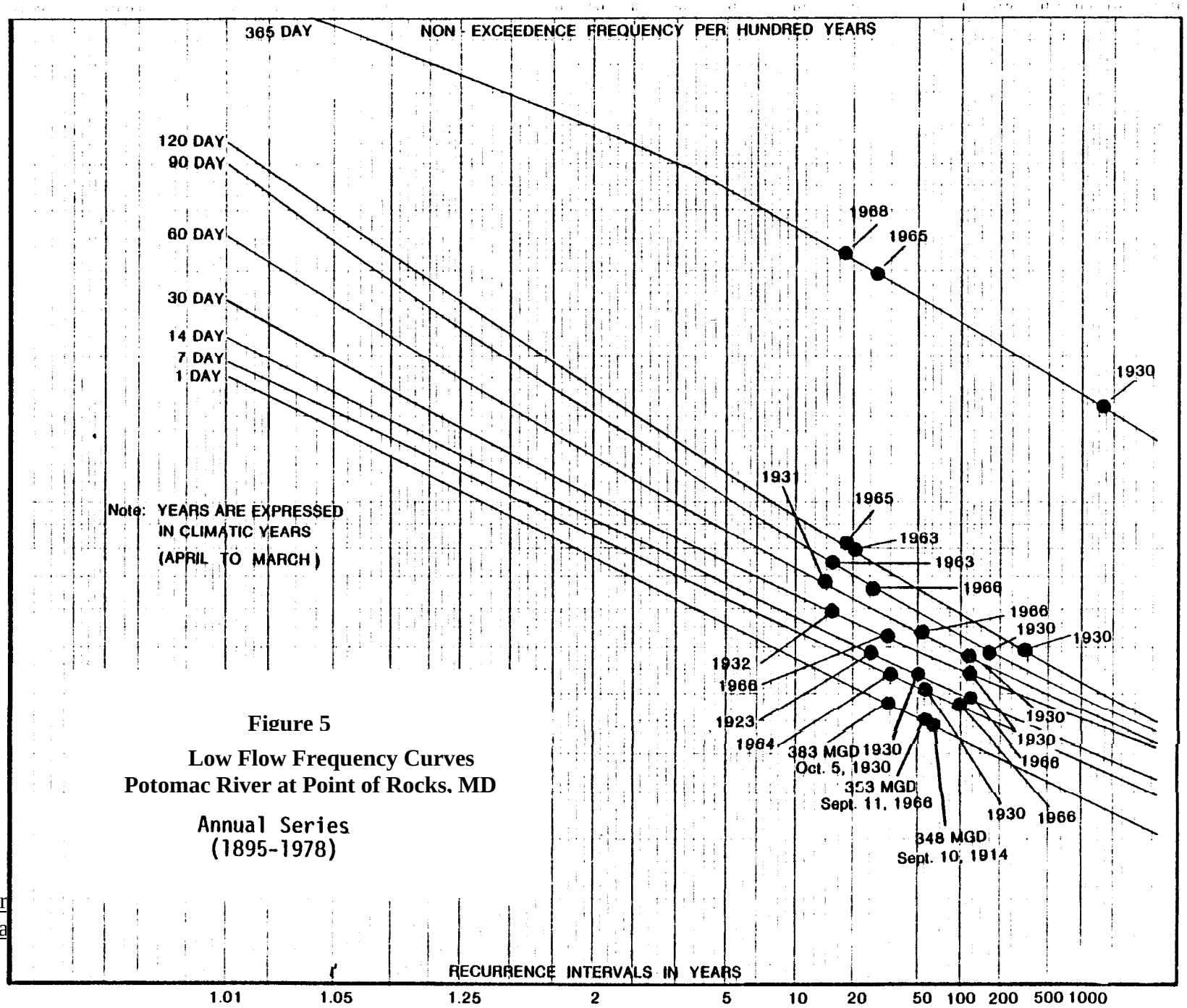


Figure 5

Low Flow Frequency Curves
Potomac River at Point of Rocks, MD

Annual Series
(1895-1978)

Sour
Area

As can be expected, the dissolved oxygen, biological oxygen demand, coliform and alkalinity contents increase as the river flows toward the District.

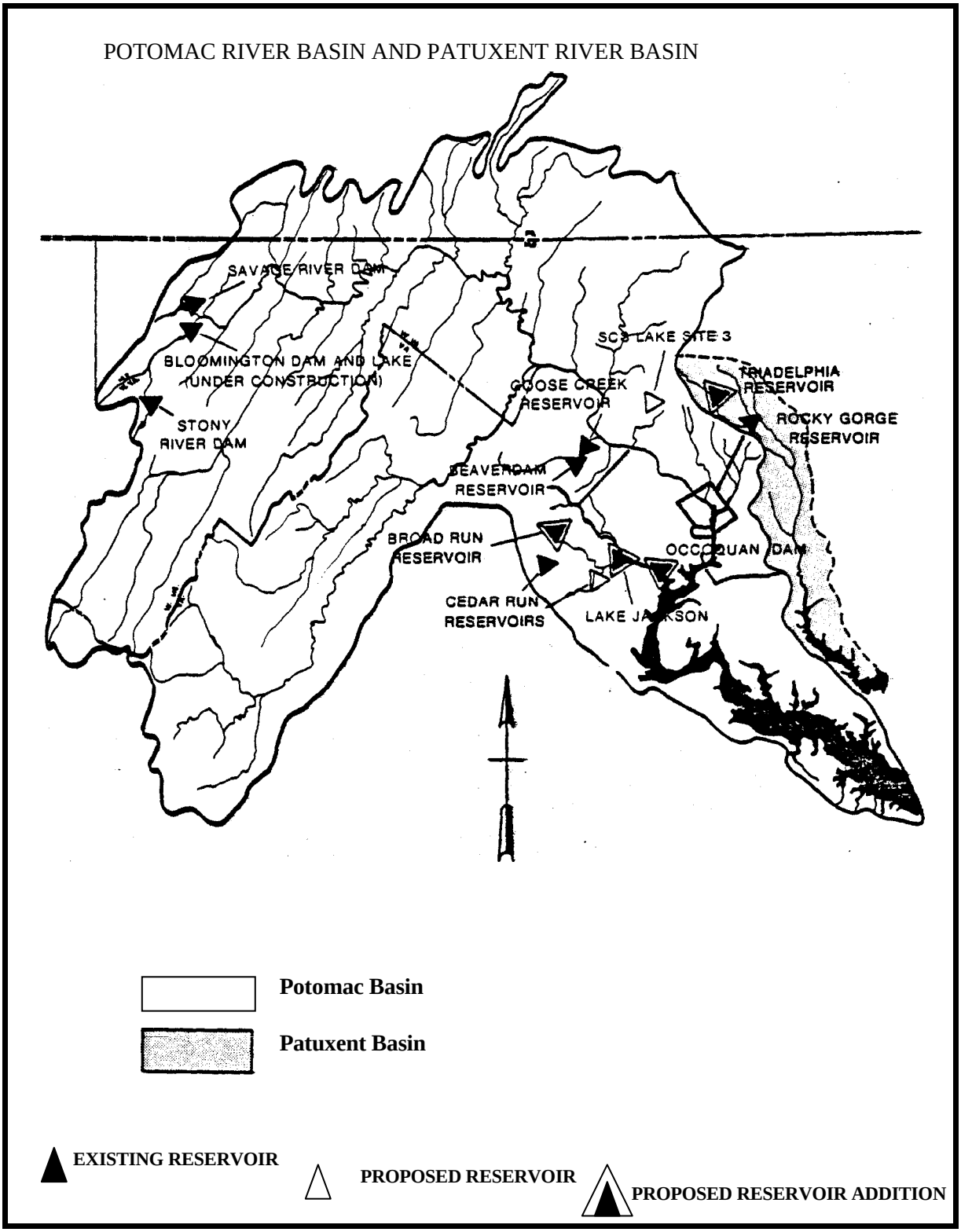
Patuxent River Basin

Another important portion of the Potomac River Basin is the Patuxent River Basin which extends through central Maryland. The headwaters of the Patuxent River originate on Parres Ridge at the junction of Carroll, Frederick, Howard, and Montgomery Counties, Maryland. The river then meanders toward the southeast for a distance of 110 miles until it discharges into the Chesapeake Bay at Solomons Island. The river has two major tributaries: the Little Patuxent River with a drainage area of 120 square miles and the Western Branch with a drainage area of 110 square miles.

Average annual runoff in the Patuxent Basin varies from 14.0 inches along the Little Patuxent to 15.0 inches along the main stem above two reservoirs in Howard County. The flow characteristics of the river are typical of those found in the Piedmont and Coastal Plain Provinces. Flow varies from 9 cfs along the smaller tributaries during summer low-flow conditions to flood stage during intense summer rainfall.

While the Patuxent River Basin is small in comparison to the Potomac Basin, it is subject to flooding as a result of storms and thundershowers. In addition, the river experiences flooding from fluvial flows on the river and its tributaries and from high water in the estuary from tidal surges originating in the Chesapeake Bay. Hurricane Agnes, in 1972, for example, produced devastating floods with a maximum discharge of 26,000 cfs (16,774 mgd). On the other hand, the Patuxent is also subject to low flows. During a normal year, for example, the average flow of the Patuxent River is about 452 cfs at its mouth, but this figure varies from a low of 23 cfs to a high of more than 2,900 cfs.

Figure 6
Existing and Proposed Reservoirs Affecting the WMA



Source:U.S.,Department of the Army, Corps of Engineers, Baltimore Division, Draft Progress Report, Metropolitan Washington Area Water Supply Stud for the Potomac Water Users, Supply and Demand Specialty Appendix, (Baltimore: Corps o Engineers, January, 1979), p. 26.

Prior to the end of World War II, the Patuxent River Basin was primarily rural in character and thus did not suffer from significant water quality problems. Since 1945, however, development pressure induced by the growth of Baltimore and Washington, D.C. -- and new towns like Columbia and Bowie Belair --- has negatively affected water quality.

In the upper reaches of the river, water quality is good and the river receives no man-made pollutants. In fact, the water is of sufficient quality that it is used as a water supply source by the Washington Suburban Sanitary Commission with two reservoirs in Howard County (see Chapter IV).

The middle reach of the river flows through an area experiencing rapid residential, industrial and commercial growth. Treated wastewater effluents and associated industrial wastes are discharged into the river in this area. This problem is exacerbated by the flow characteristics of the river at this point. The sluggish character of the flow, combined with a high pollution load, leads to significant problems. For example, a dissolved oxygen level of below five mg/l is commonly found in this section of the river. Further downstream, silt and salinity are the major problems. The salinity fluctuates greatly with freshwater flow, tides and winds with the months of greatest problems coming in the summer.[6]

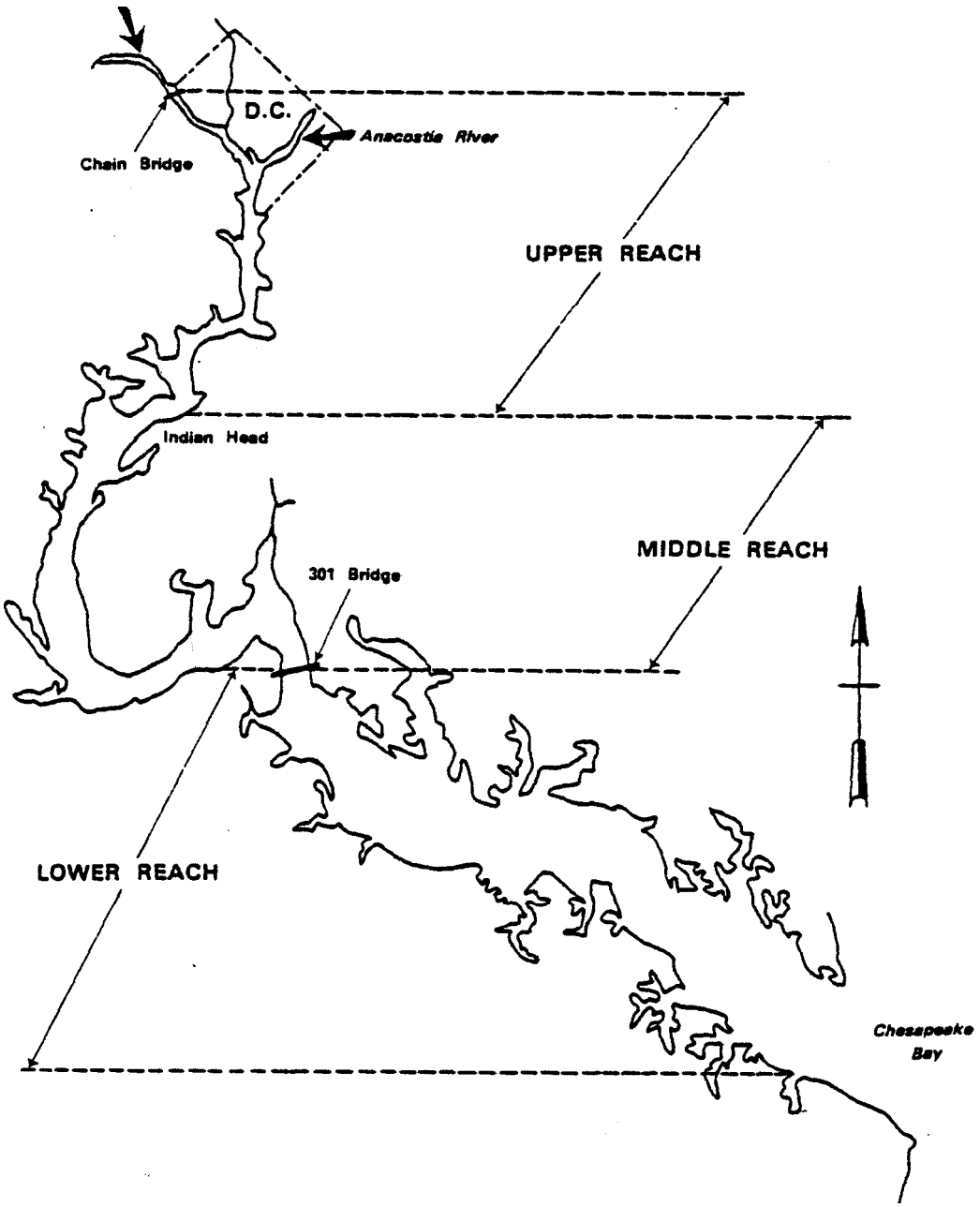
Potomac Estuary

The Potomac Estuary derives its major inflow from the river upstream from Little Falls (Figure 7). The estuary begins at the Fall Line and extends for 114 miles downstream to the river's confluence with the Chesapeake Bay. The tidal portion of the Potomac can be divided into three portions: (1) the upper reach, although tidal, contains freshwater; (2) the middle reach is normally considered the transition zone from fresh to brackish water;

6Ibid., p. 17.

Figure 7

Potomac Estuary Tidal System



Source: U.S., Department of the Army, Corps of Engineers, Baltimore Division, Draft Progress Report, Metropolitan Area Water Supply Stud for the Potomac Water Users, Supply and Demand Specialty Appendix, (Baltimore: Corps of Engineers, January, 1979), p. 21.

and (3) the lower reach which is totally saline water. The major sources of flow in the estuary are from rainfall and the semi-diurnal tidal currents induced by the ocean.

The water quality in the upper reach is degraded by pollution from wastewater discharges. These discharges originate from municipal sources from the metropolitan area which has a population exceeding three million. A further complication arises from the salinity levels which tend to favor flocculation, sedimentation, and the retention of the sediment in the estuary. As the Corps has pointed out, in the lower reach, the water quality conditions are slightly improved, however, algal blooms, depleted oxygen at depth, and high coliform counts have been noted.

CHAPTER III

LEGAL AND INSTITUTIONAL MANAGEMENT OF THE POTOMAC RIVER

> ...provision for an adequate water supply to the sprawling Washington metropolitan area is perceived as the (Potomac River] Basin's major problem, one whose resolution is substantially complicated by the multiplicity of jurisdictions concerned.
>
> --Garrett Power[1]

Introduction

The Potomac River Basin has had superimposed on it a varied array of governmental institutions. This collage of institutions involves a wide variety of legal and organizational arrangements which are critical to a better understanding of the water supply problems in the Washington metropolitan area. This chapter describes the legal and institutional arrangements *which* have an impact on the management of the Potomac River for water supply purposes. The chapter first describes the legal setting in Maryland and then describes the function of the governmental institutions in that state.This is followed by a similar analysis for Virginia.

Finally, the chapter describes the role of the two regional bodies which have an impact on water supply in the area.

Maryland

When King Charles I granted the area of Maryland to Lord Baltimore in 1632, the cession included the Potomac River and the soil under it and the islands to the high-water mark on the Virginia side. Fifty-five years later, King James II also made a grant which included the river to Lord Culpeper for the northern portion of Virginia. For nearly 100 years, there was some question about the ownership of the river because of these duplicatory land grants. These questions were resolved with the signing of the Compact of

[1]G. Power, Legal Rights in Potomac Waters: Proceedings of a Conference at Harper's Ferry, West Virginia (Rockville, Md.: Interstate Conference on the Potomac River Basin, September, 1976), p. vii. Publication No. 76-2.

1785 which also addressed the regulation of the river. The boundary between the two states was further resolved by the Black-Jenkins Award of 1877 which allotted to Maryland that portion of the Potomac River up to the low-water mark on the south side. Both the Compact of 1785 and the 1877 legislation provided for concurrent management of the river.[2]

In 1788, Maryland ceded to the Congress of the United States part of a district of ten miles square to be used for the seat of the Federal government. Virginia deeded the other portion through legislation in 1789. The Federal government accepted the territory one year later. When Maryland ceded these lands to the Federal government, it also transferred ownership of a part of the Potomac River and its bed to the Federal government.

In 1853, the Federal government became concerned about the supply of water for the capitol and it authorized $100,000 to bring water into the City of Washington. When it authorized these expenditures, however, it did provide that "if the plan adopted by the President should require water to be drawn from any source within the limits of Maryland, the assent of the legislature of that state should first be obtained."[3] When it was determined that Potomac River water would have to be used, the State of Maryland did acquiesce through legislation.

The importance of these actions is that the State of Maryland did not relinquish its jurisdiction over the Potomac when it ceded land for the District of Columbia. Rather, it was recognizing that the Federal government - and in this case the District -- was a lower riparian user. The significance is that the veil of supremacy remains with Maryland.

[2]K. Lasson, "A History of Potomac River Conflicts," in Proceedings, 1976, pp. 2-11.

[3]10 Stat. 189. For a discussion of this period see W. Rich, "The Waste Rights of Maryland in the Potomac River Basin," in Proceedings, 1976, pp. 172-76.

Maryland has adopted a "riparian" system for allocating waters from the Potomac River. Under this legal system, rights arise from the ownership of real property underlying or bordering streams and rivers. A riparian right is, in essence, a right to make use of water flowing in a stream by a property. The holder of riparian rights has no property right to the water itself, but only a right to use the water. The right does not confer any specific quantity of water; rather, all rights to water use by a riparian owner depend upon the equal, correlative rights to such use by other riparians.

Maryland has developed an appropriative permit program for withdrawals from the Potomac River. Under this system, Maryland's authority over withdrawals under a "riparian" permit system is not to allow it to deprive the District of Columbia, or other lower riparians, of a reasonable use of river water. Maryland, therefore, is to insure that an adequate supply of water is available to the competing interests within the framework of Maryland's sovereign authority to regulate the appropriation of Potomac water within its boundaries. To support this assurance, Maryland's legislative approval is a necessary prerequisite for the withdrawal of water.[4]

Department of Natural Resources. The primary state agency with jurisdiction impacting the Potomac River in Maryland is the State Department of Natural Resources. The DNR was established in 1969 to serve as the principal natural resources management agency for the state.

In establishing the DNR, the General Assembly sought to create a state agency with broad powers to set policies, undertake plans, oversee programs and practices of state, county, regional and Federal agencies and institutions. The DNR was also created to coordinate all natural resources activities within the state and to unify and promulgate policies, plans, programs

[4]Ibid.

and practices which would insure proper management of natural resources in the state.

The head of the DNR is the Secretary of Natural Resources who, like all State Cabinet officials, is appointed by the Governor with the advice and consent of the Senate. The Secretary serves at the pleasure of the Governor, is directly responsible to the Governor, and advises on all matters assigned to DNR. The Secretary is responsible for carrying out the Governor's policies in the areas of natural resources research and development, management and administration.

One important component of the DNR is the Water Resources Administration which has primary responsibility for dealing with water supply issues and problems.

Water Resources Administration. Title 8, Section 203 of the Maryland Code's Natural Resources Article outlines the authority of the Water Resources Administration (WRA). Water supply management and planning is central to the WRA's mission, which is "to exercise the State's responsibility for its water resources by planning and conservation of the waters of the State for the State's best interests and benefits."[5] With the transfer of pollution control activities to the Department o£ Health and Mental Hygiene, WRA's emphasis on its water supply planning activities and other remaining responsibilities was increased. These activities include erosion control, wetlands protection, dam safety, flood plain hazard management, dredging, hydrologic impacts of mining and facility siting/water supply issues.

The WRA has four mechanisms available to it for managing water: (1) regulatory powers; (2) technical and informational assistance;

[5]D. Petzold and S. Sawyer, The Structure and Status of Water Supply Planning in Maryland (Baltimore, Md.: Maryland Dept. of State Planning, July 1981), p. 29.

(3) financial incentives; and (4) direct spending power. It utilizes these powers through the use of the State Water Management Planning Program which has as its objectives "developing a statewide comprehensive water supply management plan that identifies and evaluates alternative strategies to address important water supply and demand problems," and "cooperate with the Interstate Commission on the Potomac River Basin in the analysis of water supply operations on the Potomac River Basin."[6]

A recent report by the University of Maryland critiqued the operation of WRA in planning-related activities. The report observed users questioned "were generally pleased with the...performance in protecting the water re sources of the State, assisting local governments in developing new water supplies, and in reducing local water use conflicts."[7] In addition, despite recent cutbacks in Federal assistance, "...it appears that there is increased DNR emphasis (and funding) for supply planning for issues viewed as having special merit such as conservation studies, drought crisis management, and low flow management techniques."[8]

Department of Health and Mental Hygiene. The primary agency responsible for water quality in Maryland is the Department of Health and Mental Hygiene. Operating within the Department is the Office of Environmental Programs which was established to manage environmental health and water quality programs man dated by the Environmental Protection Agency and the State. Water supply activities are managed by the Office of Environmental Programs' Water Management Programs Sections.

[6]State of Maryland, Department of Natural Resources, Water Resources Administration, Water Supply Division, Maryland State Water Management Planning Program Funding Proposal, 1980, pp. 5-6.

[7]Petzold and Sawyer, op. cit., p. 31.

[8]Ibid.

This Office has a long involvement in water supply provision because of its responsibility to protect public health and safety. This involvement was expanded with the Safe Drinking Water Act of 1974 which required EPA-approved regulations for every water supply system that served more than 24 people or more than 14 connections. In these capacities, the Office closely monitors well and surface water quality levels, certifies all new well sites, used for human consumption, licenses all well and filtration plant designs, investigates potential threats to water supplies (such as landfill sites), and evaluates the County Water and Sewer Plans. The Office is also the lead agency in any drought or water supply equipment outage that threatens public health and safety.

The public health and safety mandate of the Office empowers it to shut down any supply source or to require changes in its operation. The Office is less active with regard to planning the development of new water sources since its focus is on current water quality levels, and to a lesser degree, on water availability for public safety. Conservation activities are perceived as being a water quantity issue, under the purview of WRA.

Maryland Potomac Water Authority. The final state organization was created in 1969 to conserve, control and put to beneficial use the storm and flood waters of the Potomac River Basin in Allegany, Frederick, Garrett, Montgomery, Prince Georges and Washington Counties; that agency is the Maryland Potomac Water Authority.

The Authority is composed of 10 members: a chairman appointed by the Governor, county commissioners from the six Maryland counties located along the non-tidal portion of the Potomac River, and the Washington Suburban San itary Commission, the Department of Natural Resources, and the Department of State Planning. The Authority has the power to assess and collect charges

for the repayment of costs incurred in distributing water stored behind Bloomington Dam (for further, explanation, see Chapter IV).

According to the Corps of Engineers,

> ...the contractual and assessment powers are limited to the repayment of the initial water supply costs of the project. Under the current provisions, assessments are to be based on actual withdrawals in the preceding calendar year and the assessments would be recalculated annually. Non-Maryland users of Potomac River water, including the District of Columbia, would be assessed at rates similar to that of the Maryland counties. These users would be subject to the appropriation permit system administered by the Maryland DNR.

Virginia

Northern Virginia, located across the Potomac River from Washington, D.C. and Maryland, relies primarily on the Occoquan River with its 55 million gallon reservoir for its water supply. (The Occoquan is a tributary of the Potomac discharging below Washington, D.C.) With the exception of Falls Church and Arlington County, who receive their water from the Washington Aqueduct Division, most of the water to Northern Virginia is supplied by the Fairfax County Water Authority. However, the FCC will be getting a larger portion of its water from the Potomac River when its Potomac Water Filtration Plant opens in 1982.

Virginia must receive a permit from Maryland's Water Resources Administration to use water from the Potomac. With the Bloomington Dam coming online, permits to rent water storage space rather than buying water must be obtained. As Northern Virginia increases its use of Potomac River water from the current 2 mgd up to 200 mgd, it will become an important player in efforts for regional cooperation regarding the Potomac River.

[9]U.S. Department of the Army, Corps of Engineers, Baltimore Division, metropolitan Washington Area Water Supply Study for the Potomac Water Users, Draft Progress Report, Institutional Analysis and Economics Appendix (Baltimore, Md., August 1979), p. 22.

Legal Regime. Virginia follows the reasonable use formulation of riparian law with respect to water in natural streams. The reasonable use doctrine holds that the riparian owner is protected in his use of the waters of the stream as long as that use is reasonable in relation both to the available floe in the stream and to the use made of the stream by other riparian owners. The Virginia courts have held over the years that the highest priority goes to domestic uses, watering of livestock, and irrigation of household gardens. According to the Corps of Engineers, "this priority is so strong that a particular riparian owner is permitted to exhaust the flow of a stream in order to serve his domestic needs."[10] Other uses, such as agricultural, industrial and municipal, are subject to the balancing concept of the reasonable use doctrine.

In general, power for allocation and control of water resources rests with the localities -- the cities, counties and towns -- and only to the extent necessary to enable the localities to engage in the provision of water to their inhabitants. Granted, the state does retain ultimate control, but the Virginia General Assembly's willingness to exercise strong control over water allocation matters has been limited. The major enactments have been the State Water Control Law of 1946, Water Resources Act of 1972 and Groundwater Act of 1973. Localities are specifically granted the authority to engage in the business of water supply, and one or more localities may also accomplish this through several types of semi-autonomous bodies, such as sanitary districts, water authorities, and service districts.[11]

While supplies of water are abundant in Virginia, there are disparities in distribution giving rise to local supply shortages, particularly in Northern and Southeastern Virginia.

[10]Ibid.

[11]Viminia Code Annotated, Sec. 21.122.22 to 21.118.3 (1975), Sec. 15.1-1239 to 15.1-1270 (1973) and Sec. 15.1-1420 to 15.1-1441 (1973).

The absence of a state administrative allocation system for water means that no agency has authority to determine the legal status of a proposed diversion. Several Federal, state and local government entities exercise controls over various aspects of such diversion schemes, but none has the power to authorize final transfer. At present, the ultimate determination of the legality of interbasin transfers in Virginia must be determined by application of the riparian doctrine.

State Water Control Board. The State Water Control Board was created in1946 with the enactment of the State Water Control Law[12] which had as its primary purpose pollution control, prevention and abatement. The Board has general responsibility over the state's water quality control program, including: establishment of water quality standards; the issuance of certificates to parties causing pollution; adoption of regulations to supplement statutory pollution law and control of discharges from boats; establishment of requirements for waste treatment facilities; administration of financial assistance programs; water quality planning; certification of projects requiring Federal licenses; investigation of fish kills; and abatement of pollution from petroleum discharges.

In addition to these duties, the Board also exercises policy formulation responsibilities for comprehensive river basin planning, water resources coordination, designation and administration of critical groundwater areas, regulation of dam safety, state coordination of the national flood insurance program, collection of hydrologic data, and advisory services.

The Board currently consists of seven members appointed by the Governor, subject to confirmation by the General Assembly. The Board employs a staff to provide administrative assistance in all matters under its jurisdiction.

[12]Virginia Acts of Assembly, 1946, Chapter 399.

The operating budget of the Board is net from a combination of state and Federal funds.

Department of Health. The State Department of Health undertakes a number of duties related to water resources management and planning. These activities include control over public water supplies, regulation of sewage disposal, control of seafood sanitation, control over sources of radiation, regulation of disposal of solid wastes and toxic substances, collection of data on toxic substances, and mosquito control.

At the present time, the Department of Health has general supervision and control over all water supplies and waterworks in the state insofar as the sanitary and physical quality of waters furnished for drinking affect public health. The Department can prohibit the use of streams or other bodies of water as a source of supply even though it has no authority to exercise further control over the water above the point of intake, with the exception of its regulatory powers over sewage disposal.

Finally, the Department has the authority to control the establishment and operation of waterworks through a permit process. The Board can amend or revoke a permit when necessary for the protection of public health.

State Corporation Commission. The State Corporation Commission is a unique and powerful agency with regulatory responsibility over all corporate activity in the State. Created in 1903, the Commission has authority in the water resources field in two areas: (1) regulation of water supply and sewer companies; and (2) licensing of dams under the Water Power Development Act. Under Virginia law, any water or sewer company proposing to serve more than 50 customers is required to incorporate as a public system. The Commission has statutory power to supervise, regulate and control all public service companies doing business in the state, including passing on rates.

Although not all water and sewer companies are regulated as public utilities, those that serve more than 50 customers are subject to special controls under certain conditions.

The Commission's most direct water resource responsibility involves the construction of dams in certain waters. The Commission's enabling statute provides that "...the control and regulation on the part of the State of the development of the waters of the State shall be paramount and shall be exercised through the agency of the State Corporation Commizsion."[13] This authority has been interpreted to mean the Commission has control over all dams for the generation of hydroelectric energy for use or sale in public service and dams across or in the waters of the state.

Local Government Organizations

Against the backdrop of state agencies involved in water resources, there are a number of local government organizations and agencies involved in water supply management in the Washington metropolitan area.

Maryland

General Governments, Counties, cities and towns in Maryland are authorized by state law to provide for their own water supply.[14] They may, for example, construct, operate and maintain a water system and water plant. They may also extend their water systems beyond their jurisdiction, contract with other parties for water services, and regulate private water systems. However, these powers do not extend to towns or cities which are in a sanitary district or other special district authorized to provide water services.

Only two cities and three towns in the Maryland portion of the WMA provide water services through public works departments. These are: City of Bowie, City of Rockville,

[13]Corps of Engineers Water Supply Study, 1979, p. 33.

14Baryland Code, Article 23 B, Sec. 7 to 91.

Town of Upper Marlboro, Town of Indian Head and the Town of La Plata.

Washington Suburban Sanitary Commission. The WSSC is the largest water supply and sewage organization in the Washington metropolitan area and serves just over one million people.

While the Commission was established in 1918, the concept of a bi-county water/sewer agency first appeared in 1912 following a strong complaint from the District of Columbia about the pollution of streams within the District by Prince Georges and Montgomery Counties.

Mr. Asa Phillips, then Sanitary Engineer of the District, observed: "The pollution of these streams was a matter of grave concern to the District of Columbia -- not only in the problem of health, but also in the availability of the parks in these stream valleys for the use of the general public."[15]

The Maryland counties also had strong reason to join a bi-county organization. Montgomery County legislators were supportive because they felt many of the problems to be solved by the new agency were in that county. Prince Georges County was also interested because of severe sewage pollution problems in Hyattsville, Mount Rainier and surrounding areas.

Yet, for a variety of reasons, the District did not become a participant in the bi-county experiment. Following the establishment of the WSSC in 1918, several efforts were made to coordinate activities with the District:

> The Commission soon learned that, although the regional tie-in of sewage facilities with the District of Columbia's system probably would be possible, the District had no real interest in or desire to share its drinking water supply with Maryland. This District of Columbia attitude set the stage for some early arrangements for sewage disposal/pollution control ties with the Nation's Capitol and independent development of wa~9r supply capability for Montgomery and Prince Georges Counties.

[15]"Washington Suburban Sanitary Commission, A History of the Washington Suburban Sanitary Commission (Hyattsville, Md., March 1979), p. 1.

[16]1bid.,r p. 7.

Since its inception, WSSC has grown extensively with two large storage facilities and two water filtration plants, one on the Patuxent River and the other on the Potomac River.

WSSC's governing body consists of Conmissioners serving staggered four year terms. Three commissioners are appointed by the Montgomery County Council and three are named by the Prince Georges County Executive.

Besides providing water supply and sewage services, the WSSC is empowered to provide refuse collection and disposal services, and it does operate a sanitary landfill.

The Commission is also responsible for approving or disapproving the location and construction of all utilities in public ways within their service area, and for the adoption and enforcement of erosion control regulations for utility construction within the Patuxent Watershed portion of the service area.

For many years, the WSSC operated with little outside control. As a recent WSSC publication noted, however, times have changed:

> In recent years, the TVISSC, which enjoyed substantial independence during its first five decades of operation, has been functioning under new and complex Federal, State and local constraints. Much of its-autonomy has been lost through powers delegated by the Maryland General Assembly to the governments of Montgomery and Prince George's Counties over the development and approval of each county's Ten-Year Water and Sewer Plans, appointment of the six WSSC Commissioners, and approval of the Commission's annual budget.

In addition, the Maryland-National Capital Park and Planning Commission has the right to review the county ten-year water and sewer plans prepared by WSSC. The MCPPC does not have veto power over the plans, but the county governing bodies must vote separately on each item recommended for change. Finally, the State Department of Health and Mental Hygiene also reviews and can approve or disapprove the ten-year plans

[17] 1bid.,r p. 23.

Despite their feeling of losing power, the WSSC has been a leader in dealing with problems in the WMA. The establishment of the Washington Metropolitan Water Supply Task Force is the best example of this leadership.

In January 1980, WSSC General Manager Robert S. McGarry wrote local governments in the region urging establishment of a task force to seek solutions to the MWA's future supply problems. He said: "Local decision-makers can solve the problem -- if they wish -- through regional cooperation."[18] This Task Force has proven to be a capable forum for resolving most of the coordination issues facing local governments in the area. And, according to Mr. McGarry, "...the effort has paid off with the achievement of regional consensus on the management of all water supply sources, reservoir facilities and major production plants as one regional system in times of drought."[19]

Private Water and Sewage Companies. Under Maryland law, corporations formed for supplying water rights, have the power to acquire and possess land, water and other property and, with the permission of local authorities, may lay pipe and construct works. The corporations also have the right to eminent domain. There are several private water and/or sewage systems in Montgomery, Prince Georges and Charles Counties, but most are small and not of direct importance to this study.

Virginia

General Government Units. Virginia law also provides authority for cities, towns and counties to acquire, establish, maintain and operate water works and other public utilities, or to contract for such services. In northern Virginia, two counties and 12 towns provide water supply; they include:

[18]Letter from Mr. Robert S. McGarry, General Manager, Washington Suburban Sanitary Commission, to Mr. R. Scott Fosler, President, Montgomery County Council, January 2, 1980, p. 1.

[19]Washington Suburban Sanitary Commission, Annual Report on Operations in 1979 and 1980 (Hyattsville, Md.: TV15SC, 1980), p. 3. see also Appendix G.

Arlington County,[20] Fairfax County (see following section), City of Fairfax, City of Falls Church, Vienna, Herndon, Manassas and Manassas Park, Leesburg, Purcellville, Middleburg, Round Hill, Hillsboro, Hamilton and Lovettsville.

Fairfax County Water Authority. The Fairfax County Water Authority was created in 1957 by the Fairfax County Board of Supervisors under the Virginia Water and Sewer Authorities Act. As a public body, FCWA can exercise governmental functions in supplying water, but not sewer services. It can acquire existing water systems, .establish water rates and borrow money without voter approval. FCWA operates much like a business -- through its revenues, and not through tax assessments.

In 1959, the authority's charter was amended to allow it to acquire, construct, operate and maintain water systems, sewer systems, and sewage disposal systems in Fairfax County.

FCWA is administered by a board of nine members appointed by the Fairfax County Board of Supervisors. The Board represents the citizens and constituency of the Fairfax County Water Authority's jurisdiction. Two non-voting members representing the City of Alexandria and Prince William County are also on the Board because FCWA provides service to these areas. The Board makes policy decisions, sets water rates, determines what rule and regulations are needed for water service, and oversees the staff, which currently numbers 300.

FCWA is completing construction of the Potomac River Water Supply Facility to supplement its 111.6 mgd Occoquan Water Supply Facility. It is expected the new facility will come on-line in the Spring of 1982 with an initial 50 mgd capacity; the facility's capacity will ultimately increase to 200 mgd. With water supply needs growing in the Northern Virginia suburbs, the Potomac River plant will ease the usage of the Occoquan, requiring less

[20]Finished water for the county is purchased from the Washington Aqueduct Division, Corps of Engineers.

pumping and less lift to higher elevations. However, this shift will make FCWA a more important participant in water supply decision making in the Potomac River Basin.

Regional Bodies

Interstate Commission on the Potomac River Basin. The Interstate Commission on the Potomac River Basin (ICPRB) was established in 1940 when Congress authorized Maryland, Virginia, Pennsylvania, West Virginia and the District of Columbia to enter into a compact. This compact provided for the creation of a conservancy district in the Potomac River Basin for "...the purpose of regulating, controlling, preventing or otherwise rendering unobjectionable and harmless the pollution of the waters of said Potomac drainage area by sewage and industrial and other wastes."[21]

It was not until 1970, however, that ICPRB had the authority to address water supply-related issues. These amendments broadened the authority of ICPRB to: (1) include water resources and associated land resources; (2) allow ICPRB to cooperate with and assist public and *non-public* agencies in planning related to water resources and associated land resources; and (3) provide for the establishment of sections consisting of the Commissioners interested in problems which affect two or more, but not all, of the signatories.[22]

While these powers sound all-encompassing, they are not. Basically, the ICPRB is an advisory body dedicated to improved understanding and discussion of water quality and quantity issues. The ICPRB consists of three members from each of the four states and the District of Columbia, and three members appointed by the President. Each member jurisdiction provides for selection

[21]Public Resolution No. 93, 76th Congress, 54 Stat. 748, 1940. 22 See Appendix C.

of its representatives. For example, Virginia law requires appointment by the Governor with one member required to be a resident of the Basin, one a member of the Virginia Commission on Interstate Cooperation, and the other to be appointed at large.

The Commission is financed by appropriations from the signatories and from the Federal government. These appropriations vary depending upon the financial status of each of the signatories, as well as with the number of projects under study by the Commission that benefit the signatory. Any member can withdraw after giving one year's notice.

The ICPRB's major efforts in MWA water supply issues began in 1977 when the staff realized that enough water could be stored in existing KM reservoirs to deal with droughts. While their involvement has been brief, the impact of the ICPRB has been substantial. Through a series of studies and meetings, they have made important contributions toward improved understanding of the water supply situation.

For example, it was through the efforts of ICPRB that the Corps and other planning agencies concluded that there was little need for massive new storage facilities to meet future demand. At a Congressional hearing on MWA water supply, ICPRB Planning Engineer Dr. Daniel Sheer explained what they learned:

> The information produced by [several studies] leads to a much different perception of the MWN water supply problems than was prevalent only a few years ago. The theoretically achievable supply-significantly exceeds the projected water requirements.... The raw water storage available is adequate, but only if we can get it where it is needed and when it is needed. The problem, then, is one of providing adequate techniques and facilities for management of existing supplies rather than the provision of new supplies.
>
> The basic constraint on managing MWA water supply is as simple as this. On any given day, the supply of water is limited by the sum of 1) what can be taken from the Potomac, and 2) what can be taken from the local reservoirs. What can be taken from

> the reservoirs is currently limited *by* the capacity of the reservoir treatment plants on the Patuxent and the Occoquan, a total of about 165 mgd. If demands exceed this amount on any given day, the local systems will be forced to implement the Low Flow Allocation Agreement and share the shortfall.

It was out of this analysis and others that the ICPRB developed its successful CO-OP program to find ways to improve distribution of existing supplies and find ways to deal with low-flow conditions. (See Appendix H.)

Metropolitan Washington Council of Governments (COG). The Metropolitan Washington Council of Governments became incorporated as a non-profit organization in 1965. Sixteen major local governments in the NNA are represented in COG. These include the District of Columbia, three governments in Maryland, four Virginia counties, and eight Virginia cities. The Council was formed to meet the needs of developing region wide consensus on issues beyond the scope of local governments.

The Council is empowered to advise and assist local governments of the region to: (1) identify mutual area wide problems; (2) develop and promote comprehensive regional plans; (3) seek mutually desirable policies and develop cooperative mechanisms among local governments; (4) support concerted action among local governments; and (5) serve at the request of local governments as their representative in regional matters. The Council does not have the authority to legislate, regulate, enforce or tax, and member governments can oppose any proposal or withdraw from COG whenever they choose.

Water-related problems addressed *by* COG include both water supply and water quality. The Water Resources Planning Board, set up in 1974, "serves as the regional agency to conduct waste treatment planning for the metropolitan area including development of all policies, programs, and other

[23]Testimony of Dr. Daniel Sheer in U.S. Congress, Senate, Committee on Governmental Affairs, District of Columbia Water Supply, 96th Cong., lst Sess., October 10, 1979, p. 163.

actions required for effective water planning, and it also acts as COG's water quality planning committee."[24] The Council also has a number of technical committees, including the Water Quality Monitoring Task Force and Water Supply Advisory Committee, which assist on technical aspects.

COG has been involved in a wide range of issues touching on water supply in the area. For example, it has developed forecasts of populations and house holds in a cooperative effort with each jurisdiction. These forecasts have come into play in evaluating water demand and supply. While the Corps of Engineers was undertaking its water supply study, concerns were raised regarding the accuracy of demand projections. COG worked with Corps in reevaluating these projections and concluded the differences were insignificant so as not to cause changes in the direction of the Corps study.

The main thrust of COG's involvement in water issues is in the assessment of the quality of water sources and tracking pollutant loads in the Potomac River. COG's involvement in water in the past has included more direct support to water supply studies for the region. However, grants COG receives from the Federal government do not support these activities any longer.

COG's involvement in emergency regional planning has been substantial. This interest stemmed, in part, from a fire at WSSC water supply facilities which temporarily threatened supplies in 1977. COG became involved because of the conflicting reports received by the public. The result was the Metropolitan Washington Water Supply Emergency Agreement (WSEA) which was signed on December 5, 1979. According to Mr. Donald Hooker of COG:

> The WSEA represents a major achievement in regional planning and cooperation. It provides for coordination and implementation measures among utilities that were conspicuously lacking

[24]Metropolitan Washington Council of Governments, Metropolitan Washington Regional Directory, March 2, 1981, p. 4.

during water shortages which impacted many jurisdictions in the metropolitan area during July and October of 1977. Provisions of the WSEA allow for equitable management of water supply emergencies while protecting the public health and safety of Washington area residents. The Agreement reduces the need for redundant emergency plans and resources among local governments and water suppliers and lessens potential for confusion resulting from uncoordinated and often disparate emergency actions that have been taken by neighboring jurisdictions in past water shortages.

Summary

As pointed out earlier, there are a wide variety of organizations outside the District of Columbia which have an impact on water supply in the WMA. This chapter has described the role of the most important of these organizations. To assist the reader in understanding the impact of these organizations, Figure 8 has been prepared. The Figure summarizes the various functions each of the major organizations described in this chapter undertake.

25 D. Hooker, "An Overview of the Metropolitan Washington Area Water Supply Emergency Agreement," paper presented at Chesapeake Section AWNA Meeting on September 4, 1980 at Ocean City, Md., p. 3. See Appendix D for a copy of the Agreement.

Figure 8

Functions of Organizations Impacting on Water Supply
in the Potomac River Basin

Agency / Function	Planning	Financing	Acquisition	Construction	System Operation	Water Supply Management	Monitoring & Surveillance	Coordination
Maryland								
Department of Natural Resources	x	x				x		
Water Resources Administration	x	x		x				
Department of Health and Mental Hygiene	x			x		x	x	x
Maryland Potomac Water Authority								
General Governments	x	x	x					
Washington *Suburban* Sanitary Commission				x				
Private Companies	x	x	x	x	x	x		
Virginia								
State Water Control Board	x	x				x		
Department of Health	x							
State Corporation Commission		x				x		
General Governments						x		
Fairfax County Water Authority	x	x	x	x		x	x	x
Regional								
Interstate Commission for the Potomac River Basin								
Metropolitan Washington Council of Governments	x							

Source: U.S., Department of the Army, Corps of Engineers, Baltimore Division, Draft Progress Report, Metropolitan Washington Area Water Supply Study for the Potomac Water Users, Institutional Analysis and Economics Appendix, Baltimore: Corps of Engineers, January, 1979), pp. 6-42.

CHAPTER IV

WATER SUPPLY IN THE WASHINGTON METROPOLITAN REGION: AN OVERVIEW

> These problems are no less serious than those of the past 350 years, but their disposition will probably be somewhat different. The existence of interstate compacts, the dominant role of the federal government, and the propensity of factional interests to cross state lines will likely serve to de-emphasize the problem as a conflict between states.
>
> Whether solutions on a regional basis will be forthcoming resins, as always, to be seen. -Kenneth Lasson[1]

Introduction

The purpose of this chapter is to provide an overview of the water supply facilities in the Washington metropolitan area. This information is a critical foundation to better understanding of the District of Columbia's water supply management system. The chapter will first provide an overview and description of the major storage impoundments along the Potomac River system which have an impact on the WMA. It should be noted that all the major reservoirs on the Potomac will not be discussed, only those which have an impact on the WMA. Finally, the chapter will then describe the water supply facilities of the major water providers in the WMA: the Washington Aqueduct Division, the Fairfax County Water Authority, and the Washington Suburban Sanitary Commission.

Storage Facilities

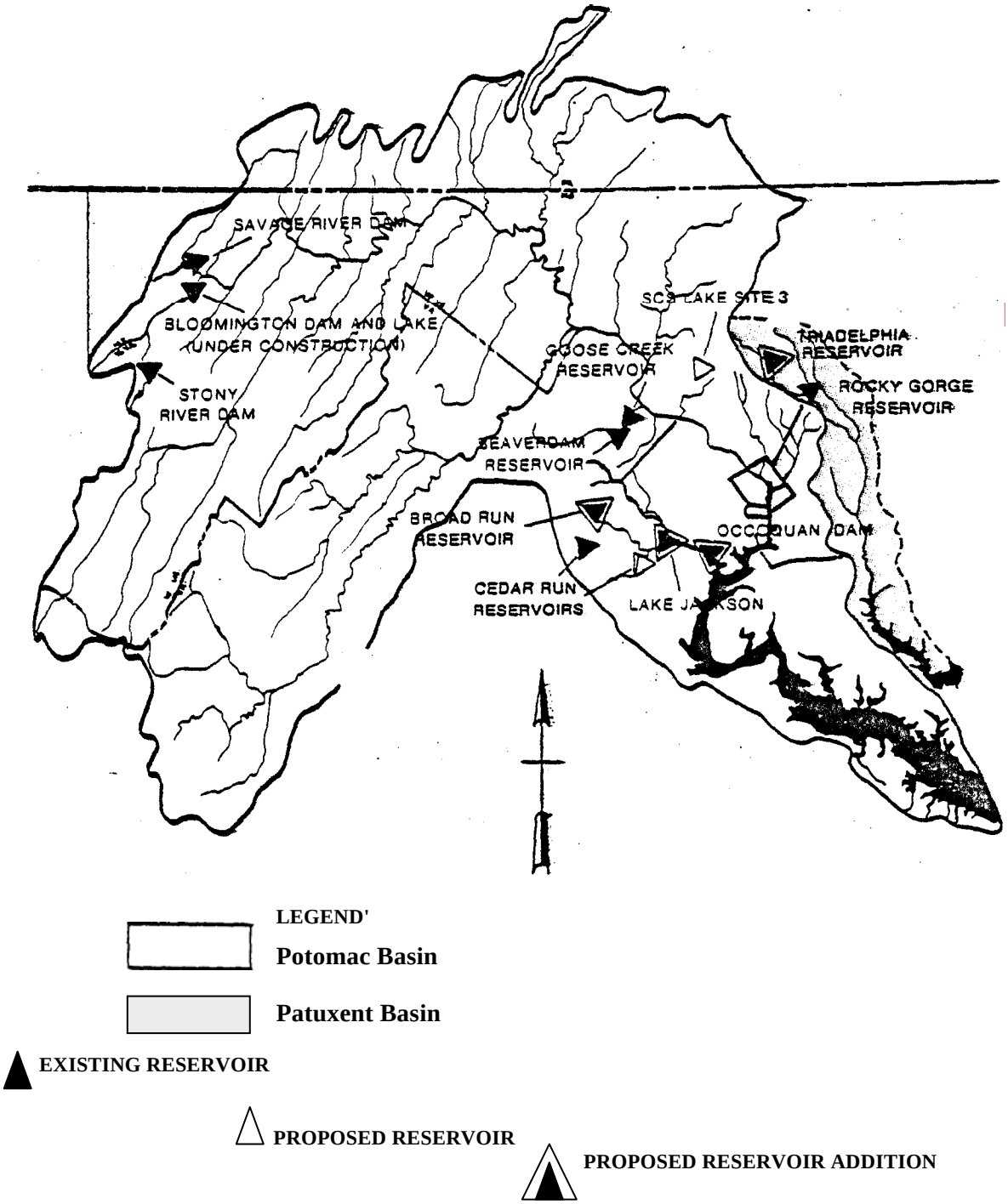
Figure 9 provides a graphic illustration of the location of the major water supply reservoirs affecting the WMA. (Readers will note that this is the same as Figure 6, page II-11; it has been reproduced here for the convenience of the reader.)

[1]G. Power, Legal Rights in Potomac Waters: Proceedings of a Conference at Harper's Ferry, West Virginia (Rockville, Md.: ICPRB, Publication No 76-2

Figure 9

Existing and Proposed Reservoirs
Affecting the WMA

POTOMAC RIVER BASIN AND PATUXENT RIVER BASIN



Source: U.S., Department of the Army, Corps of Engineers, Baltimore Division, Draft Progress Report, Metropolitan Washington Area Water Supply Study for the Potomac Water Users, Supply and Demand Specialty Appendix, Baltimore

North Branch

Stony River Reservoir and Dam. Located near the West Virginia-Maryland border, the Stony River Reservoir and Dam is situated at the highest elevation of any facility on the Potomac River. The dam is 52 feet high and over 1100 feet long. It is owned and operated by the West Virginia Pulp and Paper Company primarily for industrial water supply purposes. The dam is located 20 miles above the confluence of the Stony River with the North Branch of the Potomac and it drains only 12.5 square miles of area.

The reservoir is operated jointly with the Savage Reservoir (see below) based on a set of operating rules devised by the Corps of Engineers. The goal of these rules is to maintain a minimum flow of 60 mgd at Luke, Mary land on the North Branch of the Potomac River. The primary burden of meeting these minimum flows at Luke falls on the Savage Reservoir, with the Stony River facility providing a supplemental role.In most years, these flows occur from mid to late summer and usually range from 3 cfs up to 20 cfs. By late fall, the draw down in the reservoir is below the spillway crest and it is maintained at that level until spring.[2]

Mount Storm Lake. Mount Storm Lake is an impoundment halfway between Stony River Reservoir and the confluence of the Stony River with the North Branch. The reservoir is owned by the Virginia Electric and Power Company and was built and placed in service in 1963.

This dam is an earth fill embankment structure which is 125 feet high and 1125 feet long. The drainage area for the reservoir is 31.2 square miles. This impoundment serves as a source of cooling water for a steam power plant located adjacent to the reservoir. Since the reservoir is

[2]U.S. Department of the Army, Corps of Engineers, Baltimore Division, Metropolitan Washington Area Water Supply Study for the Potomac Water Users, Draft Progress Report, Supply and Demand Specialty Appendix (Baltimore, Md., August 1979), pp. 31-33.

operated in a run-of-the-river manner, it offers little regulation for the Stony River.

Bloomington Reservoir and Dam. The Bloomington Reservoir project was authorized by the Congress in 1962 for a number of purposes, including: water quality control, reduction of flood damages, water supply and recreation. The project is located in Garrett County, Maryland and Mineral County, West Virginia on the North Branch of the Potomac River. Funds were first appropriated for the project in 1973 and construction was completed last year.[3]

Bloomington Dam is one of the largest ones on the Potomac River. It stands over 290 feet high and is more than 2,100 feet long. The earth and rock fill structure provides impoundment for a drainage area of more than 260 square miles.

As presently envisioned, the Bloomington Reservoir will be operated in conjunction with the Savage River Reservoir and the Stony River facilities to provide a dependable low flow at Luke, Maryland of 305 cfs. At present, without Bloomington, the dependable low flow at Luke is only 93 cfs.

Costs of the project allocated to water supply must under Federal law be repaid by non-Federal interests.[4] When authorized, the Bloomington project allocated 33.2 percent of the project costs for water supply with 5.8 percent being allocated to initial water supply storage and 27.4 percent to future water supply. A contract between the Federal government and the Maryland Potomac Water Authority for repayment of the initial water supply storage

[3]See testimony of Col. James W. Peck in U.S. Congress, Senate, Committee on Intergovernmental Affairs, District of Columbia Water Supply, 96th Cong., 1st Sess., October 10, 1979, pp. 123-24.

[4]See Water Supply Act of 1958, P.L. 85-500, 72 Stat. 297.

cost has been executed. To date, no contractual arrangements for repayment of the future water supply storage cost in Bloomington has been made.

Since the project was first planned in the late 1950's, the Corps of Engineers recently decided to re-evaluate its role in meeting future water supply needs in the WMA. The first look at this question led the Corps to conclude that a full-scale re-evaluation was needed. Thus:

> The Baltimore District, Corps of Engineers is beginning a reformulation study of the *Bloomington* Lake project to examine its full water supply potential. Downstream water supply needs are increasing, particularly in the Washington Metropolitan Area (MWA). Optimum use of existing facilities may be economically and environmentally preferable to constructing other facilities at this time. The purpose of this reformulation study is twofold: (1) to determine the full water supply capability of the presently authorized low flow augmentation storage in Bloomington Lake by identifying optimum reservoir release rules; and (2) to determine the feasibility of reallocating some flood control storage to water supply storage to furnish additional downstream water supply.

The Bloomington reformulation study is currently underway and has been merged with the "Metropolitan Washington Area Water Supply Study for the Potomac Water Users." Both reports will be final in 1982.

Savage River Reservoir and Dam. The Savage River facility was designed by the Corps and constructed by the Works Progress Administration prior to World War II. The dam and reservoir are now owned and operated by the Upper Potomac River Basin Commission.

The dam at Savage is 184 feet high and 1050 feet long, and provides drainage for 29 square miles from Crabtree Creek and 76 square miles of the Savage River.

The Savage River Reservoir is presently operated jointly with the Stony River Reservoir. The object of this joint operation, as indicated earlier,

[5] U.S. Department of the Army,, Corps of Engineers, Baltimore District, Notice of Study Initiation: Bloomington Lake Reformulation Study (Baltimore, Md.: January, 1980), p. 1. See Appendix E.

is to insure sufficient low flows at Luke (93 cfs). When Bloomington is brought on-line, the three reservoirs are to be operated together to assure a dependable low flow. The reason for this low flow augmentation is that there is a natural acidity of water captured in Bloomington. The Corps currently estimates that releases from Bloomington should be no larger t'r1an twice those from Savage and never more than three times.

Triadelphia and Rocky Gorge Reservoirs. Triadelphia and Rocky Gorge Reservoirs are both owned and operated by the Washington Suburban Sanitary Commission. Both reservoirs are located on the boundary of Montgomery and Howard Counties.

The Triadelphia Dam is an earth fill structure 62 feet high and 995 feet long. The Rocky Gorge Dam, on the other hand, is a concrete gravity structure that is 125 feet high and 840 feet long.

Both facilities are operated by WSSC an interdependent system. Under its water right, WSSC is required to maintain a minimum flow downstream of the reservoirs at Laurel, Maryland. Tb do this, reservoir releases must satisfy one of two conditions: either the downstream flow must equal 10.5 mdg (16.5 cfs) or the flow must equal the natural flow as if no diversion existed, whichever is less.

Occoquan Reservoir and Dam. The major reservoir and impoundment in Virginia is the Occoquan Reservoir and Dam.[6] This facility is composed of a lower and upper dam which serve as the principal source of water for the Fairfax County Water Authority. The lower dam was built in 1950 by the Alexandria Water Company and is located approximately one-half mile down stream from the upper dam. It is a concrete gravity structure 30 feet high.

[6]There are three other facilities of smaller size located in Northern Virginia; they are: Broad Run Reservoir and Dam, Lake Jackson Reservoir and Dam, and Goose Creek Reservoir. A discussion of these facilities can be found in Corps of Engineers Metro Washington Water Supply Study, pp. 49-61.

The upper dam was also built by the Alexandria Water Company, and it was placed in service in 1957. The upper dam at Occoquan is over 725 feet long and has a maximum height of 70 feet. Drainage area for the upper dam is 570 square miles.

Both of these facilities were acquired through condemnation proceedings begun in 1962 and concluded in October, 1967. The Alexandria Water Company reorganized itself as the Virginia American Water Company and retained owner ship of water distribution systems in Alexandria and Dale City; it remains a wholesale customer of FCWA.

Plans are now underway to increase the size of the upper dam to provide for additional storage of 10.1 billion gallons of water. This will ensure a safe yield from the facility of 67.5 mgd.

Existing Water Supply Facilities

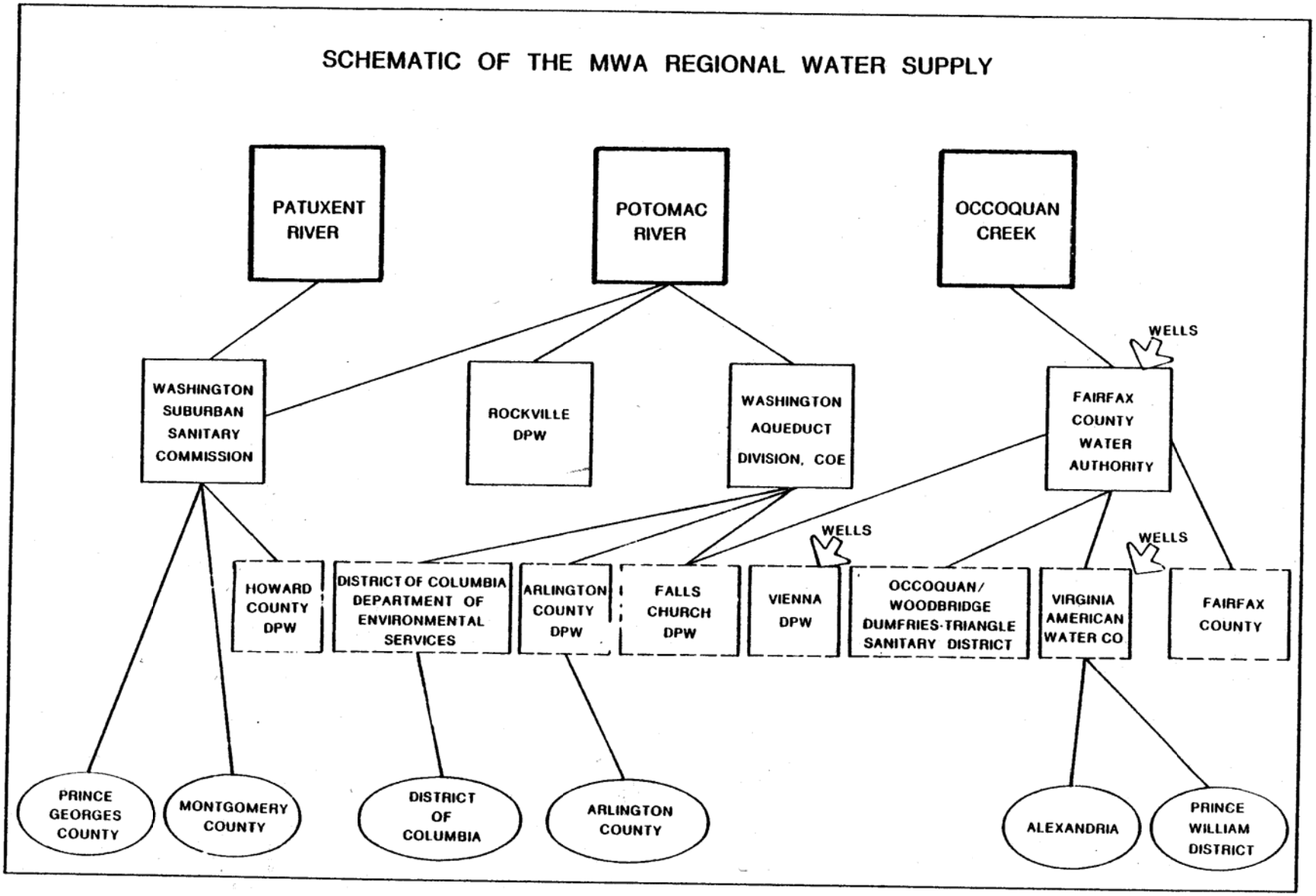
Water supplies in the WMA are provided by a number of sources through a multitude of supply agencies and from an even greater number of water distributors. Figures 10 and 11 are included to provide an overview of this complex web of sources, suppliers and distributors.

Figure 10, for example, presents a schematic of the major sources (shaded boxes), the suppliers (boxes), and distributors (broken boxes). As can be seen, while the Potomac River Basin is the only source of water, it comes from three sources in the Basin: the Potomac, Patuxent and Occoquan. The three largest suppliers are WSSC, FCWA, and the Washington Aqueduct Division.

The distribution of these supplies then becomes more diverse, with private companies, cities, counties, and sanitary districts involved.

Figure 11 is more complex, yet it does provide a more comprehensive picture of the interrelationship between suppliers, sources and distributors. In addition, it provides a good overview of the relationship of the various state and federal agencies to the water supply picture in the WMA.

Figure 10



Source: U.S., Department of the Army, Corps of Engineers, Draft Progress Report, Metropolitan Washington Area Water Supply Study for the Potomac Water Users, Supply and Demand Specialty Appendix, (Baltimore District: Corps of Engineers, January, 1979), p. 81.

Figure 11

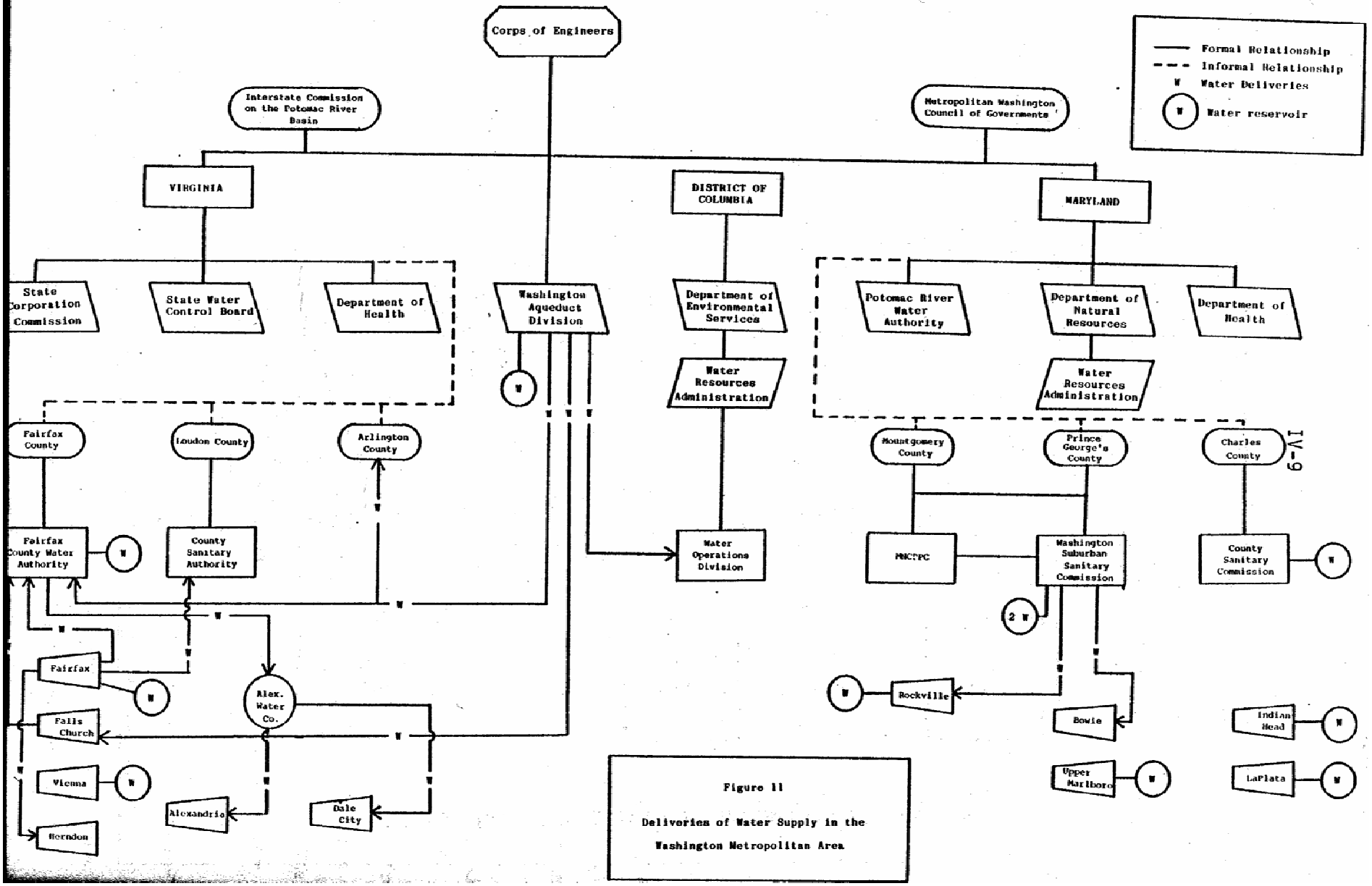


Figure 11

Deliveries of Water Supply in the Washington Metropolitan Area

The primary sources of surface water supply within the WMA are given in the figures. However, the relative importance of the sources is not indicated. The relative percent of raw water extracted from each of the major sources is as follows:

Potomac River	70 percent
Patuxent River	12 percent
Occoquan Creek	14 percent
Goose Creek[7]	2 percent
Broad Run	1 percent
Beaverdam Run	1 percent
Chopawamsic Creek	< 1 percent

As can be seen, more than 99 percent of the total water supply is obtained from surface sources; groundwater is only used in isolated suburban and rural locations.

Given the dominance of the three major sources, this chapter will concentrate next on describing the facilities of the three largest suppliers: Washington Aqueduct Division; Fairfax County Water Authority; and Washington Suburban Sanitary Commission. Because of the WAD's close relationship to the District of Columbia, it will be treated as an integral part of Chapter V. A description of the facilities of the other two suppliers is given below.

Washington Suburban Sanitary Commission. The WSSC, as indicated in Chapter III, is responsible for supplying, treating and distributing water to sub urban areas in Montgomery and Prince Georges Counties. It also provides a small amount of water under a contract with Howard County.

The major facilities of the WSSC's water system are the Triadelphia and Rocky Gorge Reservoirs on the Patuxent River and a treatment plant withdrawing water from the Potomac.

The Patuxent River Water Filtration Plant was constructed in three stages in 1944, 1951, and 1955; it is located about two miles from the Patuxent River

[7]See explanation under note 6.

near Laurel, Maryland. Raw water is supplied from Rocky Gorge Reservoir to the plant via a pumping station and three parallel pipelines. The plant has a rapid sand filtration system and it uses conventional water treatment methods and fluoridation. The maximum daily treatment capacity of the plant is 65 mgd. The finished water is run from the plant to storage facilities in Montgomery and Prince Georges Counties.

The other major source of raw water supply for WSSC is the Potomac River. The Potomac is the larger of the two raw water supplies and provides approximately 70 percent of WSSC's needs.

The Potomac River Filtration Plant, which went into operation in 1961, is located near Watts Branch in Montgomery County, just two miles upstream from Great Falls. The plant treats water from the Potomac which is pumped 140 feet from the river below. The plant currently has a capacity of 240 mgd.

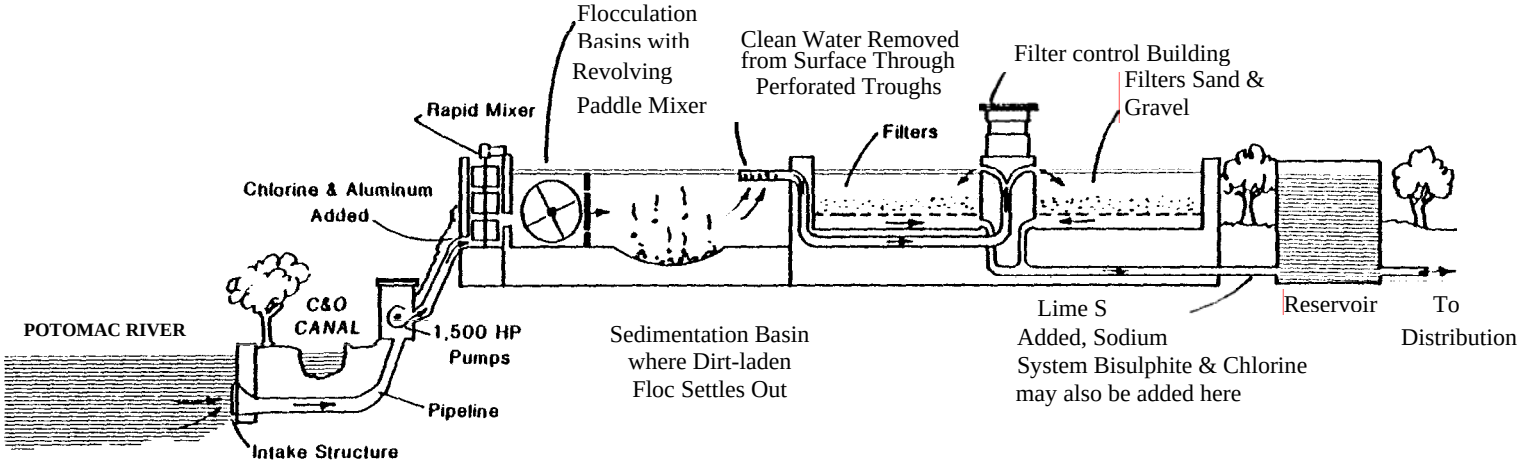
In 1978, the Corps granted WSSC a permit to construct a 400 mgd intake adjacent to the site of its existing Potomac River intake. This intake will enable WSSC to increase its Potomac withdrawals from a maximum of 184 mgd to 400 mgd (see Figures 12 and 13).

Fairfax County Water Authority. The FCWA is the second largest supplier of water in the Commonwealth of Virginia. It is also the water supplier with the fastest growing service area. FCWA provides both retail and wholesale water supplies in the City of Alexandria, Dale City, and Fairfax and Prince William Counties.

The FCWA's major facilities consist of two interconnected water treatment plants at Occoquan and Lorton, and the previously described tandem reservoir system on Occoquan Creek. The primary source of water for FCWA is Occoquan Creek which provides 92 percent of the Authority's needs.

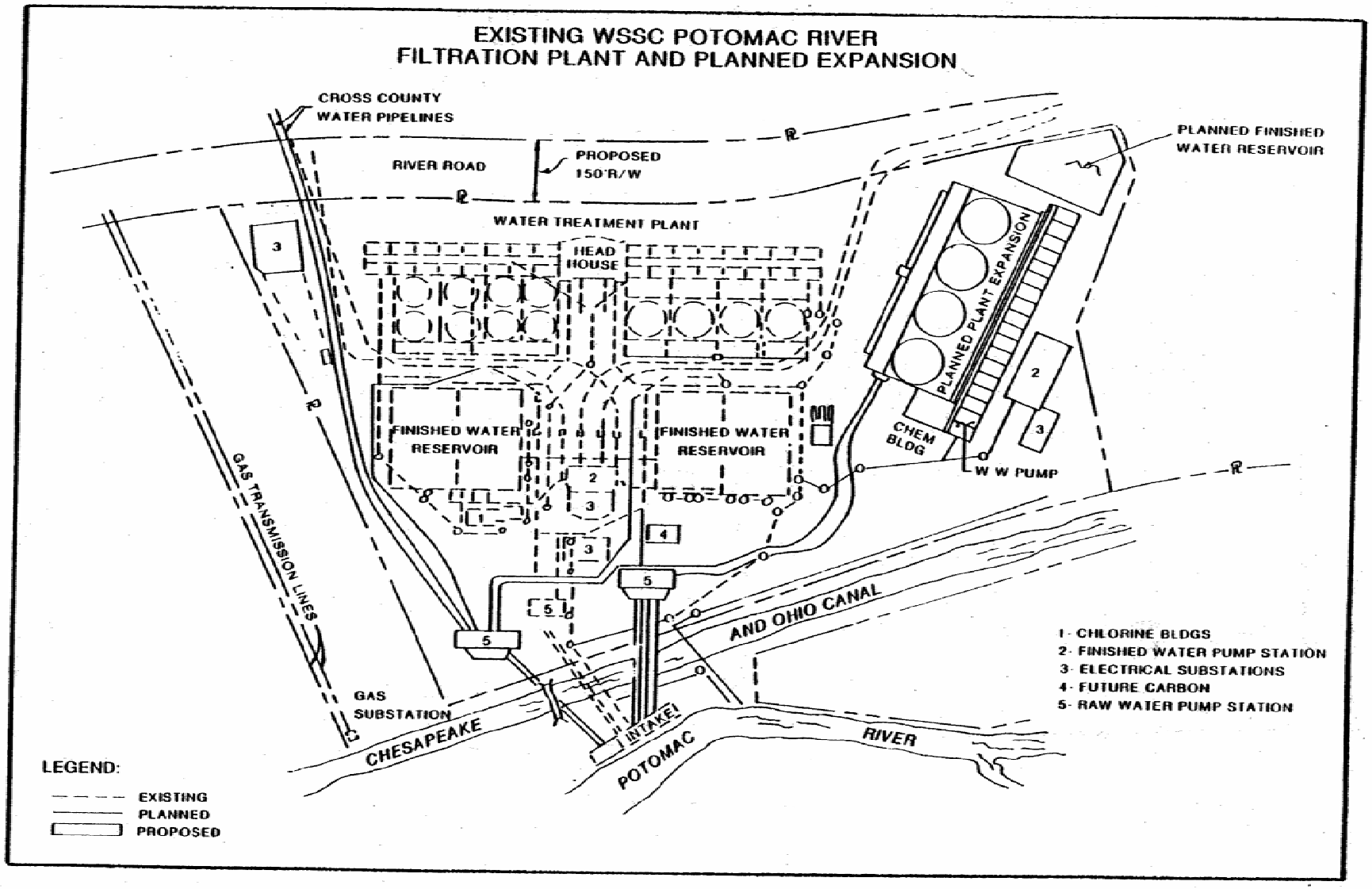
Figure 12

WSSC POTOMAC RIVER FILTRATION PLANT



Source: U.S., Department of the Army, Corps of Engineers, Draft Progress Report, Metropolitan Washington Area Water Supply Stud for the Potomac Water Users, Baltimore Division: Corps of Engineers, January, 1979 , p. 92.

Figure 13



Source: U.S., Department of the Army, Corps of Engineers, Draft Progress Report, Metropolitan Washington Area Water Supply Study for the Potomac Water Users, Supply and Demand Specialty Appendix, (Baltimore: Division: Corps of Engineers, January, 1979), p. 94.

The FCWA's treatment facilities are located near the dams and were constructed over the period 1950-1973. Raw water is conveyed to the plants through a 100 mgd intake located at the base of the dam. Conventional treatment and fluoridation of the raw water then takes place at the treatment plants.

FCWA has a rather extensive water distribution network which has over 43 distribution system reservoirs at various locations. Using these facilities, FCWA is able to store 19 million gallons of finished water.

The present system will soon be significantly enhanced with the completion of a 200 mgd Potomac River Treatment Plant. The initial capacity, expected very soon, will begin with 50 Md and increase on an as needed basis until the 200 mad maximum is reached after the year 2000. This new treatment plant is located in northwestern Fairfax County.

CHAPTER V

WATER SUPPLY MANAGEMENT IN THE DISTRICT OF COLUMBIA

> Water supply management in the District of Columbia is so close to the Federal Government that we're almost a stepchild.

Introduction

This chapter will describe how water supply management is handled in the District of Columbia. This system, like that for the surrounding suburbs, is a complex web of interrelated organizations, institutions, laws, procedures and regulations. As a result, explanation of this highly complex system will necessitate some simplification to provide the reader with an understandable overview. Thus, many minor issues and problems will of necessity be left out for ease of understanding and clarity.

The chapter will begin with a discussion of the legal and institutional organization for water supply management in the District. The chapter will then discuss the major water supply facilities, how they operate and provide some indication of future direction. Finally, an organizational review will be presented of the major offices of the District government which are involved in water supply management.

Legal and Institutional Organization

When Maryland ceded land for the District of Columbia in 1788, it also ceded title to the bed of any navigable waters within the boundaries.[2]

[1]This quote is from an interview with a District water supply official. For obvious reasons, this official wished not to be identified.

[2] The Maryland cession can be found in Chapter 46 of the 1788 Laws of Maryland. The Virginia Act of December 3, 1789 authorized the cession of its portion of the District of Columbia. When Virginia ceded the land to the United States, her rights were not extended, and when this land was returned to her, she did not acquire any additional powers she hadn't already had.

This jurisdiction extends to the tidal portions of the river from the mean high tide mark on the Maryland side to the low-water mark on the Virginia side.

When examining the legal rights of the District with respect to water, one must begin "with the recognition that Congress has plenary power over the District of Columbia by virtue of Article 1, Section 8, clause 17 of the Constitution."[3] By virtue of Maryland ceding territory for the District, the Supreme Court has recognized that the Federal government was also granted extraordinary power:

> ...Within this area Congress has the plenary power to control navigation which had been vested in the United States before the cession and which it exercises generally over navigable waters within the several states. It also acquired by the cession proprietary powers over the lands lying under water, and under article 1, Sec. 8, clause 17 of the Constitution, granting exclusive legislative power over the District, the sovereign power to regulate and control their use for public purposes other than navigation.

In a 1947 decision, another federal court was even more direct; it concluded that:

> Title to the Potomac River and its tributaries, including the Eastern Branch, and the soil thereunder below the natural ordinary high water mark, is vested in the United States for the benefit of the people. This principle is so well established in law in the District of Columbia that, it is submitted, it may be considered of the dignity of a rule of property.

Even though the Federal government -- through the District Government -exercises control over the Potomac River within its boundaries, the Congress has never conferred any statutory powers to the District to provide for its own water supply. The only legal authority conferred on the District is the

[3]J. Salyer, "Issues Relating to the Rights of the District of Columbia in the Waters of the Potomac River," in G. Power, ed., Legal Rights in Potomac Waters (Rockville, Md.: ICPRB Publication No. 76-2, 1976), p. 202.

[4]U.S. ex rel Greathouse v. Dern, 289 U.S. 325 (1933).

[5]U.S. v. Green, 72 F. Supp. 713 (D.D.C. 1947).

authority to purchase water storage in reservoirs and to pay for the costs of reservoir construction. In addition, some limited powers regarding distribution, revenue and financing were made in the Self-Government and Governmental Reorganization Act of 1973 (Home Rule legislation).[6] Congress has dealt with the water needs of the District by establishment of to Washington Aqueduct Division (WAD) and delegation to the Chief of the Army Corps of Engineers of the planning and operational responsibilities relative to providing the District and some nearby suburban communities with their water supply. (A more detailed discussion of the powers and responsibilities of TQD will be provided later). Since the waters under the "control" of the Federal government and the District are basically tidal waters, they are of little use as a source of potable water. Thus, the free-flowing Potomac outside the District is the only source of water supplies. Since Maryland "controls" the river, any provision for water supplies from the Potomac nest be through agreements made between the State of Maryland and the Federal government. The Federal government, however, feels it has the upper hand in this relationship. As the D.C. Corporation Counsel has concluded:

> ...[S]hould Congress determine ... that use of the waters of the Potomac River needs to be controlled, the Congress, by virtue of the Commerce Clause of the Constitution and, through it, the Congressional power over navigable water may impound and apportion such waters to the several states and the District.[7]

As indicated in Chapter III, Maryland certainly doesn't view this problem in the same manner. Maryland feels the consent of its legislature is required prior to the withdrawal of any water from the Potomac River by the Federal government or anyone else. This position has some precedents since

[6]Public Law 93-198, 87 Stat. 774.

[7]0pinion of the Corporation Counsel, June 30, 1964, quoted in Salyer, 22. cit., Ind

Maryland's approval was required before the WAD could begin diversions from the Potomac River[8].

In summary, the power of the District of Columbia is "encapsulated" within the power of the Federal government with respect to water supply for the District. The District has no independent capacity to deal with its own water supply needs and must therefore rely on the steps taken by the Federal government to insure adequate water supply.[9]

Washington Aqueduct Division

Soon after creation of the District of Columbia, it was recognized that the Potomac River would ultimately provide a major portion of water supply needs. George Washington, for example, observed in 1798 that "the water of the Potomac may, and will be brought from above the Great Falls into the Federal City, which would, in future, afford an ample supply of this object."[10] Yet during the early part of the 1800's, water was primarily supplied to residents through wells. The first pipeline for water supply built with public funds was constructed in 1809.[11] This project, like many that followed over the next 40 years, did nothing more than provide for more reliable supplies on a neighborhood basis. There was some reluctance to abandon the wells since they provided cooler, clearer water than unfiltered Potomac water; they also were thought to have medicinal properties.[12]

[8]See footnote 3, Chapter III.

[9]Salyer, M. cit., p. 206.

10Quoted in U.S. Department of the Army, Corps of Engineers, Washington Aqueduct Division, Washington Aqueduct: The Supply Division of the District of Columbia Water System (Washington, D.C., April 1970), p. 1.

[11]District of Columbia, Department of Environmental Services, Water Resources Administration, By Broad Potomac's Shores: The Water and Sewerage Systems of the District of Columbia (Washington, D.C., February 1979), P. 3.

[12]1bid.

Nevertheless, in 1850, the Congress and the District government appropriated funds for an examination of "the most available mode of supplying water" to the city.[13] This action was prompted by a fire in the Capitol which destroyed much of the Jefferson library.[14] Thus, there was concern about the city's ability to meet future water supply needs and concern for safety of government property.

The study was undertaken by the Secretary of War, through what later became the Corps of Engineers. Lt. Montgomery C. Meigs is credited with the planning and construction of the structures and facilities which became known as the Washington Aqueduct. His recommended plan, which Congress accepted and immediately funded, included a dam and intake above Great Falls, a 90 foot diameter conduit from Great Falls to Dalecarlia, storage and settling reservoirs at Dalecarlia and above Georgetown, and various tunnels, bridges and water mains.[15]

The first water was delivered through the system in 1859, although construction on the project was delayed during the Civil War. In 1882, the Congress authorized a number of improvements in the system; these included: raising the dam at Great Falls; the extension of the aqueduct by tunnel from Georgetown Reservoir to McMillan Park; and the construction of the new McMillan Reservoir. Water quality problems around the turn of the century forced WAD to construct a slow-sand filtration plant at McMillan and the Bryant Street pumping station was built. In the 1920's, the Dalecarlia filtration plant was built, along with a 9--mile raw water conduit, a pumping transmission main and reservoirs. These improvements were also accompanied by extensions in the distribution system throughout the city.

[13]1bid.

[14]Corps of Engineers Washington Aqueduct, p. 2.

[15]District of Columbia By Potomac Shores, p. 5.

The final set of improvements to the system are now underway. In 1946, the Corps prepared a comprehensive report describing a plan and program for the construction of improvements and additions to the water system of the District and metropolitan area. The plan provided for the facilities required to produce and distribute water to meet needs anticipated at that time.[16] According to the Chief, Washington Aqueduct Division, this plan has provided for the orderly growth of the water supply system and will insure adequate supplies to meet future needs.[17] The major projects now underway on the system are the construction of the Cross-Mown Main and the expansion and improvement of the McMillan facilities.

Throughout this period of development, the Washington Aqueduct Division of the Corps of Engineers has been responsible for water supplies in the District of Columbia. The WAD has responsibility over Washington Aqueduct and the Chief of Engineers has full control over the system and regulates how the District shall utilize this water. The Chief may prohibit certain practices when the supply is inadequate to meet the needs of the Federal government.[18] However, the District code provides that the operation of the water department of the District, under the Chief of Engineers, is subject to the control of the Mayor.[19]

In summary, the GW is responsible for the collection of raw water from the Potomac River, its purification and conveyance to the District, as well as Arlington County and Falls Church. The District government is responsible

[16]U.S. Congress, House Document 480, 79th Cong., 2nd Sess., 1946.

[17]1nterview with Mr. Harry Ways, Chief, Washington Aqueduct Division, Corps of Engineers, Washington, D.C., July 6, 1981.

[18]See 40 U.S.C. 45 and 40 U.S.C. 51; also the Act of June 25, 1860 (12 Stat. 106) and the Act of March 2, 1967 (14 Stat. 466).

[19] See 43 D.C. Code 1502.

for distribution of the purified water to consumers and responsible for maintaining the distribution facilities and collecting revenues (see Figures 14 and 15).

Treatment and Distribution Facilities

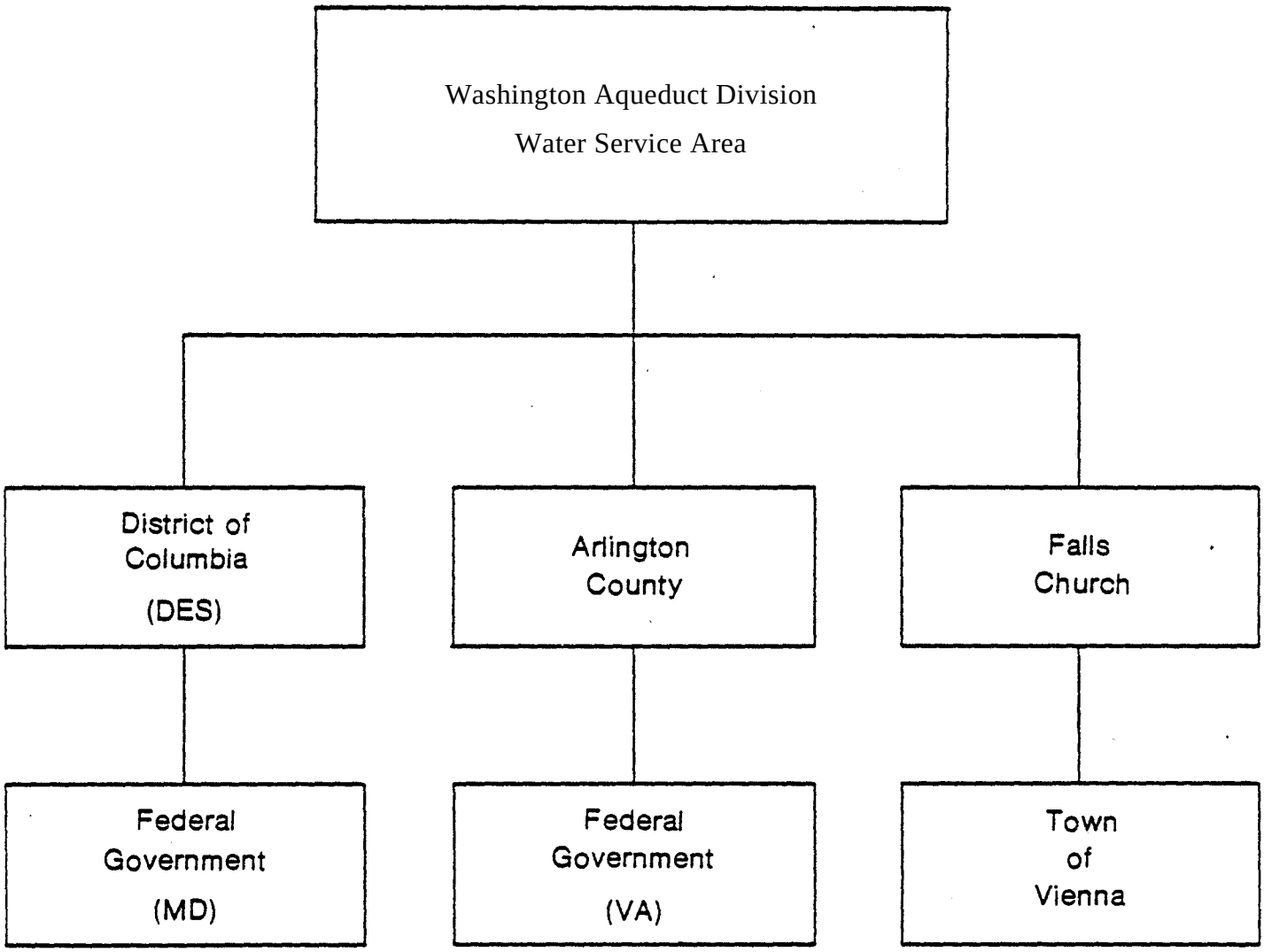
As indicated earlier, the sole source of water for the District and WAD is the Potomac River. The WAD withdraws water from the Potomac through intake structures located at Great Falls and Little Falls, Maryland (Figure 16). The water taken from Great Falls is conveyed to the Dalecarlia Reservoir - a distance of nine miles --- through a gravity flow conduit with a capacity of 200 mgd and a booster pumping system. These systems provide the bulk of the water used by WAD since this type of conveyance system is cheaper to run than withdrawing the water at Little Falls. At Little Falls water is conveyed to the Dalecarlia Reservoir through the Little Falls pumping station which has a capacity of 350 mgd through a ore-mile tunnel. This facility is not used as often as the Great Falls intake because water must be lifted 100 feet from Little Falls to Dalecarlia.

Water is then treated at two plants:' Dalecarlia and McMillan. The Dalecarlia facility, which is the larger of the two, was completed in 1928, although it has been modernized since then. It is a rapid sand filtration plant and uses conventional water treatment methods and fluoridation. The plant has undergone significant changes since its construction and it now has the capacity to treat 246 mgd. Finished water from the plant is pumped to four service area within the District of Columbia, and also to Arlington County and Falls Church.

The McMillan treatment plant, which was built in 1905, provides the balance of WAD's deliverable capacity. This plant receives its water via gravity from Dalecarlia Reservoir through the Georgetown Reservoir, the City

Figure 14

AREAS INCLUDED IN THE WAD WATER SERVICE AREA



Source: U.S., Department of the Army, Corps of Engineers, Draft Progress Report, Metropolitan Area Water Supply Stud for the Potomac Water Users, Conservation and Demand Specialty Appendix, Baltimore Division: Corps of Engineers, January, 1979), p. 15.

Figure 15

Total Water Distributed by the Washington Aqueduct Division
Water Service Area, 1976-1977

	District of Columbia		Arlington County		Falls Church		Total
Month	(mgd)	(96)	(mgd)	(%)	(mgd)	(q5)	(mgd)
Jan-76	148.8	79.6	20.6	11.0	17.6	9.4	187.0
Feb	144.8	79.9	19.6	10.8	16.9	9.3	181.3
March	146.8	80.7	19.5	10.7	15.7	8.6	182.0
April	154.3	79.7		103		9.5	194.1
May	156.1	79.8	21.0	10.7	18.6	9.5	195.7
June	178.6	79.7	24.5	10.9	21.0	9.4	224.1
July	181.2	80.9		10.8	11.7	8.3	4. 0
August	178.7	8 i.4	23.6	10.6	20.1	9.0	222.4
Sept	168.4	80.0	22.8	10.8	19.3	9.2	210.5
Oct	153.6	79.7	21.3	11.1	17.7	9.2	192.6
Nov	144.8	78.3	22.1	12.0	18.0	9.7	184.9
Dec	142.9	77.2	24.1	13.0	18.2	9.8	185.2
Avg 1976*	158.3	79.7	22.0	11.1	18.3	9.2	198.7
Jan-77	151.3	79.4	22.6	11.8	16.7	8.8	191.1
Feb	139.3	79.7	19.7	11.3	15.7	90	174.7
March	132.2	30.0	17.8	10.7	15.3	9.3	165.3
April	1 4.1	78.8	1$7,	10.9	1	10.3	170.
May	149.0	78.8	20.0	10.6	20.1	10.6	189.1
June	171.1	80.8	20.5	9.7	20.2	9.5	211.8
July	187.0	81.6	21.4	9.3	20.7	9.1	229.1
August	184.4	81.5	20.2	8.9	21.8	9.6	46. 4
Sept	178.3	79.3	22.0	9.8	23.2	10.4	223.5
Oct	160.3	78.0	24.1	11.8		10.2	205.4
Nov	151.0	80.7	18.2	9.7	18.0	9.6	187.2
Dec	152.3	81.3	18.1	9.6	17.0	9.0	187.4
Avg 1977*	157.6	80.1	20.3	10.3	18.9	9.6	196.8

NOTE: Underlined numbers represent maximum and minimum for (mgd) and (%).

*Based on total annual volume supplied divided by 366 days for 1976 and 365 days for 1977.

Source: U.S., Department of the Army, Corps of Engineers, Draft Progress Report, Metropolitan Washington Area Water Supply Stud for the Potomac Water Users, Conservation and Demand Specialty Appendix, Baltimore Division: Corps of Engineers, January, 1979), p. 16.

Tunnel and the East Shaft water pump to McMillan Reservoir. The maximum capacity of the plant at this time is 125 mgd, although it is undergoing several modifications to increase its capacity. From this plant, water can be pumped to any area of the District (Figure 17).

The District has three open raw water reservoirs to handle water supplies; these facilities have a combined capacity of 200 mgd. The reservoirs are: Dalecarlia (50 mgd), Georgetown (50 mgd), and McMillan (100 mgd).[20]

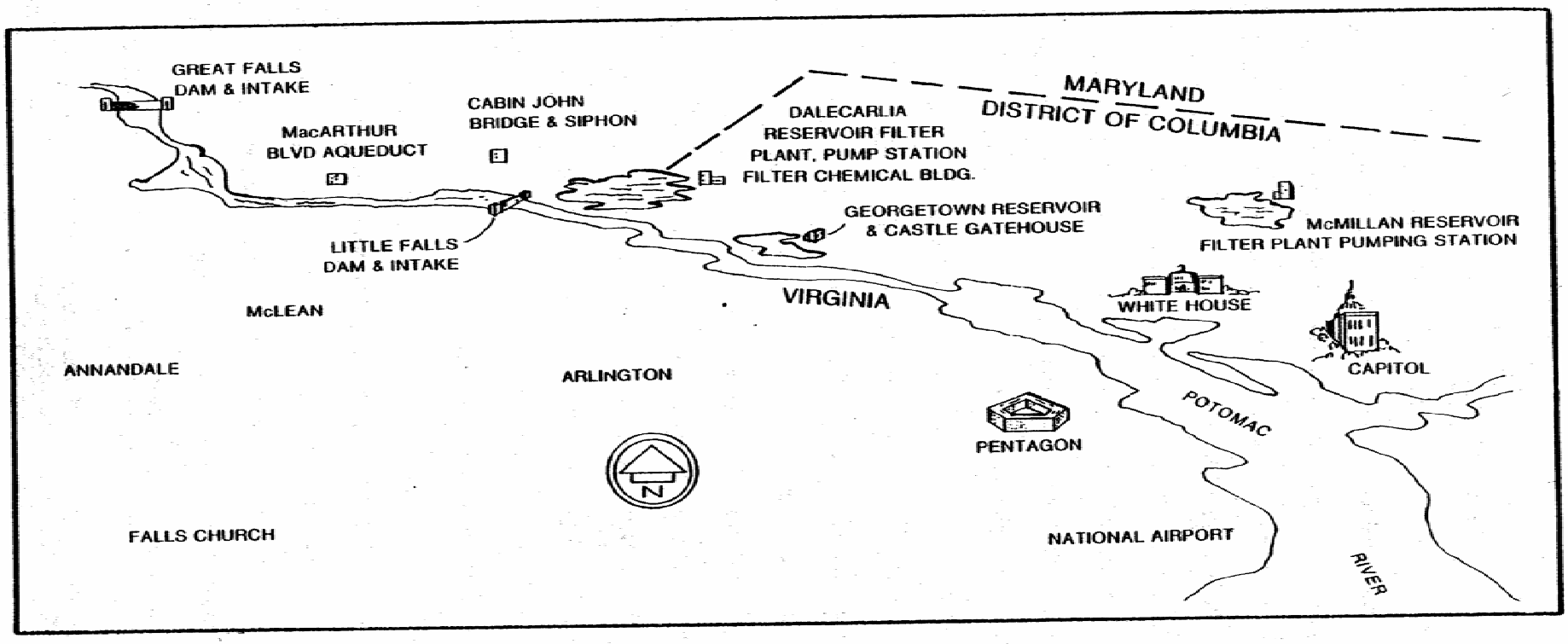
The distribution of finished water supplies is the responsibility of the District's Department of Environmental Services. The DES employs pumping stations, reservoirs, tanks, trunk mains and service mains to distribute the finished water. In addition, DES is responsible for metering and billing for water sold to consumers, including Federal agencies.

Ground elevations in the District of Columbia vary from about seven feet to 420 feet above sea level. To provide the necessary water pressure, the city has been divided into seven "service areas," each of which is defined by a specific range of ground elevation (Figure 18). The Low Service area, which includes most of the central business district, is normally supplied by gravity from both the McMillan and Dalecarlia treatment plants. The First High, Second High and Third High areas consist of the areas west of the Anacostia River -- an area of increasing elevation. These areas are serviced *by* the Dalecarlia and Bryant Street Pumping Stations. The Fourth High area, which covers the highest elevations in the Northwest, is served by pumping from the Third High area into tanks at Fort *Reno.* The First and Second High areas in Anacostia are served by the Anacostia Pumping Station (Figure 19).

The distribution system consists of about 1400 miles of water mains ranging from as small as two inches to 78 inches in diameter. In addition20A more detailed discussion of the storage and treatment facilities along with some detailed discussion of how they work can be found in Appendix F.

Figure 16

Washington Aqueduct Division Major Facilities



Source: U.S., Department of the Army, Corps of Engineers, Draft Progress Report, Metropolitan Washington Area Water Supply Study for the Potomac Water Users, Supply and Demand Specialty Appendix, (Baltimore District: Corps of Engineers, January, 1979), p. 87.

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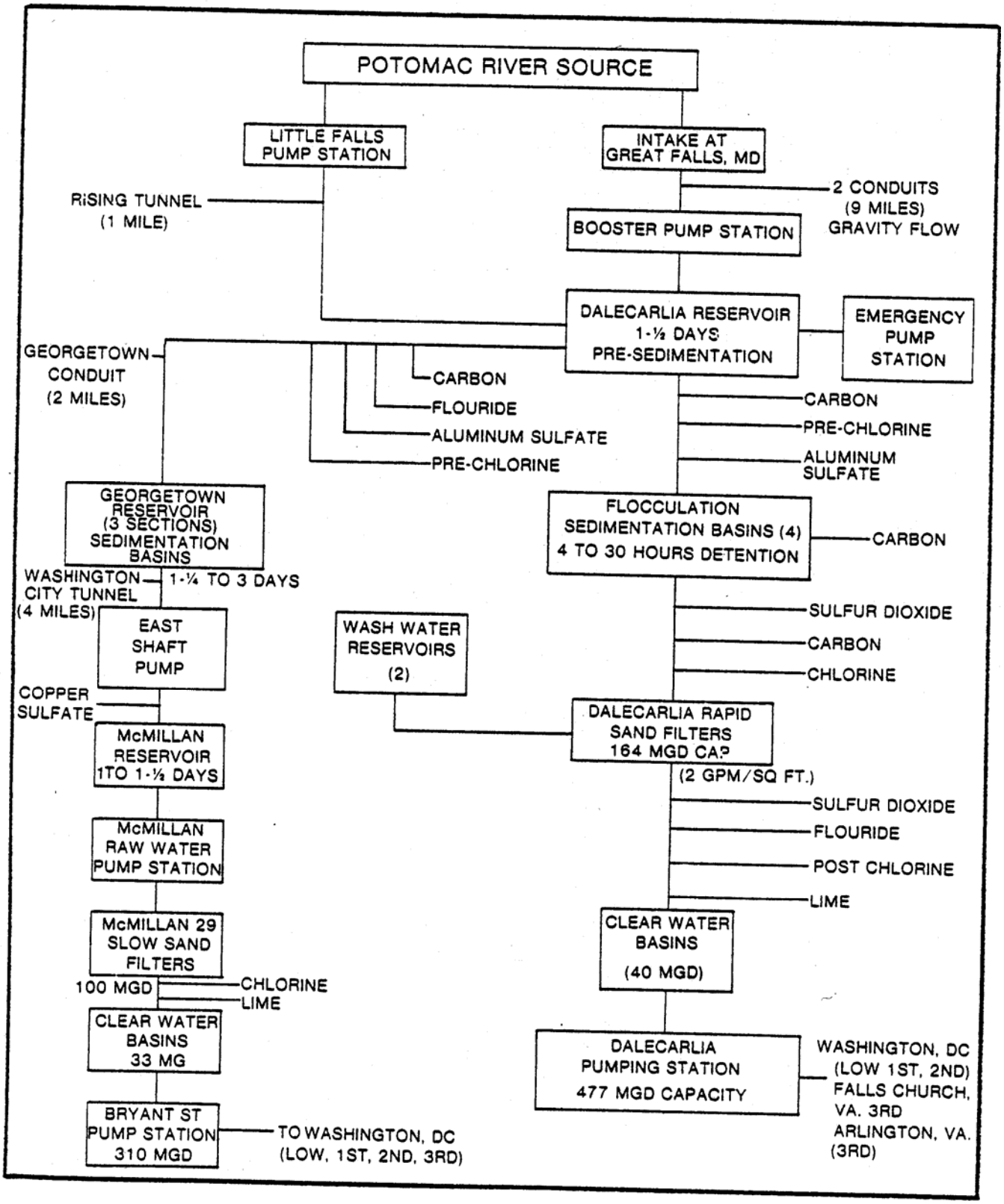
[20] A more detailed discussion of the storage and treatment facilities along with some detailed discussion of how they work can be found in Appendix F.

Figure 17

Washington Aqueduct Divison Treament and Distribution System



Source: U.S., Department of the Army, Corps of Engineers, Draft Progress Report, Metropolitan Washington Area Water Supply Study for the Potomac Water Users, Supply and Demand Specialty Appendix, (Baltimore Division: Corps of Engineers, January, 1979), p. 89.

Figure 19.

WATER DISTRIBUTION SERVICE AREAS, DISTRICT OF COLUMBIA
FISCAL YEAR 1978

SERVICE AREA		AVERAGE DELIVERY
District:		
Low Service		41,417,000
First High		41,586,000
Second High		23,406,000
Third High		25,262,000
Fourth High		4,033,000
Anacostia:		
First High		15,677,000
Second High		9,240,000
	TOTAL	160,621,000

Source: District of Columbia, Department of Environmental Services, Water Resources Administration, By Broad Potomac's Shore: The Water and Sewerage Systems of the District of Columbia (Washington, D.C.: February 1979), p. 11.

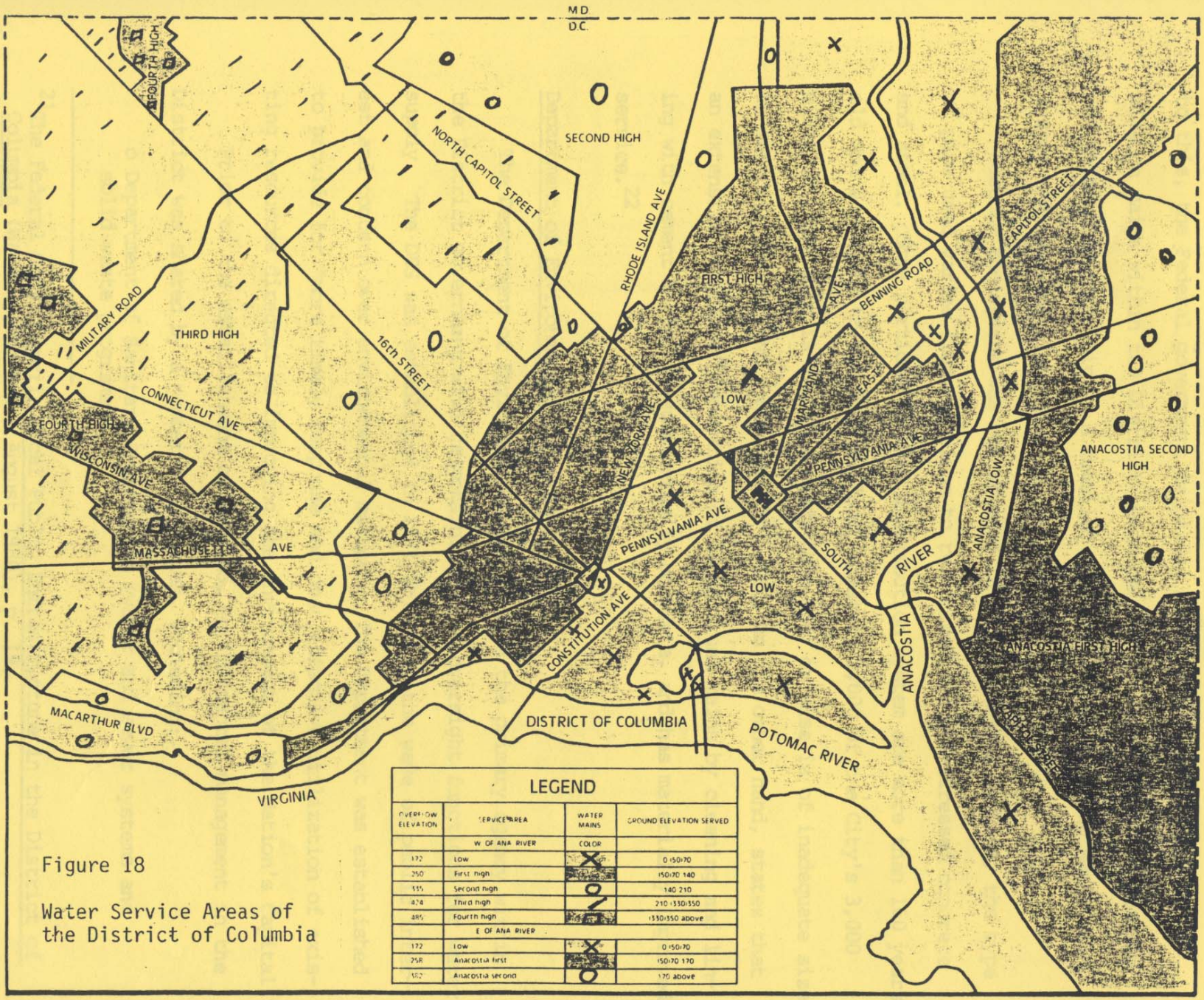


Figure 18

Water Service Areas of the District of Columbia

Source: District of Columbia, Department of Environmental Services, Water Resources Administration, By Broad Potomac's Shore: The Water and Sewerage System of the District of Columbia, February, 1979, p. 13.

to this, the Federal government maintains and operates 12 miles of transmission mains within the District which deliver water to the First, Second and Third High reservoirs. A detailed schematic drawing of the water main system and relevant elevations is presented in Figure 20. Because the system was constructed in an incremental fashion, the type of pipe used varies from cast iron to reinforced and pre-stressed concrete and steel. Some portions of this distribution system are more than 160 years old and according to one source, "approximately 1,000 of the City's 3,000 miles of water pipe is either already that old, or else is of inadequate size or material for current conditions."[21] DES, on the other hand, states that an extensive program of renovation of older trunk mains by cleaning and lining with cement mortar is substantially complete, and has materially improved service.[22]

Department of Environmental Services

The Department of Environmental Services is the primary agency within the District government with responsibility and oversight functions for water supply. The DES was established in 1971 following the wave of public interest and concern over environmental matters. The Department was established to provide for "mare timely response and cost effective utilization of existing resources directed to improving the environment of the Nation's Capital."[23]

Prior to the establishment of the DES, environmental management in the District was shared by a number of agencies, including:

- Department of Sanitary Engineering (water and sewer systems and solid waste programs)

[21]The Federal City Council, Local Public Infrastructure in the District of Columbia (Washington, D.C., August 1980), p. 19.

[22]District of Columbia, By Potomac's Shores, p. 16.

[23]District of Columbia, Department of Environmental Services, An Annual Report for the Ten Year Anniversary, 1971-1981 (Washington, D.C., 1981), p. 1.

o Department of Human Resources (environmental health programs, air and water quality programs, industrial hygiene and noise abatement)

o Department of Transportation (beautification program)

o Department of Licenses, Inspections and Investigations (issuance of licenses and permits and enforcement actions)

Figure 21 presents an organization chart for the DES. As can be seen, DES has four programmatic operating agencies: Office of Environmental Standards and Quality Assurance, Solid Waste Management Administration, Office of Facility Planning and Engineering and Construction, and the Water Resources Management Administration. There are two primary staff offices which assist the Director of DES; they are: Office of Fleet Management and Office Budget and Finance and Materiel Management. The functions of these organizations are outlined below:

o Office Budget and Finance and Material Management is responsible for providing an appropriate level of financial resources, insofar as possible, to support the responsibilities of the Department and to insure that such funds are expended in a fiscally responsible manner.

o Office of Fleet Management insures that mobile equipment essential to support the functional responsibilities of the Department is available when needed and that it is operated, maintained and repaired in an efficient and cost effective manner.

o Office of Environmental Standards and Quality Assurance Services represents a major part of the District's efforts to promote health, comfort, convenience and esthetics for residents and visitors through programs in consumer health, occupational and institutional hygiene, community hygiene, and air and water quality control.

o Solid Waste Management Administration collects all residential refuse from residential buildings having three dwelling units or less, disposes of all refuse generated in the District and maintains the public areas.

o Office of Facilities Planning, Engineering and Construction is responsible for all matters relating to environmental engineering systems and facility planning, design and construction.

o Water Resources Management Administration is responsible for the operation and maintenance of systems and facilities for the distribution of water

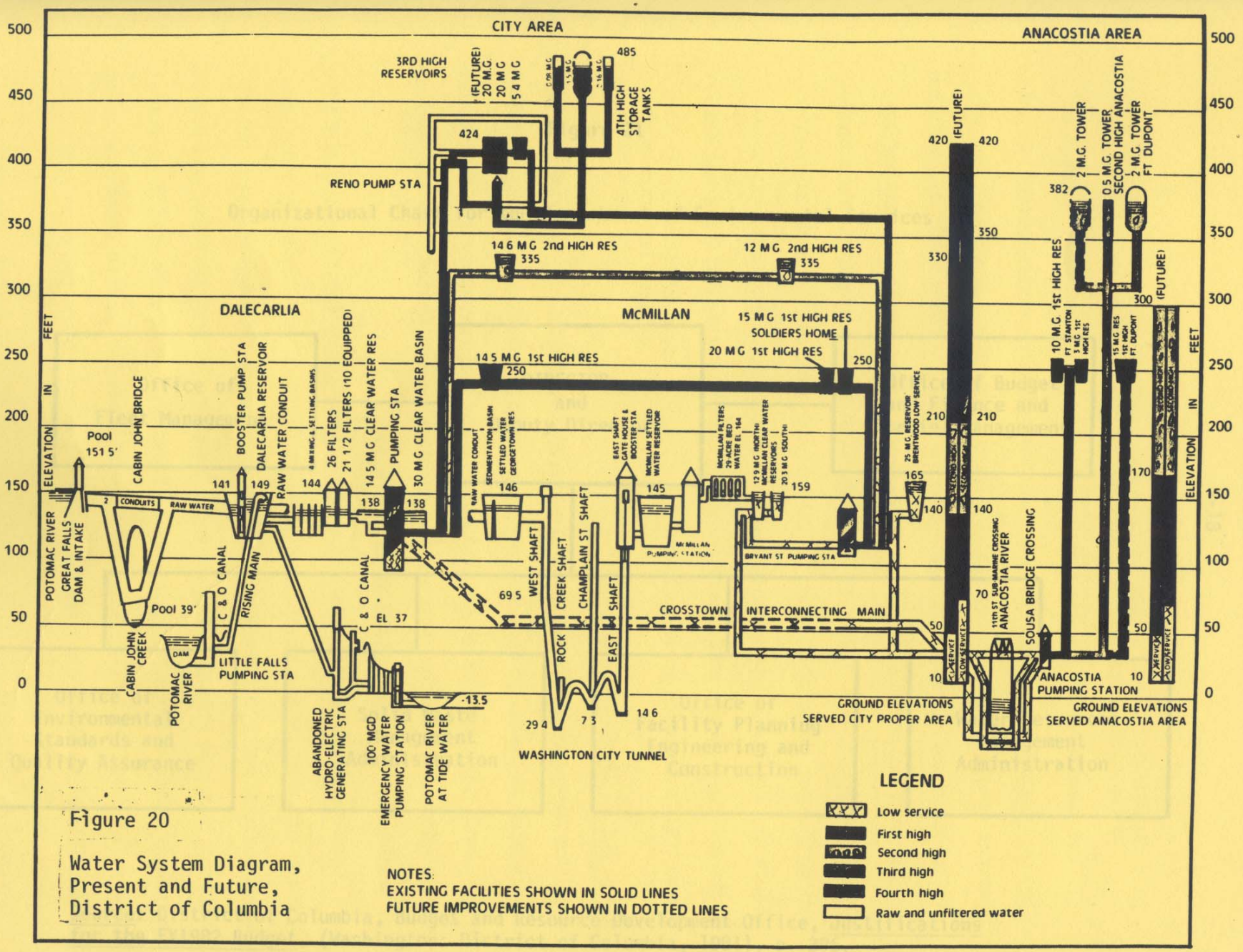


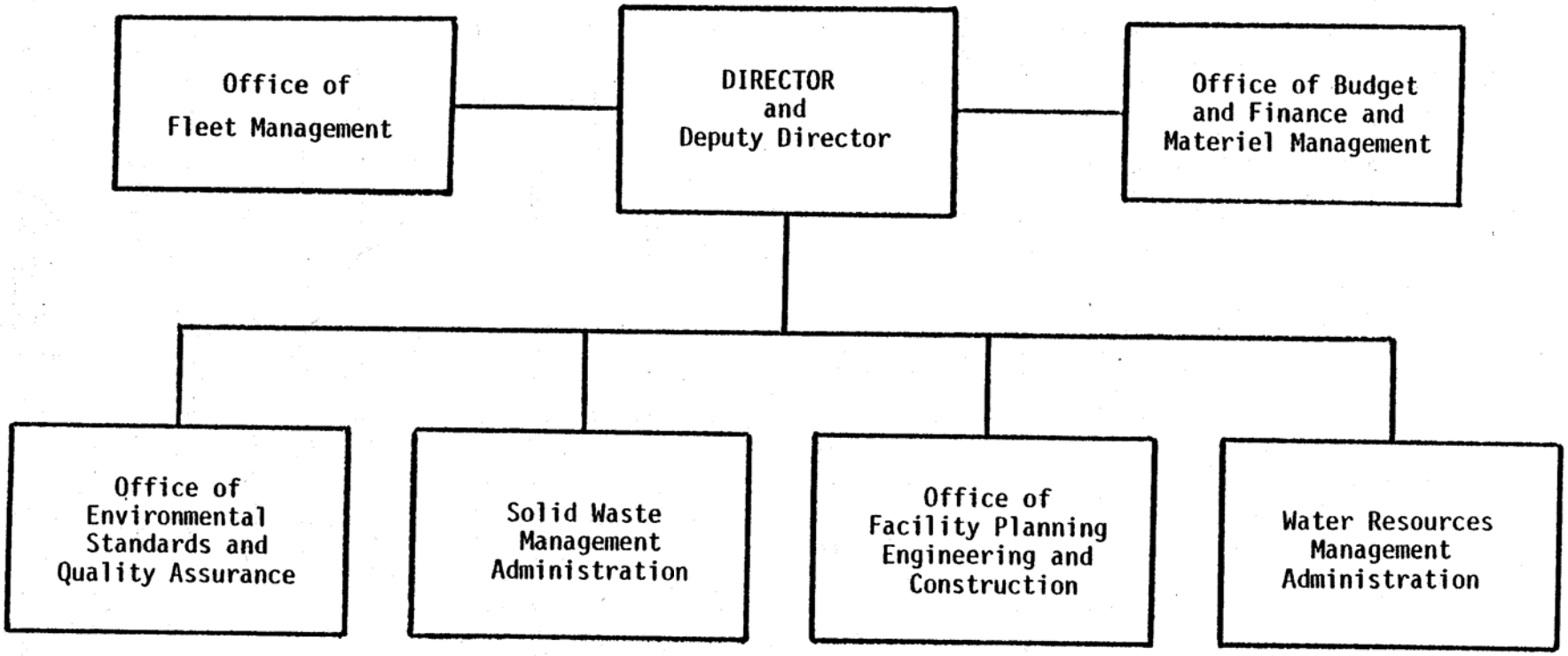
Figure 20

Water System Diagram, Present and Future, District of Columbia

Source: District of Columbia, Department of Environmental Services, Water Resources Administration, By Broad Potomac's Shore: The Water and Sewerage System of the District of Columbia, February, 1979, p. 15.

Figure 21

Organizational Chart for the Department of Environmental Services



Source: District of Columbia, Budget and Resource Development Office, Justifications for the FY1982 Budget, (Washington: District of Columbia, 1981), p. 396.

the control and disposal 5 stormwater and collection, treatment and disposal of sewage.

The Department of Environmental Services has two separate sources to finance or fund its operations. Activities relating to the collection and disposal of all refuse, solid wastes, fleet operations, management and ad ministration are financed through "general funds." These funds are supplied by the Congress and the District government through appropriations raised from general taxation authority. Figure 22 shows the level of funds requested to finance these operations in fiscal year (FY) 1982. As shown in Figure 22, the Solid Waste Management Administration, environmental standards and most of the administration and finance responsibilities and programs are funded with general funds.

Water and Sewer Enterprise Fund

The other source of funds to finance operations in the Department that are related to sewer or water supply operations is the Water and Sewer Enterprise Fund. The Enterprise Fund is used to pay for operation and maintenance of the water distribution system, the sanitary sewage system, and the regional wastewater treatment plant at Blue Plains.

Operating and capital costs associated with these functions and the production of water by the Washington Aqueduct Division are funded by water and sewer charges and are accounted for in the Enterprise Fund. District policy requires that the Enterprise Fund be self-supporting for operating and capital purposes. User charges based on sewage flows and water consumption to customers, including D.C. residents and Federal agencies, are to cover the costs of providing the services. As the operating costs change based on inflation

Figure 22.

DEPARTMENT OF ENVIR0NMENTAL SERVICES FUNDING AND PERSONNEL, FY 1982 (in thousands of dollars)

Office	General Funds	Enterprise Funds	Total Funds	Personnel
Director's Office	$ 2,954	$ 4,393	$ 7,347	299
Office of Budget, Finance and Materiel Management	$ 537	--	537	50
Office of Fleet Management	1,692	--	1,692	136
Office of Environmental Standards and Quality Assurance	2,384	--	2,384	100
Solid Waste Administration	24,730	--	24,730	749
Office of Facility Planning, Engineering and Construction	--	1,575	1,575	42
Water Resources Administration	--	60,861	60,861	890
Totals	$32,297	$66,829	$99,126	2266

Source: District of Columbia, Justifications for the FY 1982 Budget (Washington, D.C., February 1981), pp. 396-506.

and budget policy, the rates charged for water and sewer services must be adjusted. The last such adjustment was proposed in the FY 1981 to take effect October 1, 1980.[25]

Until this adjustment, the District has over recent years pursued a policy of subsidizing the water and sewer enterprise. This policy has placed an additional burden on the general funds and has led to lower service levels for citizens as the subsidies from the general fund proved inadequate to provide for necessary capital expenditures and maintenance.[26] The FY 1982 budget attempted to improve this situation by providing for an additional 70 positions and adequate non-personnel resources to accelerate maintenance and sufficient increases in user charges to all customers to cover these increased operating costs.

Figure 23 shows the anticipated revenue and expenses from the Enterprise Fund in FY 1982. This request included another new development. In 1982, the District requested Congressional approval of another line item in the Enterprise Fund to provide for repayment of loans and interest; the Congress agreed to this recommendation.

The Home Rule Act terminated, as of January 2, 1975, the District's permanent authority to borrow from the U.S. Treasury to finance the capital improvements program.[27] That Act authorized the District to issue tax-exempt general obligation bonds to finance capital projects and provide interim loan authority by which the District could borrow from the Treasury to finance projects for which funding had been authorized or appropriated before January 2, 1975. Because of unanticipated delays in the development of the bond

[25]Ibid., p. 445.

[26]District of Columbia, Summary of FY 1982 District of Columbia Government Budget (Washington, D.C., February 1, 1981), p. 154.

[27]Public Law 93-198.

Figure 23

Water and Sewer Enterprise Fund
FY 1982 Operating Revenues and Expenditures
($ in thousands)

	Appropriation	Grants and Other Revenues	Total
Revenues:			
Current Authority			
Charges for services-Department of Environmental Services	$82,372	745	83,117
Charges for services-Washington Aqueduct	3,200	...	3,200
Federal Grants		138	138
Total revenues, current authority	85,572	883	86,455
New Authority	17,960	...	17,960
Total revenues	103,532	883	104,415
Expenditures:			
Operating expenditures			
Department of Environmental Services	66,830	883	67,713
Washington Aqueduct	12,581	-	12,581
Total operating expenditures	79,411	883	80.294
Repayment of loans and interest			
Current debt service	21,268	...	21.268
Deferred debt service	2,853	...	2,8-3
Total repayment of loans and interest	24,121	.....	24,121
Total expenditures	103,532	883	104.415
Excess of revenues over (under) expenditures	$	$	$

Source: District of Columbia, FY 1982 Budget of the District of Columbia Government, (Washington: District of Columbia, 1981), p. 159.

issuance program, the District proposed amendments to the Home Rule Act to extend the interim borrowing authority. The second extension authorized borrowing through October 1, 1980 or enactment of the Fiscal Year 1981 budget, whichever was later.[28]

This change in policy to seek the use of Enterprise Funds to pay for past borrowing was reflected in the funds appropriated by the Congress in 1982. As shown in Figure 24, $24.5 million, or nearly one-quarter of the funds appropriated, were required to pay for past loans.

Figure 24 also points out the importance of the Enterprise Fund as a source of *financing* for DES and WAD operations and capital improvements. Just over $106 million was made available in 1982 for these purposes. How ever, it is important to point out that the Enterprise Fund does not automatically guarantee that all the funds collected will be made available for the purposes shown in Figure 24. The District government can only spend the receipts which accrue to the Enterprise Fund after the Congress has authorized these expenditures each year in an appropriations bill. Thus, while some would view the Fund as a valuable funding mechanism -- which it is -there are controls on its use through the Congress.

Water Resources Management Administration

The major organization in the District government with responsibility for water supply and distribution is the Water Resources Management Administration.[29] WRA has a broad responsibility which includes operation and maintenance of:

[28] D.C. Justifications for FY 1982, p. 435.

[29] The name commonly used for the Administration is the "Water Resources Administration." In formal documents, however, the word "Management" is added.

Figure 24.

EXPENDITURES AUTHORIZED FROM THE WATER AND SEWER ENTERPRISE FUND, FY 1982

Activity	1981	1982	Change 1981 to 1982
Department of Environmental Services	$55,860,400	$69,074,900	+$13,214,500
Washington Aqueduct Division	11,392,300	12,581,300	+1,189,000
Debt Service	14,937,500	24,552,000	+9,614,500
Capital Outlay	--	(29,102,600)*	(+29,102,600)*
Total	$82,190,200	$106,208,200	$24,018,000

*'These funds are reflected as "non-add" items because the projects reflect capital improvements which are undertaken by DES but cannot be legitimately charged against either water or sewer accounts.

Source: U.S. Congress, House of Representatives, Committee on Appropriations, Subcommittee on the District of Columbia, District of Columbia Appropriations Bill, 1982, House Report 97-235, 97th Gong., 1st Sess., p. 67.

(1) the District's water distribution system consisting of 1,400 miles of watermains, 130,000 water service connections, 30,000 water meters, 10,000 fire hydrants, 27,500 valves, 8 water reservoirs and elevated storage tanks; (2) the District's sanitary, storm water and combined sewer system consisting of 1,800 miles of sewers, 28,000 catch basins and 100,000 manholes; (3) the Potomac Interceptor Sewer consisting of 45 miles of sewer located in Maryland and Virginia;

(4) the D.C. Regional Wastewater Treatment plant which can treat up to 309 million gallons of sanitary sewage from D.C., Maryland and Virginia, and 289 million gallons per day of combined sewage from the District; and

(5) 26 water and sewage dumping stations and 25 support buildings.

The responsibilities of the WRA are split rather evenly between two activities: operation of the water supply distribution facilities and the operation of the Blue Plains treatment plant. The latter activity has received considerable press coverage and has been one on which the Congress and other jurisdictions have focused a great deal of attention. This was specially the case when a sewer hook-up moratorium was imposed because the capacity of the facility had been reached. This, in turn, has an impact on the attention that is devoted to water supply activities. In many respects, they do not "grab the headlines" and therefore are given lower priority both in the operation of the agency and in the increasing competition for budget funds.

CHAPTER VI

THE DISTRICT OF COLUMBIA WATER MANAGEMENT SYSTEM IN THE REGIONAL CONTEXT

> The political fragmentation in the metropolitan area makes overall cooperation very difficult, if not impossible. The self-interest of each jurisdiction becomes overly important and symbolism begins to play a major part in our perceptions of how we can resolve problems.... Yet of all the jurisdictions, the District may be in the best position to urge cooperation because it has the most to gain.

Introduction

This chapter will conclude the study with a discussion of the present and future problems the District water management system will likely have to confront over the next 10 years. For the most part, these are problems the District must deal with in a regional context. As the major water supply "consumer" in the region, the District is vitally affected by how regional water supply issues will be resolved. This chapter explores the problems that are present and can be expected to occur and presents an analysis of what the role of the District will be in these issues.

This chapter is not intended to criticize existing or even anticipated management practices in the District or the metropolitan area. Rather, the intent is to identify issues which are present or expected to arise and indicate what the District has at stake and how it can play an active role in their resolution. This analysis will be helpful in improving regional understanding of water supply problems and solutions.

Finally, throughout this chapter, suggested research topics will be highlighted to aid future research work.

Problem Identification

During the course of research for the study, an informal survey was taken of water resources experts in the Washington metropolitan area. The purpose of this survey was to discern the major problems in the water resources field they saw at the present time, and those anticipated over the next decade. This information has been combined with a public opinion survey completed by the Interstate Commission on the Potomac River Basin and the Metropolitan Washington Council of Governments under contract to the Corps of Engineers. This survey was part of a two-part public participation effort undertaken in connection with the Metropolitan Area Water Supply Study to achieve two purposes:

(1) the development, dissemination and collection of a water supply opinion survey and background paper, and (2) the conduct of 17 public workshops in various areas of the Potomac River Basin.[2]

The results of the ICPRB and COG surveys, and that undertaken for this study, have been utilized to develop the following taxonomy of issues which currently face, or are anticipated to face, water supply managers in the Washington metropolitan area. A discussion of these issues, and their relationship to the District water management system, will for the basis for the remainder of this chapter.

Adequacy of Future Supplies

A decade ago, Washington metropolitan area governments dependent on the Potomac River were faced with anticipated supply shortages and a conflict ridden water supply future. Citizens and water supply planners were alarmed by several recent events and trends:

[1]This quote, like that at the beginning of Chapter V, is from a metropolitan area water official who wished to remain anonymous.

-- The Corps of Engineers had recommended the construction of 16 major dams and reservoirs to meet future needs, yet only one was under construction and the others were bitterly opposed.

-- The drought of the mid-1960's had dramatized the vulnerability of depending on the unrestricted flow of the Potomac as the major source. In September 1966 the drought decreased the flow to just five percent of the annual average.

-- Population and construction growth rates were at record highs and projected to continue.

-- Peak consumption levels were rising as greater affluence increased summer air conditioning and residential water use.

-- Any meaningful water supply planning actions required lengthy, multijurisdictional legislative agreements including action by the U.S. Congress.[3]

In contrast to the conditions of a decade ago, water suppliers and agency personnel now seem more confident about the future and their ability to meet anticipated needs. The Chief of the Washington Aqueduct Division stated in an interview, for example, that the outlook for supplies was "good."

The General Manager of WSSC also spoke confidently about the future, indicating that if the recently established Task Force can get its work completed, "we won't have to worry about water supply in this area forever."[5] Other water resource management officials spoke in equally confident terms.

[2] U.S. Department of the Army, Corps of Engineers, Baltimore Division, Metropolitan Washington Area Water Supply Study for the Potomac Water Users, Draft Progress Report, Public_ Involvement Appendix (Baltimore, Md., August 1979).

There is some reason to agree with this outlook toward the future. The last decade has seen a considerable amount of work by water supply officials to resolve outstanding problems. In addition, public attitudes have changed, and population growth rates have reduced.

(The latter, for example, resulted in a regional 1980 population that was 700,000 people less than projected in 1970.)[6] The hard work resulted in a Low Flow Allocation Agreement, a Water Supply Emergency Plan, strong efforts at conservation, completion of Bloomington Dam, and the institution of a cooperative water supply operations program. (These efforts will be discussed later in this chapter.)

Despite this record of progress, doubt remains. The previously mentioned public opinion survey found that 83 percent of respondents in the metropolitan area believe there will be a water shortage in the next few years. The figure for upstream users on this question was 70 percent and 77 percent for downstream users. The number who felt there was no chance for a shortage in the MA was only five percent.

On balance, water supplies for the District of Columbia, for both the short and long term, appear adequate. As pointed out in earlier chapters, the District does have an advantage over other local jurisdictions because of its close association with the Federal government. Should a day ever arrive when water supplies are threatened, the legal authority of the Federal government places the District in a unique situation. Yet the District, along with other local jurisdictions and the Federal government, has a stake in insuring that water impoundments and supply facilities will be available to meet future needs.

[3] D. Petzold and S. Sawyer, The Structure and Status of Water Supply Planning in Maryland (Baltimore, Md.: Maryland Department of State Planning, July 1981), p. 57.

[4] Interview with Mr. Harry Ways, Chief, Washington Aqueduct Division, July 6, 1981.

[6] Petzold and Sawyer, op. cit., p. 58.

[5] Interview with Mr. Robert S. McGarry, General Manager, Washington Suburban Sanitary Commission, September 21, 1981.

The District's role in this complex web of intergovernmental relations is a fascinating one. The District, in partnership with the Federal government, must deal with the other states, regional and local jurisdictions in a manner which promotes the proper environment for adequate supplies. Yet the District cannot act as a partner alone. It must deal with these other governments not as a co-equal but as a partner with the Federal government. Thus, in one sense, the District can play the role of disinterested bystander.

At the same time, it must assert its responsibilities as a local government to insure the welfare of its citizens.

At the present time, the District appears able to perform this complex juggling act. Through a netcx)rk of formal and informal relationships with the Corps of Engineers, Federal agencies, states, regional bodies and other local governments, the District appears able to meet all these responsibilities. Yet this balance could change over time. Therefore, future research may wish to investigate the following questions:

(1) What role has the District of Columbia as a "local government" played in influencing water resource development decisions of the Federal government?

(2) Could the District play a more important role in insuring the adequacy of future water supplies?

(3) Has the District lived up to its potential in its relations with other local, state, regional and Federal agencies and governments on insuring adequacy of future supplies?

Regional Cooperation

The preliminary Corps report on Washington area water supply needs has tentatively concluded that with proper management and by sharing existing supplies, the MWA can have adequate water supplies through 2030. As indicated,

this conclusion is preliminary and it is conditioned on the fact that supplies will be properly managed and shared by water supply entities in the region. Given the past history of cooperative efforts, there is an element of doubt about whether both these conditions can and will be met.

This uneasiness about the future was also borne out in interviews with water managers in the area who work at the technical, rather than policy levels. One, for example, stated succinctly: "We say we cooperate, but we don't." The only cooperation noted by these officials was at the operational level, and then only in cases of emergency.

This conclusion is not much different from that noted in the Corps' analysis of water supply institutions in the area. The Corps noted several shortcomings of the present institutional system; they included:

(1) water supply management responsibilities are distributed among all layers of government in the WMA. Yet the primary means of assuring adequate water supplies is through the construction of facilities and their maintenance and operation, which is largely the responsibility of local governments.

(2) The existing systems that do not encompass large service areas exhibit several management weaknesses that mitigate against efficient water supply management. Some agencies lack sufficient personnel to carry out management functions. In some counties, there is a lack of communication within and among other agencies involved in water supply and planning. And, in other cases, there is a rather long and extensive review of water supply programs. These conditions exist, but are not widespread.

(3) Many limitations are found in law, regulations and contracts which preclude the accomplishment of some effective water supply objectives. These

[7] This official wished to remain anonymous.

service agreements involve contractual conditions that establish rates, limitations on water supply quantities, and service areas which may prevent different and more cost-effective water supply management.

(4) There are many financial constraints to meeting all the demands of a full scale water supply management program. Under present law, little or no funds are available to the local governments for water supply from the Federal sector. While local entities can legally accept the full financial burden of new or expanded systems, the practicality of it occurring is another question.

(5) Attempts for a more integrated and effective management system may be inhibited by local structures and attitudes. The MFLA is comprised of a large number of local governmental units, some of which have small populations and limited financial resources to effectively carry out water supply functions. In addition, local government officials are reluctant to relinquish their powers or cooperate with other governments for the solution of regional water supply problems. The existing political system evidences a need for better coordination. Finally, local efforts to increase water supply or improve cooperation will be influenced by conflicting public objectives and community interests that compete for the limited financial resources of local government.[8]

Despite these problems, both water officials and the public seem more than willing to take a chance at improving regional cooperation on water supply problems. The public opinion survey concluded, for example:

> (1) There is a more definite desire for solving water supply problems locally, than in going to formerly identified upstream sites as sources for solving water supply problems.

[8]U.S. Department of the Army, Corps of Engineers, Baltimore Division, Metropolitan Washington Area Water Supply Study for the Potomac Water Users, Draft Progress Report, Institutional Analysis and Economics Appendix (Baltimore, Md.: August 1979), pp. 51-52.

> Only a few (3) replies favored local impoundments, mentioned areas outside of the MWA, and in those cases, supported those projects for use in that locality.
>
> (2) There is an understanding that the water problem is a regional one. More emphasis is being placed on better quality of water for all, on emphasizing the least disruption to another community for a water supply alternative, and on the quality of life in the downstream reaches of the Potomac River Basin.
>
> (3) The "publics" are well aware, and in many cases insist, that water supply and water quality be linked to produce a workable plan for the area.

Thus, while there is optimism and recognition of the need for regional cooperation by water officials and the public, there are significant problems which could derail the progress which has taken place over the past decade. These problems raise a number of important questions to water resources researchers:

(1) Can the leadership for resolution of regional problems come from existing agencies? Can the ICPRB, COG or Washington Metropolitan Water Supply Task Force provide sufficient leadership to resolve the outstanding problems? Or, do we need to create a new regional entity with greater powers? Many water officials interviewed felt present organizations could provide the necessary forums for resolving problems. However, former Director of the District Department of Environmental Services, Mr. Jean B. Levesque, did not agree; he stated before Congress that:

> We feel that something more has to be done than just talking with local officials; we need something stronger. We recommend that a study commission be established by Congress to explore the mechanism to administer the construction, operation, maintenance, and apportionment of costs of the proposed interconnections and any other storage facility that is built, and the use of the existing facilities among the users.

[9]Corps of Engineers Public Involvement Appendix, p. 78.

[10]U.S. Congress, Senate, Committee on Governmental Affairs, District of Columbia Water Supply, Hearings, 96th Cong., 1st Sess., October 10, 1979, p. 174.

The District is not alone in seeking a more formal regional mechanism. Maryland has previously supported creation of a Potomac River Basin Compact Commission, which would have broad powers to regulate development and withdrawals from the river. This Commission would be structured like the Susquehanna and Delaware River Basin Commissions.[11]

(2) Are there institutional impediments requiring changes in law, regulations, or administrative practices that could be made to improve regional cooperation? The Corps study of institutional *arrangements* in the WMA certainly hints at this possibility, but the study is not specific about needed changes.

(3) While future water supply conditions look promising at this time, will this picture change in the decade of the 1980's because of rising energy prices, inflation, reduced government spending, changes in behavior, or other factors? Anticipating future events and conditions is always risky and imprecise. Yet laying the groundwork today to resolve future water Problems *emanating* from related developments like energy price increases could go a long way toward mitigating future problems.

Should the District of Columbia be concerned about these issues?

The answer is both "no" and "yes."

As indicated earlier in this study, the major responsibility for insuring sufficient supplies of water to the District belongs to the Federal government through the Washington Aqueduct. Unlike other local jurisdictions throughout the country, the District has the advantage (or disadvantage depending on your perspective) of a Federal "safety net" for water supplies. As Robert McGarry indicated in an interview, "In general terms, the District doesn't have a problem in terms of water quality or quantity because of its

[11]Ibid., pp. 132-40.

close association with the Federal government."[12] Even funding for water supply facilities, according to McGarry, won't be a problem because of the "power and role of the Washington Aqueduct Division."[13]

Water Supply Emergency and Drought Management

Because of the climatological and environmental factors mentioned in Chapter II, the WMA will always be subjected to periods of drought or low flow in the Potomac River. In addition, because of the complex water supply network, breakdowns and other *mechanical* failures can be expected to threaten the regular delivery of water.

The most positive example of regional cooperation in water supplies in the WMA has come in this area.

During the summer o£ 1977, the Potomac River barely supplied sufficient water to meet the demands of the local communities and WAD. At the same time, the Occoquan Reservoir experienced severe shortages and FCWA was forced to request institution of water conservation measures. During the same summer, WSSC experienced a major electrical and pump failure which halted water distribution and forced imposition of mandatory water use restrictions, including temporary closing and substantial economic burdens on many commercial
and industrial establishments.

While the conservation measures imposed by FNCA were adequate to meet the problem, the failure of the WSSC facilities represented a major and more immediate crisis. During this period, the information supplied to local news media was often contradictory and confusing. Physical facilities also showed major weaknesses. At one point, hoses connected to fire hydrants in the District had to be used to pump water across jurisdictional boundaries to supply WSSC.

[12]McGarry, op. cit. 13Ibid.

All these events dramatically pointed out the weaknesses of failing to interconnect local systems and the inability of these jurisdictions to meet water supply emergencies. In response to these problems, the Council of Governments undertook a commendable effort to develop a water supply emergency agreement acceptable to all local jurisdictions. This goal was achieved in 1979 with the signing of the Water Supply Emergency Agreement (Appendix D).

The Agreement is actually composed of two parts: (1) the Potomac River Low Flow Allocation Agreement and (2) the Water Supply Emergency Plan. The low flow agreement provides the definitions of stages specifying the severity of Potomac River water shortages. Its primary purpose is to allocate existing water supply during a shortage or low flow condition, especially to meet the needs of fish, wildlife and other environmental resources of the Potomac River Estuary. The water supply emergency plan, on the other hand, has as its primary thrust to specify methods to conserve water and deal with the effects of a water shortage and/or water outage.

Both documents represent major advances in the field of regional cooperation in water management and supply. They represent the first formal agreements among the various governments in the region to deal cooperatively with complex and difficult issues. In addition, these issues directly impinge on local prerogatives, and the fact that they were signed by all the major jurisdictions represents a significant breakthrough. Moreover, they represent a certain "momentum" toward improved regional cooperation and management. This fact has not been lost on local water managers and they cited these agreements on nearly every occasion as representative of the type of progress that can be made toward solving MWA water problems without intervention of the Federal government and without creation of new agencies or enactment of new laws.

Figure 25

REVFNUE CASH COLLECTIONS FROM WATER AND SEWER
SERVICE CHARGES DEPARTMENT OF ENVIRONMENTAL SERVICES

	Water	Sewer	Total
1981	$16,174,200	$23,804,231	$39,978,431
1980	17,399,628	24,778,272	42,177,900
1979	10,625,398	12,078,443	22,703,841
1978	16,256,000	18,007,000	34,263,000
1977	16,510,835	16,810,520	33,321,355
1976	9,779,000	9,076,000	18,855,000
1975	9,102,000	8,773,000	17,875,000
1974	9,502,042	9,179,900	18,681,942
1973	8,579,740	7,812,003	16,391,743

Source: U.S. Congress, House of Representatives, Committee on Appropriations, Subcommittee on the District of Columbia, District of Columbia Appropriations for 1982, Hearings, 97th Cong., 1st Sess., 1981, p. 1861.

This reaction was not any different from that given to Congressional investigators in 1979. The General Accounting Office made these comments: Washington water officials described the system as adequately designed and in good shape with ability to deliver safe, potable water as good as anywhere in the Nation. Their evaluation indicated a bleak future, however. These officials believed that the operating and maintenance level is barely adequate to keep the system functioning and that continued staffing reductions will eventually create a crisis situation whereby the public will not receive even minimal service. A water department official believed that any further reduction in operation and maintenance activities could endanger the health of the community.

The major problems come from the general deterioration of the system, and reduced funding for rehabilitation and upkeep. Between 1960 and 1978, for example, the city spent about $28.6 million on capital outlays for its water distribution mains and about $3.3 million on other parts of the system. However, according to DES, capital outlays in the last 10 years have been restricted to absolutely essential projects and nothing has been done to really improve the system.[19] GAO observed that both funding and personnel requirements were at the root of the problem. Concerning personnel, GAO stated:

> Staffing reductions since 1968 had generally reduced all maintenance activities.... Due to budget cuts, attrition, and reorganization, the staffing of the Water Services Division had been reduced from 285 in 1968 to 175 in 1979 although division officials believed that 96 more employees were needed to effectively meet responsibilities. In May 1979 the Water Distribution Branch of this division had a backlog of 1,700 work requests. We estimated that 77 staff years of effort would be required to eliminate this backlog.[20]

It is obvious from this discussion of the rehabilitation problem that this is one major problem the District will have to continue to address during

[18] Ibid., p. 24.

[19] Ibid., p. 34.

[20] Ibid.

the 1980's. Like other major Eastern cities with similar deteriorating systems, the District will be faced with the difficult challenge of finding the funds to replace outdated facilities and make progress in dealing with a growing backlog of repairs and replacements.

Yet because of its unique organization as part of the city government, as opposed to being a utility, DES will be faced with some unique and challenging problems in finding the funds and personnel to deal with these problems. These and other problems lead to the following research questions:

(1) What are the true dimensions of the current problems in realistic terms? Is there a real threat to public health and safety on the immediate horizon? The Federal City Council and GAO investigations were just general surveys of the problem. Is this information sufficiently reliable and should these studies be the foundation for initiating costly rehabilitation efforts? The GAO report, despite its pessimistic tone, recommended caution and a more thorough city-by-city analysis. DES itself has studied the problem and the indications are the problem could be great. Yet all research to date indicates that a more thorough and comprehensive analysis of the problem would be in order.

(2) How much would a comprehensive rehabilitation cost? GAO, DES and the Federal City Council have developed estimates on how to deal with the backlog of rehabilitation needs. Until a thorough and comprehensive survey of the needs is prepared, however, it is likely that these estimates need refinement.Examining the question of how much a rehabilitation program would cost involves some difficult questions of deciding what should be rehabilitated and when. It appears at this time that such estimates have not been prepared.

(3) Can sufficient revenues be obtained from water supply customers to finance necessary repairs and replacements or will outside assistance be

required? If outside assistance is needed, where would it come from? When the rates paid by District customers are compared with other jurisdictions in the WMA, it is obvious they are paying a lower price. As shown in Figure 26, water and sewer rates in the District are only two-thirds of those paid in suburban locations. Thus, there is some justification for raising rates to put them on a comparable basis with other jurisdictions in the area. However, as will be indicated below, the problems suffered by the District in billing and collecting have created a situation whereby it will be difficult to gain the public support needed to collect greater revenues.

As indicated earlier, water supply in the District is treated as another function of local government. The revenues collected by DES are part of the general fund--even though they are deposited in a special account--and the

DES must compete with all the other agencies of the District government for its portion of budget expenditures. Suburban water suppliers, on the other hand, are operated as separate utilities. They are able to spend what they raise. The DES does not enjoy this luxury. Revenues raised by the DES can be, and are, used by other portions of city government for yearly expenditures. Thus, DES is in the disadvantageous situation of competing with social programs, education and other government needs for yearly budget dollars. With reduced Federal budget dollars now becoming a reality for these other social programs, it is only natural that repair of water mains or replacement of valves be "put off another year" in order to meet critical social needs.

This situation could lead to some complex reappraisal by DES and District officials in the 1980's if the rehabilitation and repair program continues to need improvement. They will be faced with the situation of either organizing and funding the water system differently (such as moving to a utility type of organization), or seeking assistance from some outside source.

Figure 26

WATER AND SEWER CHAFMS: COMPARISON WITH OTHER JURISDICTIONS

(Cost of 55,352 gallons)

		District of Columbia (1)	Fairfax County (2)	WSSC (3)	Arlington County (4)
Water		$34.04	$38.74	$57.01	(4)
Sewer		50.00	78.05	63.35	(4)
	Total	$84.14	$116.80	$120.66	$116.67

(1) Water 46.0 cents per 100 cubic feet consumed. Sewer 67.7 cents per 100 cubic feet of water consumed.

(2) Water 70 cents per cubic 1000 feet consumed (established accounts); 81 cents per 1,000 gallons of water consumed (new accounts). Sewer $1.41 per 1,000 gallons of water consumed.

(3) Conservation-oriented rate structure; ranges from 49 cents to $1.11 per 1,000 gallons average daily consumption. Sewer ranges from 54 cents up to $1.40 per 1,000 gallons average daily water consumed.

(4) Flat rate of $2.11 per 1,000 gallons of water consumed for water and sewer.

Source: U.S. Congress, House of Representatives, Committee on Appropriations, Subcommittee on the District of Columbia, District of Columbia Appropriations for 1982, Hearings, 97th Cong., 1st Sess., 1981, p. 1862.

This naturally leads to the question of what type of assistance will be needed and who can it be obtained from.

(4) Can alternative staffing arrangements be developed to address the needs of rehabilitating and repairing the water delivery system? Staffing reductions for government agencies have become a hallmark of government at all levels. Water supply officials in the District are no exception. Bud get and personnel cuts have forced administrators in DES and other agencies to see ways of performing critical and necessary work without additional personnel. As GAO found, the number of personnel available to undertake maintenance work has declined steadily. The DES has attempted to use outside contracting to make up for the lack of these personnel.

This leads to the question of whether contracting-out can be expected to meet the needs of the water delivery system. This is the traditional way in which most government agencies have attempted to deal with the problem of decreased personnel and mounting workload problems. Are there alternative means to deal with this problem that DES should attempt to use? Can more efficient and orderly methods be utilized? If so, how would they be financed and where would funds come from?

(5) Finally, should the District examine alternative organizational means for providing its water supply responsibilities? Since water supply is the responsibility of a governmental department it obtains certain advantages. However, as indicated earlier, organizing water supply in this manner and financing it in this way also has its disadvantages. Should the District move toward a utility-type organization to deal with water supply? Would this type of organization be authorized under the Home Rule Charter? What are the advantages and disadvantages of changing the type of organizational scheme for water supplies?

Answers to all these questions could be the subject of further investigations in this field.

Water Billing and Collection

Another significant problem facing the District is the state of its water billing and collection system. For several years, the DES has had significant problems in sending out reliable bills and collecting revenues on a timely basis.

In late 1981, for example, it was found that the District had delayed mailing 17,900 water bills because it incorrectly read water meters, failed to repair broken meters and improperly programmed its billing computer.

These 17,900 problem accounts represented about 15 percent of the city's 112,000 commercial and residential water customers. In addition, city officials said at that time they were receiving an average of 3,750 complaints a month from residents who said they had been sent grossly exaggerated bills, had their water shut off even though they paid their bills on time, or encountered other billing problems.

According to press reports of this incident, several city council members "said their patience has been exhausted."[21] One Northeast resident, for example, saw here water bill inexplicably jump from $26.61 to $244.46 for a five-month period in which she was away for one of the months. "I didn't become a whale, I haven't flooded Northeast to become a skating rink, and I don't take 13 showers a day," she said. "People in this city are starting to feel that the water board is out to get them using a Russian roulette system," she concluded.[22]

[21] M. Isikoff, "City Inefficiency Delays 17,900 Bills for Water," Washington Post, October 29, 1981, p. C4.

[22] 1bid.

The water billing and collection problem has been a continuing one that has plagued DES for several years. Two and one-half years ago, DES attempted to correct the problem when it roved from a manual bookkeeping system for water accounts to computers. DES Director William B. Johnson said this move was needed to bring the District's old system "into the 20th Century."[23] This move was viewed as the best way to send out more accurate billings and decrease the District's current uncollected water revenues of nearly $10 million.

The DES found, however, that the use of the District's SHARE in-house computer system was inadequate to meet the problem. At a Congressional hearing in 1981, Director Johnson admitted that "...our SHARE Commuter Center is critically overloaded and we just don't want our water billings to get behind. As a result, we need to contract out for that work...."[24] The cost of contracting out this activity on a yearly basis is estimated to be $300,000.

This problem of accurate billing and collections has become vital to the credibility of the District government. As Mayor Barry is reported to have said, "[Director] Johnson's behind - and [City Administrator] Rogers' behind -- are on the line on this one; I've told them that."[25] Equally important, as the DES looks for sources of funds to finance needed repairs and rehabilitation, or considers conservation pricing, it will become

[23] U.S. Congress, House of Representatives, Committee on Appropriations, Hearings on District of Columbia Appropriations for 1981, 96th Cong., 2nd Sess., p. 1983

[24] U.S. Congress, House of Representatives, Committee on Appropriations, Hearings on District of Columbia Appropriates for 1982, 97th Cong., 1st Sess., p. 1858.

[25] Isikoff, op. cit.

increasingly difficult 'to justify price increases in the face of unreliable billings and poor collections.

This situation leads to a number of important research questions:

(1) Why is the District unable to correct the billing and collection problem?

(2) What is the extent and magnitude of the problem currently facing the District governnent?

(3) What methods can be employed to correct the problems in an efficient and timely manner?

(4) Can assistance be provided to the District through using billing systems similar to WSSC or other suburban water suppliers?

(5) IF the District is facing this problem, could it be that their problems are severe only because they have been well-publicized? Are other water suppliers in the area suffering similar problems?

Rate Increases and Conservation

Over the past few years, DES has had to increase the price charged for water delivered to final consumers. In 1982, for example, the price will in crease by 30 percent over the rates previously charged.

The primary reason for these increases was to provide the funds needed for the Enterprise Fund, which, in turn, are needed to fund operations of DES and other programs. The 30 percent increase in 1982, for example, is expected to raise $17.9 million. As DES noted:

> Although rates must be set to cover cash needs during a given budget year, the degree to which the water and sewer enterprise is successful in supporting itself (its profit and loss status) is determined based on expenditure items which exclude principal and deferred debt service payments and sometimes include annual depreciation expenses. The FY 1982 financial plan for the Water and Sewer Enterprise Fund is present in the Executive Budget on this latter basis. [26]

[25] Isikoff, op. cit.

[26] District of Columbia, Justifications for the FY 1982 Budget (Washington, D.C.: Office of the City Administrator, February 1981), V., p. 396.

Since water supply in the District is provided by a government agency, the rate increases are based on the need to supply monies for the Enterprise Fund and to provide operating capital for the Fund and other general government responsibilities.

Equally important to note, these rate increases have not been proposed in order to promote water conservation. The problem of promoting water conservation is another issue, which will be critical to the District in the1980's. Nearly every major water supplier in the country has looked at the need to promote conservation as an alternative to increased supply. Given the Corps' estimates on water supplies for the next 50 years, it is obvious some form of conservation will have to be promoted in the District, and pricing is one important tool in achieving water conservation.

The WSSC, for example, has been a leader in the nation in promoting water conservation through increased pricing and other means. According to General Manager Robert McGarry, "WSSC developed its water conservation program for three reasons: it had no choice; to save capital and operating expenses; and its *'public'* wants such a program."[27]

Water conservation programs, while their value is proven, are not without "cost," as a recent study of metropolitan water management noted:

> Though they will not provide a complete solution to a long-term water supply shortage, conservation techniques generally cost very little and, at least initially, have a great potential for reducing unnecessary and wasteful use. However, as wastage of water is curtailed, the actual and perceived social costs increase. *Public* acceptance and cooperation with a conservation program are essential to its success; the social and economic costs must be justified for each program element. As different measures shift from "conservation" to "restriction" to "prohibition" of water use, there will necessarily be higher political and social costs imposed on the local decision maker.

[27]Robert S. McGarrv, "More Efficient Water Use by Municipalities," in J. Wallace and B. Kahn, eds., Water Conservation and Alternative Water Supplies (Atlanta, Ga.: Georgia Institute of Technology, 1978), p. 130.

[28]J. Milliken and G. Taylor, Metropolitan Water Management (Washington,-D.C.: American Geophysical Union, , p.33.

The District has' had to increase its water rates not to promote water conservation, but to finance its operations. This has risky political and social costs associated with it, especially since DES has had so many problems billing and collecting revenues. The issue of rate increases for conservation, juxtaposed against *billing* and collection problems, promises to be a major issue for the 1980's.

As a result of this *discussion,* several research questions arise: (1) What are the District's present and future plans in the area of water conservation? Can or should they be implemented at this time?

(2) How do present and future water conservation plans for the District compare to other jurisdictions of equivalent size?

(3) What is the relationship of the District water conservation plans or potential to the overall solution of MWA water supply needs?

(4) How will the District be able to implement an effective water conservation strategy in light of the problems it has encountered in the billing and collection area? Can the District government deal with the social and political costs that would be associated with a water conservation plan in light of the current criticisms of its billing and collection procedures? (5) How-successful could a water conservation program for the District be? Would the advantages to be gained be outweighed by the social and political costs it would incur?

Conclusion

There is always a danger in completing a study like this with a number of unanswerable questions and discussions of problems. This approach leaves the reader with the impression that "all is not right." In the case of water supply in the District of Columbia, it is hoped that this impression is not the one gained.

Water supply in the District of Columbia is reliable, cheap and of good quality. Other than some administrative problems (such as billing and collection), the government agencies charged with the responsibility of pro viding water are performing their functions adequately. Recent studies of water supply availability do not hold out the prospects of supply shortages, and regional cooperation among the myriad of governments and utilities involved appears to be improving.

Thus, there is optimism about the future in this area. Yet one note of caution should be made: continued and improved cooperation among all the agencies and governments in the area will be the critical factor in meeting future water supply needs.

APPENDIX A

June 6, 1978

Office of the White House Press Secretary

THE WHITE HOUSE

TO THE CONGRESS OF THE UNITED STATES:

I am today sending to Congress water policy initiatives designed to:

-- improve planning and efficient management of Federal water resource programs to prevent waste and to permit necessary water projects which are cost effective, safe and environmentally sound to move forward expeditiously;

-- provide a new, national emphasis on water conservation;

-- enhance Federal-State cooperation and improved State water resources planning; and

-- increase attention to environmental quality. None of the initiatives would impose any new federal regulatory program for water management.

Last year, I directed the Water Resources Council, the Office of Management and Budget and the Council on Environmental Quality, under the chairmanship of Secretary Cecil Aridrus, to make a comprehensive review of Federal water policy and to recommend proposed reforms.

This new water policy results from their review, the study of water policy ordered by the Congress in Section 80 of the Water Resources Planning Act of 1974 and our extensive consultations with members of Congress, State, county, city and other local officials and the public.

Water is an essential resource, and over the years, the-programs of the Bureau of Reclamation, the Corps of Engineers, the Soil Conservation Service and the Tennessee Valley Authority have helped permit a dramatic improvement in American agriculture, have provided irrigation water

essential to the development of the West, and have developed community flood protection, electric power, navigation and recreation throughout the Nation.

I ordered this review of water policies and programs because of my concern that while Federal water resources programs have been of great benefit to our Nation, they are today plagued with problems and inefficiencies. In the course of this water policy review we found that:

-- Twenty-five separate Federal agencies spend more than $10 billion per year on water resources projects and related programs.

-- These projects often are planned without a uniform, standard basis for estimating benefits and costs.

-- States are primarily responsible for water policy within their boundaries, yet are not integrally involved in setting priorities and sharing in Federal project planning and funding.

There is a $34 billion backlog of authorized or uncompleted projects.

Sane water projects are unsafe or environmentally unwise and have caused losses of natural streams and rivers, fish and wildlife habitat and recreational opportunities.

The study also found that water conservation has not been addressed at a national level even though we have pressing water supply problems. Of 106 watershed sub-regions in the country, 21 already have severe water shortages.

By the year 2000 this number could increase to 39 sub-regions. The Nation's cities are also beginning to experience water shortage problems, which can only be solved at very high cost. In some areas, precious groundwater supplies are

also being depleted at a faster rate than they are replenished. In many cases an effective water conservation program could play a key role in alleviating these problems.

These water policy initiatives will make the Federal government's water programs more efficient and responsive in meeting the Nation's water-related needs. They are de signed to build on fundamentally sound statutes and on the Principles and Standards which govern the planning and development of Federal water projects, and also to enhance the role of the States, where the primary responsibilities for water policy must lie. For the first time, the Federal government will work with State and local governments and exert needed national leadership in the effort to conserve water. Above all, these policy reforms will encourage water projects which are economically and environmentally sound and will avoid projects which are wasteful or which benefit a few at the expense of many.

Across the Nation there is remarkable diversity in the role water plays. Over most of the West, water is scarce and must be managed carefully -- and detailed traditions and laws have grown up to govern the use of water. In other parts of the country, flooding is more of a problem than drought, and in many areas, plentiful water resources have offered opportunities for hydroelectric power and navigation. In the urban areas of our Nation, water supply systems are the major concern -- particularly where antiquated systems need rehabilitation in order to conserve water and assure continued economic growth.

Everywhere, water is fundamental to environmental quality. Clean *drinking* water, recreation, wildlife and beautiful natural areas depend on protection of our water resources.

Given this diversity, Federal water policy cannot attempt to prescribe water use patterns for the country. Nor should the Federal government preempt the primary responsibility of the States for water management and allocation.

For those reasons, these water policy reforms will not preempt State or local water responsibilities. Yet water policy is an important national concern, and the Federal government has major responsibilities to exercise leadership, to protect the environment and to develop and maintain hydroelectric power, irrigated agriculture, flood control and navigation.

The primary focus of the proposals is on the water resources programs of the Corps of Engineers, the Bureau of Reclamation, the Soil Conservation Service and the Tennessee Valley Authority, where annual water program. budgets total approximately $3.75 billion. These agencies perform the federal government's water resource development programs. In addition, a number of Federal agencies with water-related responsibilities will be affected by this water policy.

I am charging Secretary Andrus with the lead responsibility to see that these initiatives are carried out promptly and fully. With. the assistance of the Office of Management and Budget and the Council an Environmental Quality, he will be responsible for working with the other Federal agencies, the Congress, State and local governments and the public to assure proper implementation of this policy and to make appropriate recommendations for-reform in the future.

Scientific Initiatives

Improving Federal Water Resource Programs

The Federal government has played a vital role in developing the water resources of the United States. It is essential that Federal water programs be updated and better coordinated if they are to continue to serve the nation in the best way possible. The reforms I am proposing are ***designed*** to modernize and improve the coordination of federal water programs. In ***addition,*** in a few days, I will also be sending to the Congress a ***Budget*** amendment proposing funding for a number of new water project construction and planning starts. These projects-meet the criteria I am announcing today. This is the first time the Executive ***Branch*** has proposed new water project starts since Fiscal Year 1975, four years ago.

The actions I am taking include:

A directive to the Water Resources Council to improve the implementation of the Principles and Standards governing the planning of Federal water projects. The basic planning objectives of the Principles and Standards -- national economic development and environmental quality -- should be retained and given equal emphasis. In addition, the implementation of the Principles and Standards should be improved by:

-- adding water conservation as a specific component of both the economic and environmental objectives; requiring the explicit formulation and consideration of a primarily non-structural plan as one alternative whenever structural water projects or programs are planned;

-- instituting consistent, specific procedures for calculating benefits and costs in compliance with the Principles and Standards and other applicable planning and evaluation requirements. Benefit-cost analyses have not been uniformly applied by Federal agencies, and in some cases benefits have been improperly recognized, "double-counted" or included when inconsistent with federal policy or sound economic rationale. I am directing the Water Resources Council to prepare within 12 months a manual which ensures that benefits and costs are calculated using the best techniques and provides for consistent application of the Principles and Standards and other requirements; ensuring that water projects have been planned in accordance with the Principles and *Standards* and other-planning requirements by creating, by Executive Order, a project review function located in the Water Resources Council. A professional staff will ensure an impartial review of pre-construction project plans for their consistency with established planning and benefit-cost analysis

procedures and applicable requirements. They will report ca compliance with these requirements to agency heads, who will include their report, together with the agency recommendations, to the Office of Management and Budget. Project reviews will be completed within 60 days, before the Cabinet officer makes his or her Budget request for the coming fiscal year. Responsibility will rest with the Cabinet officer for Budget requests to the Office of Management and Budget, but timely independent: review will be provided. This review must be completed within the same budget cycle in which the Cabinet Officer intends to make Budget requests so that the-process results in no delay.

-- Projects should stress water conservation and appropriate non-structural measures.

-- The manual, the Principles and Standards requirements and the independent review process will apply to all authorized projects (and separable project features) not yet under construction.

Establishment of the following criteria for setting priorities each year among the water projects eligible for funding or authorization, which will form the basis of my decisions on specific water projects: Projects should have net national economic benefits unless there are environmental benefits which clearly more than compensate for any economic deficit. Net adverse environmental consequences should be significantly outweighed by economic benefits. Generally, projects with higher benefit/cost ratios and fewer adverse environmental consequences will be given priority within the limits of available funds.

-- Projects should have widely distributed benefits.

--Projects should have no significant safety problems involving design, construction or operation.

-- There should be evidence of active public support including support by State and local officials.

-- Projects will be given expedited consideration where State governments assume a share of costs over and above existing cost-sharing.

-- There should be no significant international or inter-governmental problems.

-- Where vendible outputs are involved preference should be given to. projects which provide for greater recovery, of Federal and State costs, consistent with project purposes.

-- The project's problem assessment, environmental impacts, costs and benefits should be based on up-to-date conditions (planning should not be obsolete).

-- Projects should be in compliance with all relevant environmental statutes.

-- Funding for mitigation of fish and wildlife damages should be provided concurrently and proportionately with construction funding.

Preparation of a legislative proposal for improving coat-sharing for water projects. Improved cost-sharing will allow States to participate more actively in project decisions and will remove biases in the existing system against non-structural flood control measures. These changes will help assure project merit. This proposal, based on the study required by Section 80 of P.L. 93-251, has two parts:

participation of States in the *financing of* federal water project construction. For project purposes with vendible outputs (such as Water supply or hydroelectric power), States would contribute 10% of the costs, proportionate to and phased with federal appropriations. Revenues would be returned to the States proportionate to their contribution. For project purposes without vendible outputs (such as flood control), the State financing share would be 5%. There *would* be a cap on State participation of 1/4 of 1% of the State's revenue
per project per year, so that a small State would not be *precluded* from having a very large project located in it.

Where project benefits accrue to more than one State, State contributions *would* be calculated accordingly, but if a benefiting State *did* not choose to participate in coat-sharing, its share could be paid by other participating States. This State cost-sharing *proposal would* apply on a mandatory basis to projects not yet authorized. However, for projects in the authorized backlog, States which voluntarily enter into these cost-sharing arrangements will achieve expedited Executive Branch consideration and priority for project funding, as long as other project planning requirements are met. Soil Conservation Service projects will be completely exempt from this State cost sharing proposal.

equalizing cost-sharing for structural and non-structural flood control alternatives. There is existing authority for 80%-20% Federal/non Federal cost-sharing for non-structural flood control measures (including in-kind contributions such as land and easements).

I will begin approving non-structural flood control projects with this funding arrangement and will propose that a parallel cost-sharing requirement (including in-kind contributions) be enacted for structural flood control measures, which currently have a multiplicity of cost-sharing rules.

Another policy issue raised in Section 80 of P.L. 93251 is that of the appropriate discount rate for computing the present value of future estimated economic benefits of water projects. After careful consideration of a range of options I have decided that the currently legislated discount rate formula is reasonable, and I am therefore recommending that no change be made in the current formula. Nor will I recommend retroactive changes in the discount rate for currently authorized projects.

Water Conservation

Managing our vital water resources depends on a balance of supply, demand and wise use. Using water more efficiently is often cheaper and less demanding to the environment than developing additional supplies. While increases in supply will still be necessary, these reforms place emphasis on water conservation and make clear that this is now a national priority.

In addition to adding the consideration of water conservation to the Principles and Standards, the initiatives I am taking include:

Directives to all Federal agencies with programs which affect water supply or consumption to encourage water conservation, including:

-- making appropriate community water conservation measures a condition of the water supply and wastewater treatment grant and loan programs of the Environmental Protection Agency, the Department of Agriculture and the Department of Commerce;

-- integrating water conservation requirements into the housing assistance programs of the Department of Housing and Urban Development;

-- requiring development of water conservation programs as a condition of contracts for storage or delivery of municipal and industrial water supplies from federal projects;

-- requiring the General Services Administration, in consultation with affected agencies, to establish water conservation goals and standards in Federal buildings and facilities;

-- encouraging water conservation in the agricultural assistance programs of the Department of Agriculture and the Department of Interior which affect water consumption in water-short areas; and

- requesting all Federal agencies to examine their programs and policies so that they can implement appropriate measures to increase water conservation and re-use.

A directive to the Secretary of the Interior to improve the implementation of irrigation repayment and water service contract procedures under existing authorities of the Bureau of Reclamation. The Secretary will:

-- require that new and renegotiated contracts include provisions for recalculation and renegotiation of water rates every five years. This will replace the previous practice of 40-year contracts *which* often do not reflect inflation and thus do not meet the beneficiaries' repayment obligations; under existing authority add provisions to recover operation and maintenance costs when existing contracts are renegotiated, or earlier where existing contracts have adjustment clauses;

- more precisely calculate and implement the "ability to pay" provision in existing law which governs recovery of a portion of project capital costs. Preparation of legislation to allow States the option of requiring higher prices for municipal and industrial water supplies from Federal projects in order to promote conservation, provided that State revenues in excess of Federal costs would be returned to municipalities or other public water supply entities for use in water conservation or rehabilitation of water supply systems.

Federal-State Cooperation

States must be the focal point for water resource management. The water reforms are based on this guiding principle. Therefore, I am taking several initiatives to strengthen Federal-State relations in the water policy area and to develop a new, creative partnership. In addition to proposing that States increase their roles and responsibilities in water resources development through cost-sharing, the actions I am taking include:

Proposing a substantial increase from $3 million to $25 million annually in the funding of State water planning under the existing 50%-50% matching program administered by the Water Resources Council. State water planning would integrate water management and implementation programs which emphasize water conservation and which are tailored to each State's needs including assessment of water delivery system rehabilitation needs and development of programs to protect and manage groundwater and instream flows. Preparation of legislation to provide $25 million annually in 50%-50% matching grant assistance to States to implement water conservation technical assistance programs. These funds could be passed through to counties and cities for use in urban or rural water conservation programs. This program will be administered by the Water Resources Council in conjunction with matching grants for water resources planning.

Working with Governors to create a Task Force of Federal, State, county, city and other local officials to continue to address water-related problems. The administrative actions and legislative proposals in this Message are designed to initiate sound water management policy at the national level. However, the Federal government must work closely with the States, and with local governments as well, to Continue identifying and examining water-related problems and to help implement the initiatives I am announcing today. This Task Force will be a continuing guide as we implement the water policy reforms and will ensure that the State and local role in our Nation's water policy is constant and meaningful.

An instruction to Federal agencies to work promptly and expeditiously to inventory and quantify Federal reserved and Indian water rights. In several areas of the country, States have been unable to allocate water because these rights have not been determined. This quantification effort should focus first an high priority areas., should involve close consultation with the States and water users and should emphasize negotiations rather than litigation wherever possible.

Environmental Protection

Water is a basic requirement for human survival, is necessary for economic growth and prosperity, and is fundamental to protecting the natural environment. Existing environmental statutes relating to water and water projects generally are adequate, but these laws must be consistently applied and effectively enforced to achieve their purposes. Sensitivity to environmental protection must be an important aspect of all water-related planning and management decisions. I am particularly concerned about the need to improve the protection of instream flows and to evolve careful management of our nation's precious groundwater supplies, *which* are threatened by depletion and contamination.

My initiatives in this area include the following:

. A directive to the Secretary of the Interior and other Federal agency heads to implement vigorously the Fish and Wildlife Coordination Act, the Historic Preservation Act and other environmental statutes. Federal agencies will prepare formal implementing procedures for the Fish and Wildlife Coordination Act and other statutes *where* appropriate. Affected agencies will prepare reports on compliance with *environmental* statutes on a project-by-project basis for inclusion in annual submissions to the Office of Management and Budget. A directive to agency heads requiring them to include designated funds for environmental mitigation in water project appropriation requests to provide for concurrent and proportionate expenditure of mitigation funds. Accelerated implementation of Executive Order No. 11988 on floodplain management. This Order requires agencies to protect floodplains and to reduce risks of flood 103303 by not conducting, supporting or allowing actions

in floodplains unless there are no practicable alternatives. Agency implementation is behind schedule and must be expedited.

A directive to the Secretaries of Army, Commerce, Housing and Urban Development and Interior to help reduce flood damages through acquisition of flood-prone land and property, where consistent with primary program purposes.

A directive to the Secretary of Agriculture to encourage more effective soil and water conservation through watershed programs of the Soil Conservation Service by:

-- working with the Fish and Wildlife Service to apply fully the recently-adopted stream channel modification guidelines;

-- encouraging accelerated land treatment measures prior to funding of structural measures on watershed projects, and making appropriate land treatment measures eligible for Federal cost-sharing;

-- establishing periodic post-project monitoring to ensure implementation of land treatment and operation and maintenance activities specified in the work plan and to provide information helpful in improving the design of future projects.

A directive to Federal agency heads to provide increased cooperation with States and leadership in maintaining instream flows and protecting groundwater through joint assessment of needs, increased assistance in the gathering and sharing of data, appropriate design and operation of Federal water facilities, and other means. I also call upon the Governors and the Congress to work with Federal agencies to protect the fish and wildlife and other values associated with adequate instream flows.

New and existing projects should be planned and operated to protect instream flows, consistent with State law and in close consultation *with* States. Where prior commitments and economic feasibility permit, amendments to authorizing statutes should be sought in order to provide for streamflow maintenance.

Conclusion

These initiatives establish the goals and the framework for water policy reform. They do so without impinging on the rights of States and by calling for a closer partnership among the Federal, State, county, city and other local levels of government. I want to work with the Congress, State and local governments and the public to implement this policy. Together we can protect and manage our nation's water resources, putting water to use for society's benefit, preserving our rivers and streams for future generations of Americans, and averting critical water shortages in the future through adequate supply, conservation and wise planning.

THE WHITE HOUSE

APPENDIX B

Public Law 93-251
93rd Congress, H.R. 10203
March 7, 1974

An Act

Authorizing the construction, repair, and preservation of certain public works on rivers, and harbors for navigation, flood control, and for other purposes.

Sec. 85. (a) The projects for Verona Dam and Lake, Virginia, and for Sixes Bridge Dam and Lake, Maryland, are hereby authorized substantially in accordance with the recommendations *of* the Secretary of the Army in House Document Numbered 91-343 as modified by the recommendations of the Chief of Engineers in his report dated July 13, 1973, except that such authorization shall be limited to the phase I design memorandum of advanced engineering and design, at an estimated cost of $1,400,000.

(b)(1) Prior to any further authorization of such Sixes Bridge Dam Project, the Secretary of the Army, acting through the Chief of Engineers shall (A) make a full and complete investigation and study of the future water resources needs of the Washington metropolitan area, including but not limited to the adequacy of present water supply, nature of present and future uses, the effect water pricing policies.. and use restrictions may have on future demand, the feasibility of utilizing water from the Potomac estuary, all possible water impoundment sites, natural and recharged ground water supply, wastewater reclamation, and the effect such projects will have on fish, wildlife, and present beneficial uses, and shall provide recommendations. based on such investigation and study for supplying such needs, and (B) report to the Congress the results of such investigation and study together with such recommendations. The study of measures to meet the water supply needs of the Washington metropolitan area shall be coordinated with the Northeastern United States water supply study authorized by the Act of October 27, 1965(79 Stat. 1073).

(2) The Secretary of the Army, acting through the Chief of Engineers, shall undertake an investigation and study of the use of estuary waters to determine the feasibility of using such waters as a source of water supply and is authorized to construct, operate, and evaluate a pilot project on the Potomac estuary for the treatment of such waters at an estimated cost of $6,000,000. The Secretary of the Army, acting through the Chief of Engineers, shall report to the. Congress on the results of such project within three years after commencement *of* operation of such project and such report shall include the results of two years testing at the pilot project for

the treatment of water from the Potomac estuary.

(3) The Secretary of the Army, acting through the Chief of Engineers, shall request the National Academy of Sciences-National Academy of Engineering to review and by written report comment upon the scientific basis for the conclusions reached by the investigation and study of the future water resource needs of the Washington metropolitan area and the pilot project for the treatment of water from the Potomac estuary. Such review and written report shall be completed and submitted to the Congress within one year following the completion of both the Corps of Engineers report on the future water resource needs of the Washington metropolitan area and the report on the results derived from the pilot project for the treatment of water from the Potomac estuary. Completion of such review and written report by the National Academy of Sciences-National Academy of Engineering shall be a condition of further authorization of such Sixes Bridge Dam Project.

(4) The Secretary of the Army is authorized to enter into appropriate arrangements with the National Academy of Sciences National Academy of Engineering for the purpose of this subsection.

(c) There is authorized $1,000,000 for the purposes of carrying out the provisions contained in paragraph (3) of subsection (b).

APPENDIX C

Public Law 91-407

91st Congress, S. 3. Res. *67*

September 25, 1970

Joint Resolution

Granting the consent of Congress to the States of Maryland and West Virginia and the Commonwealths of Virginia and Pennsylvania and the District of Columbia. as signatory bodies. for certain amendments to the compact creating the Potomac Valley Conservancy District *and* establishing the Interstate Commission on the Potomac River Basin.

84 STAT.856

Whereas, by Public Resolution Numbered 93, Seventy-sixth Congress, third session, approved July 11, 1944 (b4 Stat. 748), Congress granted consent to the States of Maryland and West Virginia and the Commonwealths of Virginia and Pennsylvania and the District of Columbia, hereinafter designated signatory bodies, to enter into a compact for the creation of a Potomac Valley Conservancy District and the establishment of the Interstate Commission on the Potomac River Basin; and

33 USC 567b.

Whereas, all said signatory bodies have entered into said compact; and Whereas, all the said signatory bodies have adopted identical proposed amendments to said compact, for which they seek the consent of Congress, by virtue of which amendments said, compact will read as follows:

"COMPACT

Compact for creation of Potomac Valley Conservancy District and Interstate Commission On the Potomac River Basin, amendment.

[11]WHEREAS, it is recognized that abatement of existing pollution and the control of future pollution of interstate streams can best be promoted through a , point agency representing the several states located wholly or in part within the area drained by any such interstate Stream; and

"WHEREAS, the Congress of the United States has given its consent to the States of Maryland and West Virginia, the Commonwealths of Pennsylvania; and Virginia, and the District of Columbia to enter into a compact providing for the creation of a *conservancy* district to consist of the drainage basin of the Potomac river and the main and tributary streams therein, for 'the purpose of regulating, controlling, preventing, or otherwise rendering unobjectionable and harmless the pollution of the waters of said 'Potomac drainage area by sewage and industrial and other wastes'; and

"WHEREAS, the regulation, control and prevention of pollution is directly affected by the quantities of water in said streams and the uses to which such water may be put, thereby requiring integration and coordination of the planning for the development and use of the water and associated land resources through cooperation with, and support and coordination of, the activities of Federal, State, local and private agencies, groups,' and interests concerned with the development, utilization and conservation of the water and associated land resources of the said conservancy district;

"Now, therefore, the States of Maryland and Nest Virginia, th$_e$ Commonwealths of Pennsylvania and Virginia, and the District of Columbia, hereinafter designated signatory bodies, do hereby create the Potomac Valley Conservancy District, hereinafter designated the Conservancy District, comprising all of the area drained by the Potomac River and its tributaries; and also, do hereby create, as an agency of each signatory body, the Interstate Commission on the Potomac River Basin, hereinafter designated the Commission, under the articles of organization as set forth below.

Pub. Law 91-407
84 STAT. 857

September 25, 1970

“ARTICLE I

"The Interstate Commission on the Potomac River Basin shall consist of three members from each signatory body and three members appointed by the President of the United States. Said Commissioners, other than these appointed by the President, shall be chosen in a manner and for the terms provided by law of the signatory body from which they are appointed and shall serve without compensation from the Commission but shall be paid by the Commission their actual expenses incurred and incident to the performance of their duties.'

“(A). The Commission shall meet and organize within thirty days after the- effective date of this compact, shall elect from its number a chairman and vice-chairman, shall adopt suitable bylaws, shall make, adopt and promulgate such rules and regulations its are necessary for its management and control, and shall ado t a seal.

"(B). The Commission shall appoint and, at its pleasure, remove or discharge such officers and legal, engineering, clerical, expert and other assistants as may be required to carry the previsions of this compact into effect, and shall determine their qualifications and fix their duties and commission. Such personnel as may be employed shall be employ:[without regard to any civil service or other similar requirements for employees of any of the signatory bodies. The Commission may maintain one or more offices for the transaction of its business and may meet at any time or place within the area of the signatory bodies.

"(C). The Commission' shall keep accurate accounts of all receipts and disbursements and shall make an annual report thereof and shall in such report set forth in detail the operations and transactions conducted by it pursuant to this compact. The Commission, however, shall not incur any obligations for administrative or other expenses prior to the malting of appropriations adequate to meet the same nor shall it in ay pledge the credit of any of the signatory bodies. Each of the signatory bodies reserves the right to make at any time an examination and audit of the acconuit.5 of the Commission.

"(D). A quorum of the Commission shall, for the transaction of business, the exercise of any powers,- or the performance of any duties, consist of at east six members of the Commission who shall represent at least a majority of the signatory bodies Provided, however, That no action of the Commission relating to policy or stream classification or standards shall be binding on any one of the signatory bodies unless at least two of the Commissioners from such signatory body shall vote in favor thereof.

"ARTICLE II

"The Commission shall have the power

"(A). To collect, analyze, interpret, coordinate, tabulate, summarize and distribute technical and other data relative to, and to conduct studies, sponsor research and prepare reports on. pollution and other water problems of the Conservancy District.

“(B). To cooperate with the legislative and administrative agencies of the signatory bodies, or the equivalent thereof, and with other commissions and Federal, local governmental and non-governmental agencies, organizations, groups and persons for the purpose of promoting uniform laws, males or regulations for

the abatement and control of pollution of streams and the utilization, conservation and development of the water and associated land resources in the said Conservancy District.

“(C). To disseminate to the public information in relation to stream pollution problems and the utilization, conservation and development of the water and associated land resources of the Conservancy District and on the aims, views, purposes and recommendations of the Commission in relation thereto.

"(1). To cooperate with, assist, and provide liaison for and among, public and non-public agencies and organizations concerned with pollution and other water problems in the formulation and coordination of plans, programs and other activities relating to stream pollution or to the utilization, conservation or- development of water or associated land resources, and to sponsor cooperative action in connection with the foregoing.

" (E). In its discretion and at any time during or after the formulation thereof, to review and to comment upon any plan or program of any 1public or private agency or organization relating to stream pollution or the utilization, conservation or development of water or associated land resources.

" (F) (1) . To make, and, if needful from time to time, revise and recommend to the signatory bodies, reasonable minimum standards for the treatment of sewage and industrial or other wastes now discharged or to be discharged in the future to the streams of the Conservancy District, and also for cleanliness of the various streams in the Conservancy District.

"(2). To establish reasonable physical, chemical and bacteriological standards of water quality satisfactory for various classifications of use. It is agreed that each of the signatory bodies through appropriate agencies will prepare a classification of its interstate waters in the District in entirety or by portions according to present and proposed highest use, and far this purpose technical experts employed by appropriate state water pollution control agencies are authorized to confer on questions relating to ' classification of interstate waters affecting two or more states. Each signatory body agrees to submit its classification of its interstate waters to the Commission with its recommendations thereon.

"The Commission shall review such classification and recommendations and accept or return the same with its comments. In the event of return, the signatory body will consider the comments of the Commission and resubmit the classification proposal, with or without amendment, with any additional comments for further action by the Commission.

"It is agreed that after acceptance of such classification, the signatory body through its appropriate state water pollution control agencies will work to establish programs of treatment of sewage and industrial wastes which win meet or exceed standards established by the Commission for classified waters. The Commission may from time to time make such changes in definitions of classifications and in standards as may be required by changed conditions or as may be necessary for uniformity and in a manner similar to that in which these standards and classifications were originally established.

`'It is recognized, owing to such variable factors as location, size, character and flow and the many varied uses of the waters subject to the terms of this compact, that no single standard of sewage and waste treatment and no single standard of quality of receiving waters is practical and that the degree of treatment of sewage and

industrial wastes should take into account the classification of the receiving waters according to present and proposed highest use, such as for drinking water supply, bathing and other recreational purposes, maintenance and propagation of fish life, industrial and agricultural uses, navigation and disposal of wastes.

"ARTICLE III

"For the purpose of dealing with the problems of pollution and of water and associated land resources in specific areas which directly affect two or more, but not all, signatory bodies, the Commission may establish Sections of the Commission consisting of the Commissioners from such affected signatory bodies: Provided, however, That no signatory body may be excluded from any Section in which it wishes to participate. The Commissioners appointed by the President of the United States may participate in any Section. The Commission shall designate, and from time to time may change; the geographical area with respect to which each Section shall function. Each Section shall, to such extent as the Commission may from time to time authorize, have authority to exercise and perform with respect to its designated geographical area any power or function vested in the Commission, and in addition may exercise such other powers and perform such functions as may be vested in such Section by the laws of any signatory body or by the laws of the United States. The exercise or performance by a Section of any power or function rested in the Commission may be financed by the Commission, but the exercise or performance of powers or functions vested solely in a Section shall be financed through funds provided in advance by the bodies, including the United States, participating in such Section.

"ARTICLE IV

"The moneys necessary to finance the Commission in the administration of its business in the Conservancy District shall be provided through appropriation from the signatory bodies and the United States, in the manner described by the laws of the several signatory bodies and of the United States, and in amounts as follows:

"The pro rata contributions shall be based on such factors as population; the amount of industrial and domestic pollution; and a flat service charge; as shall be determined from time to time by the Commission, subject, however, to the approval, ratification and appropriation of such contribution by the several signatory bodies.

"ARTICLE V

- “Pursuant to the aims and purposes of this compact, the signatory bodies mutually agree:

“1.Faithful cooperation in the abatement of existing pollution and the prevention of future pollution in the streams of the Conservancy District and in planning for the utilization, conservation and development of the water and associated land resources thereof.

"2. The enactment of adequate and, insofar as is practicable, uniform legislation for the abatement and control of pollution and control and use of such streams.

[11]3. The appropriation of biennial sums on the proportionate basis as set forth in Article IV.

"ARTICLE VI

"This compact. shall become effective immediately after it shall have been ratified by the majority of the legislature of the States of Maryland and West Virginia, the Commonwealths of Pennsylvania and Virginia, and by the Commissioner of the District of Columbia, and approval by the Congress of the United States *Provided. ho-mever. That* this compact shall not be effective as to any signatory body until ratified thereby.

"ARTICLE VII

"Any signatory body may, by legislative *act*, after one year's notice to the Commission, withdraw from this compact."

Now, therefore, be it

Consent of Congress.

Resolved by the Senate and House of Representatives of the United 8tates o f. America in Congress assembled, That the consent of Congress is hereby given to the States of Maryland and West Virginia and the Commonwealths of Virginia and Pennsylvania and the District of Columbia to adopt the aforementioned amendments and enter into the amended compact hereinbefore recited and every part and article thereof: Provide That nothing contained in such amended compact shall be construed as impairing or in any manner affecting any right or jurisdiction of the United States in and over. the region which forms the subject of this compact: And provided further. That the consent herein given does not extend to section (F) (2) of article II of the amended compact.

Sec. 2. The Commissioner of the District of Columbia is authorized to enter into, on behalf of the District of Columbia, the amended compact hereinbefore recited.

Sec. 3. The right to alter, amend, or repeal this joint resolution is hereby expressly reserved.

Approved September 25, 1970.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 91-1405 accompanying H.J. Res. 1179 (Comm. on Public works).
SENATE REPORT No. 91-1114 (Comm. on the Judiciary).
CONGRESSIONAL RECORD, Vol. 116 (1970):
Aug. 14, considered and passed Senate.
Sept. 14, considered and passed House, in lieu of, H.J. Res. 1179.

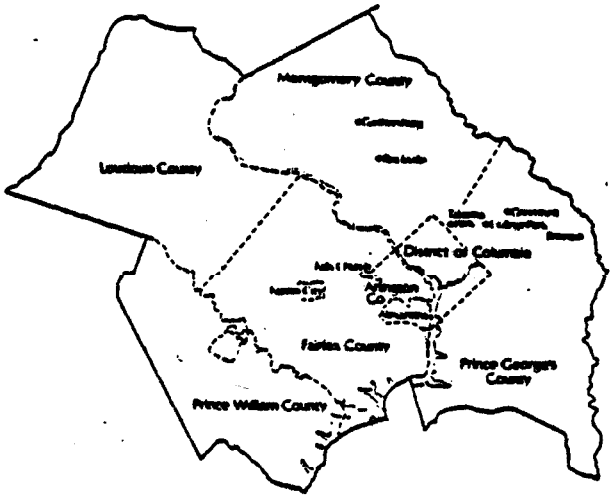
APPENDIX D

METROPOLITAN WASHINGTON

WATER SUPPLY EMERGENCY AGREEMENT

Prepared by

Metropolitan Washington Council of Governments



METROPOLITAN WASHINGTON

Metropolitan Washington Water Supply Emergency Agreement

This Agreement; made and entered into this fifth day of December, 1979, between local governments and regional and special purpose agencies within the Metropolitan Washington Area signatory hereto,

WITNESSETH:

WHEREAS, it has been determined by the concerned governments and agencies signatory hereto that interjurisdictional cooperation and assistance among the signatories to conserve water and 'provide for necessary curtailment of water use and improved management of the existing water supply during emergency shortages will increase their ability within their jurisdictions; and

WHEREAS, the Potomac River Low Flow Allocation Agreement is designed to equitably allocate Potomac River water for public water supply in the Metropolitan Washington Area during Potomac River low flow conditions, but does not address reduction in use of water to prolong the capability of water supplies to provide water during such conditions; and

WHEREAS, the signatories are authorized under Federal, state, and local law to enter into such cooperative agreements for conservation and management of existing water supplies within the Metropolitan Washington Area, although it is recognized that long-range water supply planning should minimize the need of invoking water supply, emergency agreements,

NOW, THEREFORE THE PARTIES HERETO DO AGREE AS FOLLOWS:

SECTION 1.00 PURPOSE

The purpose of this Agreement is to provide interjurisdictional assistance and coordination to conserve water and provide for necessary curtailment of water use during a critical water supply situation within the Metropolitan Washington Area.

SECTION 2.00 DEFINITIONS

2.10 "WATER SHORTAGE EMERGENCY": period during which the supply of available potable water is or may be limited such that special water conservation actions or water allocations are required to protect the health, safety, and welfare of the population.

2.20 "POTOMAC RIVER LOW FLOW ALLOCATION AGREEMENT": an agreement: among the State. of Maryland,. Commonwealth of Columbia Washington. Suburban Sanitary Commission, Fairfax County Water."
Authority and the U.S . Army Corps of Engineers to allocate Potomac River water for public water supply in the Metropolitan Washington Area during Potomac River low flow conditions.(See Attachment A to the Agreement.)

2.30 "METROPOLITAN WASHINGTON WATER SUPPLY EMERGENCY PLAN," commonly called Water Supply Emergency Plan, (formerly called the "GUIDE WATER SUPPLY EMERGENCY IMPLEMENTATION PLAN"): a plan issued in January 1978 for necessary curtailment of water use and other emergency actions during a water shortage or outage to water suppliers, local governments, and specified government agencies of the Metropolitan Washington Area. (See Attachment B to the Agreement.)

2.40 "PERTINENT PORTION OF THE POTOMAC RIVER": the portion of the Potomac River subject of this plan is defined as the pertinent portion of the river subject of the Potomac River Low Flow Allocation Agreement

2.50 "COORDINATOR": the Executive-Director of the Metropolitan Washington Council of Governments or his designee.

2.60 "AQUEDUCT": Chief, Washington Aqueduct Division, Baltimore District, U.S. Army Corps of Engineers, or his designee.

2.70 "METROPOLITAN WASHINGTON WATER RESOURCES PLANNING BOARD": established by the local governments of the Metropolitan Washington Council of' Governments with the responsibility for developing all policies, programs and other actions for the effective implementation of water quality management planning and other water resources planning, including planning for water supply.

2.80 "SIGNATORY": parties who have executed this Agreement including water purveyors, local governments, and specified government agencies.

2. 90 "WATER OUTAGE EMERGENCY": a condition in which the supply is a jeopardy of cessation; or is polluted; and in which immediate action is required by governments and agencies concerned to provide minimum necessary potable water for human consumption, to inform the public and to protect the health, safety and welfare of the population in the area or areas affected. .

SECTION 3.00 CONDITIONS FOR INITIATION

3.10 Potomac River Water Supply Emergencies

3.11 Stages of a Potomac River water supply shortage (Alert, Restriction, and Emergency stages) are defined and declared by the AQUEDUCT according to the POTOMAC RIVER LOW FLOW ALLOCATION AGREEMENT. These stages denote successively lower amounts of water supply available from the Potomac River. Parallel water shortages are contained .in the WATER SUPPLY EMERGENCY PLAN with emergency procedures-to be taken.

3.12 Potomac water supply emergencies other- than water shortages, including finished water and water quality emergencies (possibly creating a water outage), that exist within that portion of the Metropolitan Washington Area under a SIGNATORY's authority shall be defined and declared by the SIGNATORY. All affected local governments will be immediately notified to coordinate emergency procedures.

3.13 Only Potomac River water supply emergencies within the PERTINENT PORTION OF THE POTOMAC RIVER are subject to this Agreement.

3.20 Non-Potomac River Water Supply Emergencies

3.21 Stages of non-Potomac water supply shortages are defined and declared by the SIGNATORY who supplies water to that portion of the Metropolitan Washington Area affected.

3.22 Non-Potomac water supply emergencies other than-water shortages, including finished water and water quality emergencies, that exist within that portion of the Metropolitan Washington Area under a SIGNATORY's authority shall be defined and declared by the SIGNATORY.

SECTION 4.00 RESPONSIBILITIES OF THE COORDINATOR

Upon notification by the Aqueduct, the Coordinator will notify the District of Columbia Office of Emergency Preparedness of the necessary operations for the existing stage of water shortage emergency (same stages as defined in the Potomac River Low Flow Allocation Agreement); notify the public through the local news media, using the Local Emergency Broadcasting Procedures, of general aspects and actions called for in the critical stage as set forth in the Water Supply Emergency Plan; and provide informal monitoring and coordination of regional water conservation in response to a water shortage in accordance with the Plan.

SECTION 5.00 RESPONSIBILITIES OF THE SIGNATORIES

The SIGNATORIES have adopted or will adopt local procedures to meet water supply emergencies, and such procedures will be followed so long as they remain in effect. Nothing in this Agreement requires a local jurisdiction or agency to undertake any actions not allowed by law.

SECTION 6.00 WATER SUPPLY EMERGENCY AGREEMENTS

Any proposed amendment is not effective until approved by the majority of SIGNATORIES to this Agreement and any SIGNATORY who does not approve the amendments is not obligated under this Agreement to take any action or render any assistance required thereby.

SECTION 7.00 DURATION

This Agreement shall remain in effect until terminated by all SIGNATORIES hereto upon written notice setting forth the date of such termination. Withdrawal from this Agreement by one party hereto shall be made by thirty days written notice to all other parties but shall not terminate the Agreement among the remaining parties. ,

IN WITNESS WHEREOF the parties hereto. have executed this Agreement as of the date first above written.

- City of Alexandria, Virginia
- Arlington County, Virginia
- City of Bowie, Maryland
- City of College Park, Maryland
- District of Columbia
- City of Fairfax, Virginia
- Fairfax County, Virginia
- City of Falls Church, Virginia
- City of Gaithersburg, Maryland
- City of Greenbelt, Maryland
- Loudoun County, Virginia
- City of Manassas, Virginia
- Montgomery County, Maryland
- Prince George's County, Maryland
- Prince William County, Maryland
- City of Rockville, Maryland
- City of Takoma Park, Maryland
- Town of Vienna, Virginia
- Fairfax County Water Authority
- Loudoun County Sanitation Authority
- Washington Suburban Sanitary Commission
- Metropolitan Washington Council of Governments

ATTACHMENT A

POTOMAC RIVER LOW FLOW ALLOCATION AGREEMENT

11 January 1975

POTOMAC RIVER LOW FLOW ALLOCATION AGREEMENT

THIS AGREEMENT, made and entered into this 11th day of January 1978, by and among the UNITED STATES OF AMERICA (hereinafter called "the Government") acting by the Secretary of the Army through the Chief of Engineers,, the STATE OF MARYLAND (hereinafter called "the State") acting by the Governor and the Secretary of the Department of Natural Resources, the COMMONWEALTH OF VIRGINIA (hereinafter called the Commonwealth") acting by the Governor and the Chairman of the State Water Control Board; the DISTRICT OF COLUMBIA (hereinafter called "the District") acting by its Mayor, the WASHINGTON SUBURBAN SANITARY COMMISSION (hereinafter called "the Commission") acting by its Chairman; and the FAIRFAX COUNTY WATER AUTHORITY (hereinafter called "the Authority") acting by its Chairman;

PREFACE

WHEREAS, the Chief of Engineers is charged with the operation and maintenance of the Washington Aqueduct for the primary purpose of providing an adequate supply of potable water for distribution to and consumption by the agencies and instrumentalities of the Government situate in the District of Columbia and its environs, and thereafter of

providing a public water supply for the inhabitants of the District of Columbia, and

WHEREAS, the Secretary of the Army is authorized, subject to certain conditions, to supply treated water from the Washington Aqueduct to, any competent state or local authority in the Washington Metropolitan Area in Virginia, and to that end has entered into agreements with the County of Arlington and the City of Falls Church, Virginia; and

WHEREAS, the sole source of raw water treated by the Washington Aqueduct and dispensed therefrom is the Potomac River, and the Washington Aqueduct is now maintaining intake facilities for this purpose at Little Falls and Great Falls, Maryland; and

WHEREAS, the State of Maryland has enacted as appropriation permit statute which requires that all non-exempt jurisdictions obtain a permit from the Water Resources Administration of the State's Department of Natural Resources (hereinafter called "the Administration*) to appropriate or use the water of the Potomac River; and

WHEREAS, the City of Rockville, Maryland, is operating and maintaining water treatment facilities and a water distribution system and maintains an intake facility about one mile upstream from Great Falls on the Potomac. River, which intake is upstream from the Washington Aqueduct

herein requiring that access by any- of them to such 'water be made subject for the inhabitants of the District of Columbia; and

WHEREAS, the Commission is charged with the responsibility of providing a safe and adequate public water supply within the Counties of Montgomery and Prince George's, Maryland and is also authorized to enter into agreements to provide water, and for that purpose is operating and maintaining water treatment facilities and a water distribution system; and

WHEREAS, the Commission maintains a water treatment' plant and an intake therefrom on the Potomac River, which intake is upstream from the Washington Aqueduct intakes and within the limits of the River covered by this Agreement, and in addition the Commission maintains a water treatment plant with intake on the Patuxent River, and requires water from both sources in order to fulfill its above mentioned responsibilities for providing a public water supply; and

WHEREAS, the parties to this Agreement recognize that other riparian interests, such as communities located in Virginia, may in the future desire to withdraw and use water from the segment of the Potomac River which is the subject of the within Agreement, and provision is made

intakes and .within the limits of the River covered by this Agreement; and

WHEREAS; the Fairfax County Water Authority is an authority in the commonwealth of Virginia proposing to withdraw water from that portion of the Potomac River, which is covered by this Agreement and has applied for a permit to construct a water intake structure for such purpose; and

WHEREAS, in the absence of adequate upstream impoundments and associated flow regulation, the quantity of water which may flow in the Potomac River between Little Falls Dam and the farthest upstream limit of the pool of water behind the Chesapeake and Ohio Canal Company rubble dam at Seneca, Maryland, during periods of low flow in that portion of the River, may be less than the quantity needed to meet the demand for all customary public water supply purposes during such periods; and

WHEREAS, in light of the Federal legislative enactments providing for the Corps of Engineers to supply water to the District of Columbia, enactment of legislation was deemed by the Government to be a prerequisite to its participation in a Potomac River Low Flow Allocation Agreement; and

WHEREAS, the consent of Congress to a Potomac River Low Flow Allocation Agreement is expressly stated in Section 181 of the crater Resources Development Act of 1976, Public Law94-587; and

WHEREAS, the consent of Congress, pursuant' to Section 9 of the Rivers and harbors Act of 1899, to the construction of a water diversion structure by the Commission from the north shore of the Potomac River at the Commission's water filtration plant to the north shore of Watkins island is conditioned in Section 181 of the aforesaid Water Resources Development Act of 1976 upon an enforceable Low Flow Allocation Agreement; and

WHEREAS, it is the judgment of the Chief of Engineers and the Secretary of the Army, acting pursuant to Section 10 of the Rivers and Harbors Act of" 1899, that the public interest requires that such a Low Flow. Allocation Agreement be a requirement for issuance of the permits for the construction of water intake structures in the subject portion of the Potomac River by the Commission and the Fairfax County Water Authority;

NOW, THEREFORE, in consideration of the premises and of the public and governmental interests deemed to be served hereby, the parties hereto do mutually agree as follows:

ARTICLE l. Enforcement.

A. Certain Definitions:

1. Pertinent Portion of the River. The portion of the Potomac River subject to this Agreement-is that located

between Little Falls Dam and the farthest upstream limit of the pool of water behind the Chesapeake and Ohio Canal Company rubble dam at Seneca, Maryland. This portion is referred to herein as "the defined portion" or, alternately the subject portion" of the Potomac River.

2. Parties. The Government, the State, the Commonwealth, and the District shall be termed "the governing parties." All other parties hereto shall be termed "member parties." The term "parties" shall mean all parties, both governing and member, except when the context otherwise requires

a. Moderator. Authority to enforce the provisions of this Agreement shall be vested in an unbiased Moderator. It shall be the duty of the Moderator "and he shall have the authority:

l. To take all actions necessary to enforce the provisions of this Agreement and his decisions hereunder, and for this purpose he may sue in his own name.

2. To decide all disputes between or, among the parties arising under this Agreement not disposed of by consent.

The authority of the Moderator shall not restrict those powers reserved to the parties, including those specified in Article 3, Section C.

C. The decision of the Moderator shall be final and conclusive unless determined by a court of competent jurisdiction to have been fraudulent, capricious, arbitrary, or not supported by substantial evidence. All parties accept and implement every decision of the moderator unless and- until said decision is overturned by a court of competent jurisdiction.

D. The parties specifically grant to the Moderator the authority to inspect documents, records, meters, facilities, and other items necessary to decide any question or verify reports made by any party as a consequence of this Agreement. Upon the request of any party, the Moderator shall provide said party any or all of the information held by him relevant to this Agreement.

E. Should the Moderator decide to commence or defend any action or otherwise have need of legal services relating to this Agreement, he shall have the right to contract with counsel -for such purpose, and *the* cost of such services shall be repaid in equal shares by the governing parties in the interest of prompt action; the Moderator may - accept legal services, or an advance of funds, for such purpose from. any party. Nothing herein shall require a party being sued by the Moderator to advance funds for such purpose.

F. The Moderator shall not be liable for injury or damage resulting from any decision or action taken in good faith without malice under apparent authority of this agreement, even though such decision or action, is later judicially declared to be authorized or invalid.

G. The Moderator shall be selected, and may be, relieved of his duties for any reason, by unanimous action of the governing parties expressed in a signed memorandum. Should the office of Moderator become vacant through death, resignation, or otherwise, a new Moderator shall be selected as soon as practicable by such unanimous action. During any period in which the office of the Moderator remains vacant through a failure of unanimous action or otherwise, the full functions of the office of Moderator shall be exercised by a Stand by Moderator who shall, except as expressly otherwise provided, be treated as the Moderator for all purposes under the provisions hereof. The duty to designate the Standby Moderator shall rotate annually among the Government, the State, the Commonwealth, and the District in the order stated, beginning on the date this agreement becomes effective and rotating thereafter on the first day of each calendar year. Written notice of such annual designation shall be sent to all other parties by January 15 of each year. The first Moderator for this Agreement is designated in Annex A hereto.

H. Subject to the availability of funds, the reasonable expenses, including legal fees, and compensation of the moderator shall be paid in equal shares by the governing parties. Any expense shall be deemed reasonable if at least three of the governing' parties so agree or if so determined by a court if any such party accepts as reasonable a particular expense not accepted as reasonable by the other such parties, that party may pay that expense, in addition to that party's proportionate share of all other expenses. At the time of each annual review as provided in Article 4 of this agreement, the governing parties shall set by majority vote, the per diem fee to be paid a Moderator in the event his services shall be necessary. A Standby Moderator, who is an employee of the designating party or one of its political subdivisions or agencies, shall serve without fee in exercising the functions of the Moderator.

I. The Moderator or any party may bring an action against any one or more other parties to enforce this 'Agreement or a decision of the Moderator made hereunder. Such action shall be brought in -the United States District Court for the District of Columbia, and each party consents to venue in said court and to service of process upon it from said court, provided that if the action is between two states of the United States, such action may be commenced in the Supreme Court of the United States. In any such action the joinder of all

parties hereto shall not be deemed necessary or indispensable merely because they are parties to this Agree•-sent. Application for or receipt of a determination by the Moderator shall not be a prerequisite to the maintenance of an action by a party, but any decision made by the Moderator on a matter involved is s a i d action, whether before or after commencement thereof shall be given the effect set forth in Article I, Section C. Nothing. herein s h a l l be deemed to be a waiver of any immunity any party may have from a claim for monetary damages or a claim which has substantial fiscal impact, except for the fees and expenses which are provided to be paid pursuant to the agreement. It is the intention of the parties that any matters involving the technical aspects of maintenance of litigation be resolved in a manner which ensur rapid and certain enforcement of this Agreement.

ARTICLE 2. Administration.

A. Washington Aqueduct. The Government will provide a communication control center at the Washington Aqueduct for the administration of the allocation plan as provided herein. The Washington Aqueduct Division, Q. S. Army Engineer District, Baltimore ("the Aqueduct") , will collect, receive, record and accumulate daily reports regarding the flow of the Potomac River and the quantities of water being with drawn from the defined portion of the Potomac River, and the quantities of water withdrawn and available from all other

sources for use within the Washington metropolitan Area, by the parties and the political subdivisions, authorities, and permittees of any of them, and by any other water with drawing entity which May formally be added or made subject to this Agreement subsequent to its initial execution.

Subject to the parties' rights of appeal to the Moderator, the parties grant to the Aqueduct, and to each other, the right to inspect documents, records, meters, facilities and other items necessary to decide any question or verify reports made by any party as a consequence of this agreement.

Beginning with the Alert Stage, the Aqueduct will keep the Moderator informed as to the stage of flow in the Potomac River, and, during the Restriction and Emergency Stages the fair share allocated to each user, and all information utilize for determining the allocation. The Aqueduct will provide all parties with the same information relating to allocation, the quantities of water being withdrawn by all users from any and all sources, and the flow of the Potomac River. To permit uniformity of reports and to implement the administrative measures specified herein, reports acid calculations, by or to the Aqueduct, of daily withdrawals or daily flows, will be based on the twenty-four hour period from one midnight to the following midnight, unless the parties subsequently agree to a different twenty-four hour. measuring period. The Aqueduct will calculate the total daily flow by adding the withdrawals during the previous 24 hours at all withdrawal points and the

remaining daily flow over the Washington Aqueduct Dam at Little Falls, as determined by the readings recorded on the USGS gage at Little Falls during the preceding twenty-four (24) hours. The average reading will determine the flow over the dam for the previous day.

B. Stages of Flow in the Potomac River. The Aqueduct will determine fray the information accumulated when the following stages exist in the defined portion of the Potomac River.

1. Alert Stage. When the total daily withdrawal from the subject portion of the Potomac River is equal to or greater than fifty percent (50$) of the total daily flow, but less than 80%, the Aqueduct will declare an "Alert Stage" to be in effect.

2. Restriction Stage. When the total daily withdrawal from the subject portion of the Potomac River is equal to or greater than eighty percent (80%) of the total daily flow, the Aqueduct will declare a "Restriction Stage" to be in effect and the Aqueduct will request the II. S. Park Service to discontinue putting Potomac River water into the C&O Canal.

3. Emergency Stage. When the estimated total daily withdrawal for any within the ensuing five (5) days

from the subject portion of the Potomac River is expected to exceed the daily river flow anticipated will declare an "Emergency Stage" to be in effect.

C. Allocation of Flow. Whenever the Restriction Stage or the Emergency Stage is in effect, the Aqueduct shall daily calculate and advise each user (as defined herein), and the Moderator, of each user's allocated fair share of the water available from the subject portion of the Potomac River in accordance with this Section C. In calculating the amount of water available for allocation, the Aqueduct will determine, in consultation with the parties, and based upon then current conditions and information, any amount needed for flow in the Potomac River downstream from the Little Falls dam for the purpose of maintaining environmental conditions ("environmental flow-by") [4], and shall balance such need against essential human, industrial. and domestic requirements for water. The Aqueduct's determination shall be based upon the data and shall give substantial weight to conclusions for environmental flow by submitted by the State.

l. For the purposes of this Section C, the term "users" refers to the following entities which, are or may be appropriating water for public water supply purposes from the subject portion of the Potomac Rivers namely, the Government (including its water customers), the Commonwealth for and on behalf of herself and each of her political subdivisions and

authorities (including the Authority) , the State and the Administration (for and on behalf of its permittees whether or not parties to this. Agreement), the District of Columbia, the Commission, and such entities which may formally be added or made subject to this Agreement subsequent to its initial execution.

2. Each, user shall report to the Aqueduct (and to. each other) the number of gallons of processed water pumped daily to all its customers from all sources during each winter period (the months of December through February), commencing with the winter period 1377-78. 'The amounts pumped during the 5 most recent winter periods which have elapsed as of the time of allocation, or less than 5 if fewer have so elapsed, shall be combined for the purpose of computing each user's average daily winter use; except that, in the case of a user first withdrawal water subsequent to the initial execution of the Agreement, the average daily winter use of such user shall be the average of the amounts of water pumped during all of the winter periods, commencing December 1 of the year immediately prior to its first withdrawal from the subject portion of the river, which have elapsed as of the time of allocation, but not exceeding the 5 most recent winter periods. The ratio which the- average daily winter use of each user bears to the average daily winter use of all users will be applied to the daily amount of water available at the

time of allocation from the subject portion of the Potomac River (after deduction for environmental flow-by) and all other sources as specified in Paragraph 5 below. (calculated at maximum capacity practicable). The resulting amount, less the amount then available to said user by use of the maximum capacity practicable from all such other sources, will be such user's allocated fair share of the flow of the Potomac River.

3. a. The formula set forth in Article 2.C.2. shall continue in effect unless changed by unanimous consent of the governing parties or as set forth below. After January 1, 198E any of the governing parties which desires to change the allocation formula shall give written notice to all other parties. Within 60 days thereafter, both the governing and member parties shall meet for the purpose of negotiating a replacement formula. In the event that no such replacement formula is agreed on by the governing parties within one year after receipt of the aforesaid notice, the allocation ratio which would have been in effect for the summer of the year in which the notice was given shall be used as an interim allocation ratio for the withdrawal of water during subsequent periods of low flow until such time as the governing parties agree upon a replacement formula. Any governing party, at any time after the expiration of one, year from the receipt of such notice and after the exhaustion of such administrative procedures as may be applicable if it is a permittee for

water appropriation or withdrawal, may apply to a court of competent jurisdiction :adjudication of such rights, if any, as it or users associated with it may have to a greater share of water than set by the interim allocation ratio, provided that all parties shall adhere to the interim allocation ratio until and unless altered by a decision of such court. Applications for intakes, or other modifications to water works shall continue to be received and processed during periods in which the interim allocation ratio is in effect, but such ratio shall be recalculated only in the event of the grant of an application to a new user as set forth in Section E of Article 3.

b. Any formula negotiated pursuant to subparagraph a hereof shall allocate water on a fair and equitable basis and shall take into consideration, among other things, (a) steps taken by parties which can do so to minimize dependence upon the Potomac River during periods of low flow, (b) the nature and effectiveness of water conservation methods put into effect, (c) steps taken to increase the water supply availablefor the Washington Metropolitan Area, (d) then current population growth and planning for future growth, (e) feasibility and availability of new sources of water, and (f) technological advances in water treatment and water quality measurement.

c. In any court proceeding instituted pursuant to subparagraph a, neither the signing of this agreement nor the

passage of time thereafter shall be asserted as waiver or diminution of any party's rights to or right to seek a greater share of water from the subject portion of the river. Such action shall be brought in the United States District Court for the District of Columbia, and each party consents to venue in such court and to service of process upon it from such court, provided that if the action is between two states of the United States, such action may be commenced in the Supreme Court of the United States.

4. In the event the applicable allocation formula results in an allocation exceeding the proposed withdrawal of any user, the excess amount shall be reported by said user to the Aqueduct for reallocation.

5. The water subject to the allocation formula under the teams of this Agreement includes the maximum capacity practicable from Patuxent and Occoquan as it exists in each case on December 31, 1977, and *both* the natural flow and the augmented flow from existing upstream reservoirs, in addition to Bloomington Lake, of the subject portion of the Potomac River. Any other augmentation to flow, reservoir storage, or treating capacity developed by a user after December 31, 1977, shall not be made subject to the allocation formula, but those users who incur, or participate in the payment of, the expenditures for such augmentation may agree as to how it is to be divided and shall file a copy of said agreement with

the other parties: In recognition that the sole source of water supply for the District of Columbia is the Potomac River, each other party will offer the District an opportunity to participate in a portion of any additional augmentation for use during the Restriction and Emergency stages on reasonable terms, unless such party shows that it is infeasible to do so.

6. In the event a disaster, such as a major fire or water main break, results in an abnormal loss of a significant portion of any user's water supply, the Aqueduct shall determine suitable adjustments in low flow allocation during the emergency period created by the disaster only, taking into consideration all sources available to the users.

• 7. Water from the emergency pumping station having its intake at the estuary of the Potomac shall not be considered as water available from other' sources for the purposes of Section 2.C.2. or otherwise included in computations made under this agreement.

ARTICLE 3. Obligations of the Parties.

A. The-Government agrees to cause the Aqueduct as the operating agency to perform the functions and requirements which are required of the Government and the Aqueduct in this Agreement, including the furnishing of information to the other parties relating to the Aqueduct's water withdrawal , and use, the same as required by other parties to be furnished

To the Aqueduct under Subparagraphs B and D, of this Article. These functions and responsibilities of the Aqueduct shall be carried out under the supervision of the District Engineer, U.S.- Army Engineer District, Baltimore, or his designee, who shall be responsible for making the determinations required in the discharge of these responsibilities.

B. The parties agree to provide the Aqueduct with all the information relating to the withdrawal and use by them, their permittees, entities reporting through them and their political subdivisions, as applicable, of the waters of the subject portion of the Potomac River and availability, from other sources which is needed for the administration of the allocation system.

C. The State agrees that all appropriation permitsgranted by the Administration for any appropriation of water from the subject portion of the Potomac River shall include a provision subjecting the permittee to the provisions of this Agreement. Nothing herein shall restrict or limit such authority as the Administration may properly have to issue permits or impose low flow allocation requirements upon any other water appropriating permittee withdrawing water from other, segments of the Potomac River, or to enforce provisions of its permit's in the subject portion of the Potomac River; nor any such authority' as the Commonwealth may have; nor the authority of the Government with respect to navigable waters,

including the regulation of commerce among the states and the states and with foreign nations.

D. The parties will comply with the determinations made by the Aqueduct pursuant to this Agreement, unless and until overturned pursuant to the terms of Article 1.

E. Any community or entity which seeks to appropriate water from the subject portion of the Potomac River shall either become a member party to this Agreement or shall be governed by a permit which includes the low flow allocation formula and such other provisions as are necessary to effect the purposes of this Agreement. Any such community or . entity. may apply for permits necessary to build water intake . structures or to appropriate water, and such permits shall. be processed in accordance with the rules and regulations of the permit-issuing agency, notwithstanding the pendency of negotiations or the imposition of an interim allocation ratio pursuant to Section 2.C.3. 2f the necessary permits are granted to a. community or entity not previously withdrawing water from the subject portion of the river, the existing interim allocation ratio shall be recalculated based on winter period use for the year immediately prior to the first withdrawal from the subject portion of the river by such new user, The average daily winter use of the new user for such winter period and those of the other users employed in determining the interim allocation ratio shall be employed

to compute a revised interim allocation ratio, which shall remain in effect until a replacement formula is determined pursuant to Section 2.C.3.

F. This Agreement does not affect such rights as parties or others subject to this agreement may have to grant or obtain permits to appropriate additional amounts of water during periods other than the Restriction or Emergency stages, but except as specifically provided in Article 2, Section C and Article 3, Section E, any additional water use resulting therefrom shall not affect any user's allocated fair share during such stages.

ARTICLE 4. Review

In the month of April in each year during the term of this Agreement the parties shall convene for the purpose of reviewing the provisions of this Agreement and considering any modifications thereof, and make such modifications as the governing parties agree upon: Upon agreement among the governing parties, review and modifications as might be agreed upon can occur at any time and not be necessarily limited to the annual, April consideration. Entities shall be admitted as new member parties upon unanimous agreement of the governing parties.

ARTICLE 5. Revocation.

This Agreement shall not be revoked without the unanimous consent of the governing parties.

ARTICLE 6. Effective Date.

This Agreement shall become binding when: (1) it is executed by the parties, and (2) a Moderator has been selected as provided in Article 1.G. and (3) the Government issues one or more permits for the construction of any water diversion structure or water intake in the subject portion of the Potomac River to any party hereto or political subdivision or authority thereof, and (4) all acts have been taken by each of the parties hereto necessary to make this agreement binding and enforceable with respect to each of them, including, if' necessary, ratification by the legislatures of the signatory states.

Notice that all such necessary acts have been taken by each of the parties shall be delivered to the other parties along with the opinion of its respective counsel or attorney general that the acts taken are sufficient to cause this agreement to become effective, binding and enforceable under the laws or charter of such parties. The parties will, however, commence to record and maintain the consumption figures and other base data called for under the foregoing provisions of this Agreement, at the time they execute this Agreement. This Agreement may be executed in one or more counterparts.

ARTICLE 7 - Severability

The provisions of this agreement shall be severable and if any phrase, clause, sentence or provision of the agreement is declared to be unconstitutional or the applicability thereof to any party is held invalid, the remainder of such agreement shall not be affected thereby.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first above written, except as a different date of execution may be noted following any party's signature.

APPENDIX E

Notice of Study Initiation Bloomington Lake Reformulation Study

The Baltimore District, Corps of Engineers is beginning a reformulation study of the Bloomington Lake project to examine its full water supply potential. Downstream water supply needs are increasing, particularly in the Metropolitan Washington Area (MWA). Optimum use of existing facilities may be economically and environmentally preferable to constructing other facilities at this time. The purpose of this reformulation study is two-fold: (1) to determine the full water supply capability of the presently authorized low flow augmentation storage in Bloomington Lake by identifying optimum reservoir release rules; and (2) to determine the feasibility of reallocating some flood control storage to water supply storage to furnish additional downstream water supply.

Existing Project Description

The Bloomington Lake project is located on the North Branch Potomac River in Garrett County, Maryland and Mineral County, West Virginia, about eight miles upstream of the confluence with the Savage River near Luke, Maryland. The project was authorized by the Flood Control Act of 23 October 1962 for the purposes of flood control, municipal and industrial water supply, water quality, and recreation.. Construction began in 1971 and is scheduled for completion in 1981...

Costs allocated to water supply in any Federal project are to be repaid by non-Federal interests in accordance with the provisions of the Water Supply Act of 1958, as amended. For the existing Bloomington Lake project, 33.2 percent of the project cost is allocated to water supply with 5.8 percent being allocated to initial water supply storage and 27.4 percent to future water supply storage. A contract between the Federal government and the Maryland Potomac Water Authority (MPWA) for repayment of the initial water supply storage cost has been executed. To date, no contractual arrangements for the repayment of the future water supply storage cost in Bloomington Lake have been made.

Previous Evaluations of Reformulation

Since the evaluation of the project in the early 1960's, which was the basis for the authorization, two recent independent evaluations have been made of Bloomington Lake's water supply capability. One preliminary analysis was conducted by the Corps of Engineers in early 1979 and dealt primarily with the reallocation of flood control storage to water supply storage. The purpose of this analysis was` to use available data to determine if a detailed reformulation study of Bloomington Lake was warranted. Conclusions of the analysis were that some flood control storage could be reallocated to water supply storage if project authorization was modified, and this additional water supply storage could be-used effectively

to meet MWA projected water needs.

The second evaluation was conducted by the Johns Hopkins University at about the same time. It dealt with the combined regulation of the existing low flow augmentation storage in Bloomington Lake and Savage Reservoir (both Federal projects) plus storage in local MWA reservoirs (the Occoquan Reservoir operated by the Fairfax County Water Authority, Virginia and the Patuxent Reservoirs operated by the Washington Suburban Sanitary Commission, Maryland)...The product of the investigation was a computer simulation model titled "Potomac River Interactive Simulation Model (PRISM)," which accounts for items such as the Potomac Low Flow Allocation Agreement, initial storage in reservoirs, intake and treatment capacities, varying demands and supplies, flow-by to the Potomac Estuary, and other system constraints.

The PRISM was developed as a site-specific flow balance model for the MWA which allows the user to test different reservoir operating policies and then observe the effects on projected deficits and the remaining reservoir storages. The important conclusion of the Johns Hopkins work is that combined or conjunctive operation of the four reservoirs as one system can furnish significantly more flow in the Potomac River at Washington during a drought than if each reservoir were operated independently.

Need for Detailed Reformulation Study

At the time of authorization, Bloomington Lake was one of three reservoirs under consideration in the North Branch as well as one of the 16 reservoirs under consideration for the entire Potomac River Basin. Most of these reservoirs included potential water supply and water quality benefits for the MWA. Since then, no additional reservoirs have been authorized for construction, although water supply needs have continued to increase.

Five Congressmen from the MWA (Harris and Fisher, Virginia; Spellman and Steers, Maryland; and Fauntroy, District of Columbia) have formally requested a reformulation study of Bloomington Lake for the specific purpose of providing supplemental water supply to the MWA. Recent statements and questions by local officials as well as water resource agencies also indicate a great deal of interest in the reformulation of Bloomington Lake.

A detailed reformulation study of Bloomington Lake is desirable at this time for the following reasons:

To respond to the inquiries of the five Congressmen and water supply agencies regarding the full water supply potential of Bloomington Lake.

To analyze the possibility of operating Bloomington Lake and Savage Reservoir in conjunction with MWA reservoirs

(Patuxent and Occoquan) to maximize the volume of water available to the MWA during drought thereby delaying construction of new reservoirs or other facilities
for additional supplies.

To examine the changes in downstream flood damages if some flood control storage is reallocated to water supply storage, and to determine the impacts on present flood control beneficiaries.

To assess the ecological, environmental, and social impacts of reallocating storage from flood control to water supply.

To estimate in-stream flow losses and travel times between Bloomington Lake and the MWA for the purpose of scheduling reservoir releases for water supply.

To investigate "changed conditions" since authorization in 1962. These could include changes in flood damages resulting from flood plain development, implementation of Executive Order 11988 (Flood Plain Management) and the availability of Federal flood insurance; changes in water quality conditions and requirements, especially toxics, as mandated by Public Law 92-500; and changes in volume and timing of water supply needs, particularly with no other major reservoirs authorized for construction.

Study Approach

The Bloomington Lake Reformulation Study is being accomplished as an integral part of the Corps of Engineers' ongoing Metropolitan Washington Area Water Supply Study authorized by Section 85 of Public Law 93-251. This authorization directs the Secretary of the Army, acting through the Chief of Engineers, to: (1) make a detailed study of future water supply needs in the MWA and identify feasible water supply alternatives and their impacts; and (2) make recommendations to the Congress on a course of action for meeting both short-range and long-range water supply needs of the MWA. -More intensive use of the Bloomington Lake for water supply purposes (reformulation) will be investigated as one of the possible alternatives for the MWA, and these results will be incorporated into the recommendations for long-term solutions to the MWA water supply problems.

The Bloomington Lake project, as formulated in the 1962 authorization document, provides 92,000 acre-feet of low flow augmentation storage and 36,200 acre-feet for flood control storage. On the basis of expected benefits in the authorization document, the low flow augmentation storage was further subdivided into water supply storage and water quality storage. These storages were allocated to the various project purposes based on the prevailing conditions at the time of authorization. Since then, water quality, flood

control, recreation, and water supply needs have changed. Additionally, hydrologic data for nearly 20 more years is available, the MWA has experienced a severe drought in the mid-1960's, and the methodology for predicting future hydrologic conditions has improved with the use of computers.

Given these facts, the Bloomington Lake Reformulation Study has been divided into two major work elements: (1) investigation of the maximum water supply potential of the existing low flow augmentation storage; and (2) examination of the feasibility of reallocating some or all of the flood control storage to water supply storage. Overall, the study approach is to investigate the possibilities of storage reallocation among the project purposes in light of today's conditions...

The anticipated product of the Bloomington Lake Reformulation Study will be a companion document to the MWA Water Supply Study report to be completed in draft form in September 1981 and final form in September 1982. The Bloomington Lake Reformulation Study portion of the report will document the needs, technical analyses, impacts, and results of the work activities just described. Changes to the existing project storage allocation will not be recommended unless they are found to be in the best overall public interest.
If the report does recommend changes in local cooperation requirements, substantial changes in the project scope, or the addition or deletion of project purposes, then Congressional approval would be required before project modifications could be accomplished. The level of detail in such a report would be similar to any feasibility report, and would document the need for changes to the project.

Public Involvement

A continuous public involvement program will be part of the Bloomington Lake Reformulation Study. Beginning with this Notice of Study Initiation, newsletters will be published at significant decision points in the study. Public workshops and formal public meetings will be conducted during the study. Progress reports will be available for public review at various repositories throughout the area...

Source: U.S., Department of the Army, Corps of Engineers, Notice of Study Initiation Bloomington Lake Reformulation Study, Baltimore: Corps of Engineers, Baltimore District, 1980), pp.7-6.

APPENDIX F

Water Supply and Treatment Facilities in the District of Columbia

Existing Supply Facilities

On September 30, 1850, the Secretary of War was first made responsible for "supplying the City of Washington with pure water." Since that time, an officer of the Corps of Engineers or (since 1867) the Corps itself has been responsible for supplying water to the District of Columbia. The Washington Aqueduct is the agency of the Corps of Engineers that performs the actual function of supplying me water. This organization has been perpetuated since sometime prior to 1855, when it was first mentioned in a Congressional Statute.

The DC supply system consists of the facilities required to collect water from the Potomac River, convey it to the District of Columbia, and filter and pump a portion of it into the distribution system. This requires dams, conduits, reservoirs, filtration plants, pumping stations and transmission mains.

The Potomac River is the third largest stream on the Atlantic seaboard and it is the entire source of water for Washington, DC. Water supply intakes are located at Great Falls, Maryland, about 10 miles northwest of the District of Columbia boundary, and at Little Falls, Maryland, approximately 1-1/2 miles upstream from Chain Bridge. At Great Falls the river has a drainage area *of* 11,460 square miles, which is slightly less than the combined areas of the states of Maryland and Rhode Island. The average discharge is 7,100 million gallons per day (mgd) at Great Falls, Maryland. The maximum 'water consumption, at present, inching that of parts of Maryland and Virginia supplied from Washington purification plants utilizes only about 5 percent of the average flow, but more than the low flow record of 388 mgd which occurred on September '10, 1966 A record high of 448 mgd was withdrawn on June 18,1974. Therefore, during periods *of* drought, the supply of ware* from the free flowing Potomac Rive is barely adequate for needs of Washington and its environs.

Dams and Intakes. The diversion dam at Great Falls is a rectangular shaped masonry structure, reinforced with riprap upstream. It is 2,877 feet long, 8 feet wide at top, and 10 to 15 feet in height for the greater part of. its length. The twelve-inch-high flashboards on top of the dam maintain the surface of the intake pool at an elevation of 151.5 feet above mean sea level. Two screened intake structures feed the raw water conduits.

In June 1959, the Washington Aqueduct completed construction of a 1,500 foot diversion dam, intake works and a pumping station at Little Fails on the Potomac. This facility provides an additional independent raw water supply. A rising tunnel, 10 feet in diameter and 4,560 feet long, discharges into the Dalecarlia Reservoir. This remotely-operated intake structure and pumping station has an installed capacity of 450

mgd, and a future installed capacity of 600 mgd. A 36-inch reinforced concrete pipeline was built into the upstream face of the dam to serve areas in Virginia. A fish ladder was constructed through the dam at Snake Island.

Conduits. Two conduits (known as the Old Conduit and the New Conduit) conduct river water by gravity to the Dalecarlia Reservoir.

The Old Conduit, a part of the original system completed in 1863, traverses the nine miles between Great Falls and the Dalecarlia Reservoir, with an additional two miles of conduit linking the Dalecarlia and the Georgetown Reservoirs. This conduit is circular, nine feet in diameter. It is constructed of two or three rings'of brick or cementrubble masonry. The slope is about nine inches per mile for the entire length, and includes a number of tunnels, culverts, and bridges. Building a conduit of this magnitude and flatness.of grade makes it one of the remarkable engineering feats of its time. The conduit is under slight pressure at the upper end. The maximum capacity is 100 mgd. MacArthur Boulevard, originally Conduit Road, was constructed in 1870 between Great Falls and Washington to provide access to the old conduit and intake facilities in Maryland.

The New Conduit, completed in 1926, parellels the old conduit between Great Falls and Dalecarlia. It is horseshoe shaped, 10 feet by 10 feet in section, and made of reinforced concrete. Its hydraulic gradient is approximately the same as that of the old conduit. At Cabin John Bridge, a steel, concrete-encased, concrete-lined, inverted siphon is used in lieu of the bridge crossing of the old conduit. The maximum capacity is 100 mgd. Three interconnections with the old conduit permit repair of a section of either conduit without placing art entire conduit out of service.

The Dalecarlia Reservoir and Booster Pumping Station. The receiving reservoir is an earth-embankment, riprap-reverment, settling and storage reservoir. It is 46 acres in area, with a normal working capacity of 41 million gallons. It is located at the northwest District boundary in the valley of little Falls Branch. This reservoir provides 1 to 1-1/2 days of natural presedimenrarion prior to treatment. A dam across the northern neck of the reservoir creates a fore-bay at the effluent of the raw-water conduits. A renore-controlled booster station lowers the water level in the fore-bay and raises the level in the reservoir proper. This induces greater flow in the conduits by increasing the head differential and also increases the head between the reservoir proper and the Dalecarlia Treatment Plant and the Georgetown Reservoir. The booster station consists of three main pumps; each of 108-mgd capacity against a head of 8 feet, and a single unit of 21-mgd capacity, all electrically driven. Ware- from little Fails Pumping Station is pumped directly to the main Dalecarlia Reservoir.

The Georgetown Reservoir. The Georgetown Reservoir is an earth embankment, riprap-revetment, sedimentation and storage reservoir. It is 42 acres in area, with a usable capacity of 55 million gallons. Originally intended for use only as a settling, storage and distribution reservoir when the water supply was unfiltered, this reservoir is now used as a sedimentation basin for the water destined for the McMillan Filter Plant. Coagulant is added to the water in the conduit at Dalecarlia, where sufficient turbulent energy is generated during flow to Georgetown to accomplish mixing of the chemicals and flocculation. The floc formed in transit settles in the two sections of the reservoir which have paved floors. These sections are drained and cleaned periodically. Clarification continues during passage through the third

section of the reservoir; then the effluent from the reservoir passes through the Washington City Tunnel to the McMillan Reservoir A 7-foot-diameter conduit bypasses the reservoir for emergency use.

The Washington City Water Tunnel. The Washington City Tunnel is four miles long extending from the West Shaft at Georgetown Reservoir to the East Shaft at McMillan Reservoir. It is horseshoe-shaped in section, 9 feet by 9.8 feet, and constructed of brick and
rubble masonry (except for four hundred feet of flanged cast-iron pipe under Rock Creek). The end shafts are 12 feet in diameter. Two intermediate shafts, 6 feet in diameter, are at Rock Creek and Champlain Street. The entrance to the tunnel at the bottom of the West Shaft is at Elevation +70 feet, and the discharge end is at Elevation -14 feet. The lowest point in the tunnel is at Elevation -29 feet which is under Rock Creek. The gravity-flow capacity is 90 mgd. The maximum Capacity has been increased to 150 mgd by the installation of a pump in the East. Shaft.

The McMillan Reservoir and East Shaft Pumping Plant. The East Shaft Gatehouse of the tunnel is located at the southwest corner of the McMillan Reservoir. The East Shaft Pumping Plant consists of one vertical, adjustable-blade impeller pump with a maximum capacity of 150 mgd. This pump increases the head differential between the east and west terminals of the tunnel, thus increasing the rate of flow. The reservoir is earth-embanked and reverted with riprap. It has an area of 38 acres and a usable capacity of 100 million gallons. This facility is used as a storage reservoir. The water from the East Shaft Gatehouse is introduced to the reservoir at its northwestern end through a circulating conduct. This provides good water distribution and allows for additional settlement during passage through the reservoir to the pump intakes in the east bay.

The McMillan Pumping Station. At this station, three vertical, adjustable-blade impeller pumps, each having a capacity of 75 mgd against a head of 26 feet, lift water from the McMillan Reservoir to the adjacent McMillan slow-sand filters. Wash water for the filters is pumped from the unfiltered reservoir by two horizontal centrifugal pumps with capacities of 1-1/2 and 2 mgcl against a head of 250 feet. All pumps are electrically driven.

Existing Treatment Facilities

The McMillan Water Treatment Plant. The McMillan Water Treatment Plant, which was completed in 1905, is one of the few large, slow-sand filtration plants still in use in the united States. originally rated at 75 mgd, plant improvements and modification of treatment operations have increased the capacity to 125 mgd. There are 29 slow-sand filter beds with an area of one acre each with necessary sand bins, regulator houses, and administration and maintenance buildings. The filters are of groined arch, unreinforced concrete construction, with a sand depth of 26 inches supported by 12 inches of graded crushed scone. The sand has an effective size of 0.32 millimeters and a uniformity coefficient of 1.75.

Filtered water is collected by an underdrain system of 6-inch and 12-inch tile pipes, laid with open joints on the filter floor, feeding a

24-inch central collector. Twenty-inch -diameter effluent pipes equipped with propeller meters deliver the filtered water, to the ,regulator houses. A large, collector main intercepts the filtered water from the regulator houses and discharges it into the north chamber of two clear-water basins connected in series. Filters are washed after filtering approximately 1000 million gallons. A treaded electrically operated mechanical unit scrapes and washes the sand, ejecting cleaned sand immediately behind the machine. The sand is raked with a tractor-drawn harrow between washings. Sand is deep-cleaned as necessary.

Pre-treatment with aluminum sulphate at Dalecarlia and subsequent sedimentation at Georgetown and McMillan Reservoirs results in curbidiries as low as 1 N.T.U. in the water as it is applied to the McMillan filters. Chlorine and fluoride are added to the McMillan raw water as it leaves Dalecarlia. After filtration, the water is again created with chlorine and the pH is adjusted with hydrated lime. Two covered clear-water basins are adjacent to the filters and have a combined capacity of 33.2 million gallons. These basins act as a suction well for the nearby Bryant Street Pumping Station, which pumps water to the various pressure services. when Low Service is not being pumped, the basins act as a distributing reservoir for that service area.

The 73 year-old plant 'is currently being modernized by replacing the slow-sand filters with 12 rapid-sand filters rated at 120 mgd. New pumping units will be installed and a new chemical building constructed.

The Dalecarlia Water Treatment Plant. Dalecarlia is a rapid-sand fitter plant with a rated capacity of 85 mgd. It was constructed in 1928. Since that time 16 additional filters and a new chemical building have been constructed, increasing the nominal capacity to 164 mgd.
This plant receives raw water from the Dacarlia Reservoir. Chlorine is applied to the raw water entering the plant to disinfect the water and to oxidize any organic matter which may be present. Chlorine residuals are maintained during flocculation, sedimentation, filtration, and in the finished water going to the city.

Aluminum sulphate is also fed continuously to the. raw water. Complete mixing of chemicals with the raw water and' flocculation occur in the mechanical flocculation chambers located at the influent of the sedimentation basins. Removal of the alum floc, together with the entrapped mud particles and bacteria, occurs in the sedimentation basins. There are two concrete sedimentation basins, each 335 feet long, 150 feet wide, and 12 to 17 feet deep, with around-the-end diversion walls.

There are also two double-deck flocculation-sedimentation basins, added in 1949 ark d 1967. The water enters these two-story basins through distributing ports into the flocculation section, which is part of the lower story. Flocculation is accomplished by six rows of paddles, 14 feet in diameter, operating with axes transverse to the flow of the water. From here, the water flows through the lower sedimentation section; then, vertically, upward and back through the upper sedimentation section to the effluent channel. The capacity of the flocculation section of the basin is 1.64 million gallons and the retention

TABLE 1
WASHINGTON AQUEDUCT DIVISION
U.S. ARMY ENGINEER DISTRICT BALTIMORE
COMPOSITE MINERAL ANALYSIS OF WATER
BY DALECARLIA LABORATORY

POTOMAC RIVER RAW WATER SUPPLY FOR SC

1977	Turbidity NTU	Temperature °F	pH	Alkalinity as Ca Co. mg/l	Total Solids mg/l	Methylene Blue Active Substances mg/l	Chloride mg/l	Fluoride mg/l	Total Phosphorus mg/l	Silica mg/l	Sulfate mg/l	Nitrate as Nitrogen mg/l	Arsenic mg/l	Barium mg/l	Cadmium mg/l	Chromium mg/l	Lead mg/l	Mercury mg/l	Selenium mg/l	Silver mg/l	Aluminum mg/l	Beryllium mg/l	Calcium mg/l	Copper mg/l	Iron mg/l	Magnesium mg/l	Manganese mg/l	Nickel mg/l	Potassium mg/l	Sodium mg/l	Strontium mg/l	Zinc mg/l	Hardness Total as Ca Co. mg/l
January	4	38	8.3	89	156	.007	16.5	.16	.070	1.8	34	2.19	.001	.023	.002	.001	.003	.0002	.001	.001	0.006		45.5	.021	0.041	8.6	.006	.001	1.1	8.3	.109	.013	148
February	9	41	8.2	76	176	.010	16.4	.15	.109	2.1	39	1.62											43.4			8.5							142
March	49	53	7.5	38	122	.011	11.4	.12	.052	4.5	20	1.18	.004	.064	.001	.005	.003			.000	1.950		25.4	.01	3.860	5.0	.116	.004	2.4	5.4	.104	.015	82
April	59	64	7.9	55	136	.005	10.0	.09	.056	3.4	22	1.10	.004	.061	.002	.005	.014			.000	2.600		29.0	.064	5.200	5.1	.224	.004	2.1	4.3	.120	.054	93
May	13	76	8.3	85	191	.006	13.6	.13	.043	1.2	33	0.76	.001	.050	.005	.002	.001			.000	1.290		40.2	.003	0.600	7.8	.099	.005	2.2	7.8	.170	.003	132
June	22	79	8.2	93	236	.008	19.9	.13	.034	2.2	42	0.41	.001	.036	.001	.001	.011	.0001	.001	.000	1.170		49.6	.004	0.760	8.3	.142	.005	2.6	14.2	.200	.009	157
July	33	87	7.8	75	224	.010	23.9	.16	.021	1.3	49	0.21	.001	.070	.000	.002	.002	.0001	.001	.000	2.100		39.6	.018	1.320	8.9	.200	.005	3.2	20.8	.200	.006	138
August	30	85	7.9	82	236	.009	24.6	.16	.032	1.8	48	0.22	.002	.076	.000	.002	.001	.0001	.001	.000			42.4	.003	1.200	7.9	.190	.005	3.2	25.7	.200	.005	139
September	28	77	7.8	88	303	.008	30.9	.16	.014	1.4	61	0.15	.001	.065	.000	.003	.002	.0001	.001	.000	2.100		49.6	.005	0.940	11.3	.130	.005	3.4	34.8	.250	.006	167
October	15	64	8.1	103	317	.003	31.0	.25	.022	2.6	23	0.32	.002	.053	.000	.002	.001	.0001	.001	.000	2.600		57.7	.007		9.4	.070	.005	3.1	28.3	.240	.003	184
November	28	58	7.6	68	179	.007	15.3	.10	.059	6.3	39	0.56	.001	.047	.000	.002	.002		.002				42.2	.002		9.2	.040		2.1	5.5	.100	.009	136
December	47	45	7.5	47	140	.011	13.2	.06	.056	6.2	26	1.72	.001		.000	.001	.002		.002	.000	1.400		33.4	.002	0.500	6.3		.004	2.3	6.8		.004	106
Average	28	64	7.9	75	201	.008	18.9	.14	.047	2.9	36	0.87	.002	.054	.001	.002	.004	.0001	.001	.000	1.691		41.5	.013	1.603	8.0	.122	.004	2.5	14.7	.169	.011	135
Maximum	59	87	8.3	103	317	.011	31.0	.25	.109	6.3	61	2.19	.004	.076	.005	.005	.014	.0002	.002	.001	2.600		57.7	.064	5.200	11.3	.224	.005	3.4	34.8	.250	.054	184
Minimum	4	38	7.5	38	122	.003	10.0	.06	.014	1.2	20	0.15	.001	.023	.000	.001	.001	.0001	.001	.000	.006		25.4	.002	0.041	5.0	.006	.001	1.1	4.3	.100	.003	82

period is 45 minutes, with an average velocity of 2.6 feet per minute. The lower sedimentation section is 316 feet long, 138 feet wide, and 17 feet deep. The upper basin is 460 feet long. 138 feet wide, and 15 feet deep, with a total capacity of 12.074 million gallons. The retention period in the sedimentation sections is 5.4 hours, and these basins are flushed out 3 or 4 times per year.

From the sedimentation basins, the settled water flows by gravity to the 36 rapid sand filter beds. The old filters have a rated capacity of 4 or 6 million gallons per filter per day, at design filtration rates of 2 gallons per minute per square foot. Both sand and crushed anthracite coal are used as filter media. The filters are cleaned by back washing with filtered water. Rotary surface sweeps are utilized during the backwash operation.

The filtered water may be post-chlorinated, if necessary, to obtain desired residual chlorine in the finished water. Powdered activated carbon may be applied to remove objectionable tastes and odors, and sulphur dioxide may be added to remove excess Chlorine. Quick -lime is added to adjust the pH and to control corrosion in the distribution system.

Fluoridation of water was begun on June 23,1952. Fluoride residuals of approximately 1 ppm are carried in the mains. This has been determined as the optimum to accomplish reduction of dental caries.

The filtered and treated water is collected in covered concrete clear water basins. The original clear water basin at Dalecarlia has a capacity of about 15 million gallons. An additional 30-million-gallon covered clear water basin was completed in 1954, increasing the total reserve storage to 45 million gallons. The main brick and concrete filtration plant building houses chemical storage bins, chemical feed equipment, and a complete waterworks laboratory.

The physical and chemical characteristics of raw and finished water are given in tabulation on Table 1. The water supplied by the Washington Aqueduct system exceeds all standards promulgated to date by the U.S. Environmental Protection Agency under the Safe Drinking Water Act.

In order to meet certain requirements of the USEPA, modifications to the waste solids handling facilities are being planned. The filter backwash will be recycled to the raw water inflow and the solids removed in the sedimentation basins will be thickened and disposed in a landfill. Other modifications to the sedimentation basins and provisions for removal of solids from the Georgetown Reservoir are being studied.

DALECARLIA WATER TREATMENT PLANT FINISHED WATER 1 8

1977	Turbidity NTU	Temperature °F	pH	Alkalinity as CaCO3 mg/l	Total Solids mg/l	Methylene Blue Active Substances mg/l	Chloride mg/l	Fluoride mg/l	Total Phosphorus mg/l	Silica mg/l	Sulfate mg/l	Nitrate as Nitrogen mg/l	Arsenic mg/l	Barium mg/l	Cadmium mg/l	Chromium mg/l	Lead mg/l	Mercury mg/l	Selenium mg/l	Silver mg/l	Aluminum mg/l	Beryllium mg/l	Calcium mg/l	Copper mg/l	Iron mg/l	Magnesium mg/l	Manganese mg/l	Nickel mg/l	Potassium mg/l	Sodium mg/l	Strontium mg/l	Zinc mg/l	Hardness Total as CaCO3 mg/l
January	31	38	8 5	92	226	008	18 9	1 06	038	2 1	42	2 15	001	040	001	001	002	001	001	001	015		48 6	019	020	8 1	010	001	1 0	8 4	105	020	155
February	20	41	8 2	77	228	008	21 3	1 10	025	1 9	43	1 51											50 7			7 2							157
March	15	53	8 1	42	160	009	17 8	1 06	009	4 8	28	1 13	001	054	000	001	001			000	041		35 5	002	031	5 0	007	002	2 2	5 5	114	005	107
April	14	63	8 4	56	166	008	16 8	1 10	020	3 2	27	1 12	001	049	000	001	007			000	214		36 8	050	349	5 1	057	001	1 7	4 6	120	014	112
May	18	74	8 1	82	228	008	20 1	1 05	014	1 7	40	0 65	001	048	010	001	000			000	108		44 1	004	018	7 1	003	005	2 2	7 7	180	001	140
June	33	78	7 8	87	276	007	26 4	0 99	012	2 5	45	0 33	001	061	000	002	000		001	000	083		53 1	008	094	8 7	020	005	2 6	13 6	200	002	168
July	38	85	7 6	72	273	008	30 9	0 89	008	1 4	54	0 20	001	066	000	001	000	000	001	000	091		48 0	007	045	8 3	015	005	3 2	20 8	200	001	156
August	36	83	7 7	80	280	008	32 1	0 98	023	1 8	59	0 17	001	064	000	001	000	000	001	000	153		49 7	004	020	8 0	013	005	3 1	25 0	200	001	158
September	24	79	7 6	88	350	004	36 3	0 99	008	0 9	70	0 10	001	058	000	001	000	000	001	000	130		54 8	003	023	10 8	011	005	3 3	34 3	220	001	180
October	25	62	7 6	98	317	009	35 1	1 16	011	1 3	42	0 38	001	046	000	001	000	000	001	000	110		40 4	002	017	10 0	007	005	3 2	12 5	240	001	192
November	17	56	7 6	69	184	002	27 8	1 03	016	5 3	40	0 39	001	036	000	000	000		002				49 8	001	019	8 1	001		2 3	5 3	150	001	150
December	15	44	7 8	50	162	010	13 7	0 92	014	6 0	37	1 60	001		000	000	000		002	000	060		40 6	001		6 2		002	2 5	6 8		001	125
Average	24	63	7 9	74	238	007	24 8	1 03	016	2 7	44	0 81	001	052	001	001	001	000	001	000	101		46 0	009	064	7 7	014	004	2 5	14 5	173	004	150
Maximum	38	85	8 5	98	350	010	36 3	1 16	038	6 0	70	2 15	001	066	010	002	007	001	002	001	214		54 8	050	349	10 8	057	005	3 3	34 3	240	020	192
Minimum	14	38	7 6	42	160	002	13 7	0 89	008	0 9	27	0 10	001	036	000	000	000	000	001	000	015		35 5	001	017	5 0	001	001	1 0	4 6	105	001	107

McMILLAN WATER TREATMENT PLANT FINISHED WATER "I"

1977	Turbidity NTU	Temperature °F	pH	Alkalinity as Ca Co mg/l	Total Solids mg/l	Methylene Blue Active Substances mg/l	Chloride mg/l	Fluoride mg/l	Total Phosphorus mg/l	Silica mg/l	Sulfate mg/l	Nitrate as Nitrogen mg/l	Arsenic mg/l	Barium mg/l	Cadmium mg/l	Chromium mg/l	Lead mg/l	Mercury mg/l	Selenium mg/l	Silver mg/l	Aluminum mg/l	Beryllium mg/l	Calcium mg/l	Copper mg/l	Iron mg/l	Magnesium mg/l	Manganese mg/l	Nickel mg/l	Potassium mg/l	Sodium mg/l	Strontium mg/l	Zinc mg/l	Hardness Total as Ca Co mg/l
January	50	56	7.9	73	176	009	18.1	1.16	032	2.7	37	1.99	001	040	001	001	001	000	001	001	003		42.8	042	007	7.8	003	001	1.0	8.3	104	011	140
February	29	37	8.2	83	226	008	19.8	1.08	008	2.0	45	1.52											54.0			7.7							165
March	21	48	8.2	39	152	004	15.2	1.00	010	4.1	33	1.20	001	042	000	001	006			000	072		33.2	051	047	4.7	012	001	1.8	5.4	102	008	103
April	23	59	8.3	48	145	007	14.1	1.16	016	4.0	30	1.11	000	051	001	001	005			000	720		32.9	071	480	5.5	105	001	1.7	4.5	110	018	104
May	22	70	8.2	75	202	006	18.1	1.16	008	1.6	41	0.78	001	047	000	001	000			000	619		41.7	018	007	6.6	001	005	2.1	7.3	160	001	133
June	20	78	7.8	85	256	005	22.5	1.06	014	2.6	50	0.26	001	059	000	000	000	000	001	000	019		50.7	025	008	8.1	001	005	2.5	12.5	200	006	163
July	58	84	7.7	71	262	005	31.8	0.82	013	1.3	59	0.19	000	069	000	001	000	000	001	000	118		46.9	034	045	8.9	040	005	3.1	20.1	200	002	154
August	31	83	7.7	77	294	006	34.3	0.90	021	2.2	68	0.12	000	060	000	001	000	000	001	000	038		49.6	034	033	8.2	010	005	3.1	23.6	210	002	157
September	24	78	7.7	81	329	003	40.2	0.92	002	0.9	82	0.20	001	058	000	001	000	000	001	000	028		52.3	036	011	10.8	005	005	3.4	33.2	220	003	177
October	23	63	7.7	96	330	000	38.6	1.16	010	1.1	39	0.22	000	053	000	001	000	000	001	000	060		58.6	037	005	10.5	002	005	3.5	31.0	230	002	196
November	32	55	7.6	68	193	001	30.9	1.00	016	3.9	42	0.34	000	042	000	001	000		002		030		48.8		006	8.7	001		2.9	6.9	140	001	154
December	17	41	7.9	46	171	008	17.2	0.79	022	5.9	37	1.52	000		000	000	000		002	000	040		39.4			5.9		002	2.4	6.6		001	121
Average	29	61	7.9	70	228	005	25.1	1.02	014	2.7	47	0.79	000	052	000	001	001	000	001	000	106		45.9	039	063	7.8	018	004	2.5	14.5	168	005	147
Maximum	58	84	8.3	96	330	009	40.2	1.16	032	5.9	82	1.99	001	069	001	001	006	000	002	001	720		58.6	071	480	10.8	105	005	5.5	33.2	230	018	196
Minimum	17	36	7.6	39	145	000	14.1	0.79	002	0.9	30	0.12	000	040	000	000	000	000	001	000	003		32.9	018	005	4.7	001	001	1.0	4.5	102	001	103

APPENDIX G*

THE WASHINGTON METROPOLITAN WATER SUPPLY TASK FORCE

For more years than most of us who are responsible for the Washington Metropolitan Region's water supply care to remember, we have been trying to insure that the communities we serve will have an adequate supply. It should be emphasized that we are not committed to providing all the water needed for all the possible lawn watering during the most severe drought on the driest thereof. All our planning today is based on conservation and drought management through restrictions as necessary. We prefer to avoid restrictions but accept that they, along with conservation, are elements of water resource planning.

The history of efforts has bearing on formation of the Washington Metropolitan Water Supply Task Force so it is appropriate to review the past briefly.

THE PAST

1962	Bloomington Reservoir authorized
1963	Corps' District Engineer recommends 16 Reservoirs
1969	Chief of*Engineers recommends 6 of the 16
1970	Secretary of the Army recommends 2 of the 6:
	Sixes Bridge -- Maryland
	Verona -- Virginia
1974	Congress authorizes;
	Sixes* Bridge – Maryland
	Verona - Virginia Pilot Estuary Plant
	A new final all purpose Washington Metropolitan Water Supply Study

The Bloomington Reservoir that started filling in the summer of 1981 was authorized in 1962 (almost 20 years from the time it was authorized until it was in service). Almost in conjunction with the authorization of Bloomington the Baltimore District Engineer completed a Potomac water resource study and recommended 16 reservoirs *in* the basin. This sounds like a large number of reservoirs, and it is, but it should be remembered that the study considered flood control and pollution abatement as well as water supply. Six years later the Chief Engineers, after reviewing that report recommended that six of the sixteen be constructed immediately. The Secretary of the Army reviewing the Chief's recommendation a year later recommended two of the six - Sixes Bridge and Verona -- for early action. Four years later, in 1974, the Congress not only authorized Sixes Bridge and Verona, they authorized the Pilot Estuary Plant and yet another study of the Washington Metropolitan water supply. This study is unique because it was authorized by Congress without the request of local jurisdictions and also unique because the authorization requires a review by the National Academy of Sciences.

What has happened to all this Congressional activity in 1974?

*Remarks of Robert S. McGarry, General Manager, Washington Suburban Sanitary Commission before National Capital Section, American Water Resources Association Conference on "1980's View of Water Management in the Potomac Basin," Washington, D.C., November 12, 1981.

In the fall of 1981 we find that Bloomington reservoir has been completed and is in operation. The Pilot Estuary Plant has been completed and is in the testing phase. Because of local opposition both Sixes Bridge Reservoir in Maryland, and Verona Reservoir in Virginia are, for all practical purposes, a dead idea. The Corps has completed the interim report on the Washington Metropolitan Water Supply Study. As will be explained, this interim report had a significant impact on the water supply issue.

Perhaps the most important step that has been taken since 1974 is the formation of a Regional Water Supply Task Force to solve the region's problems with regional resources. Water supply is a local problem and we have finally recognized the problem as our responsibility and put in place a mechanism to resolve it.

A brief review of the events that lead to the formation of the Water Supply Task Force is also important. Frustrated with years of study that produced no action to resolve Prince George's and Montgomery Counties' water supply situation, the two Maryland counties determined to find a solution that could be implemented by WSSC for them. In 1975, Prince George's, Montgomery County and WSSC formed a Bi-County Water Supply Task Force. It is important to consider how this task force operated because it was successful. First, the task force was the political leadership of the two counties. Since the solution would have to be approved and financed by the local governments through the WSSC and if opposition arose it would be the political leadership that took the heat, it was very important that elected officials lead the task force. The task force also had a strong Citizens Advisory Committee " that did their homework, studied the issues, and influenced all decisions. This citizen involvement is important because the conclusions of the study were liable to be controversial. A broad ba4Pd citizens' committee with expertise and interest in the environmental, welfare of the two counties would assist the political leadership to obtain public support for any final decisions. Third, the task force had strong technical support from WSSC and consultants selected in consultation with the leaders and the Citizens Advisory Committee. After two years, the task force completed their work and first accepted the concept of risk (drought) management. An over simplification of almost two years of work describes the risk management concept. The task force accepted L8% probability that there will be restrictions on the outside use of water (primarily lawn irrigation) in any year. This reduced the additional water requirements by almost two thirds. Having accepted this fairly new concept of drought management, the task force considered 13 alternative ways to meet the bi-county demands and selected the construction of Little Seneca Reservoir. Several public hearings on the Task Force's work showed general support for the analysis and Little Seneca as the best solution. This facility is well on its way to construction. All land has been purchased, the design is complete and the necessary State *and* Federal permits have been issued. Little Seneca. Reservoir, plus WSSC's share of Bloomington Reservoir, will insure that Montgomery and Prince George's County have an adequate water supply through 1995. The Maryland portion of the regional water supply problem was solved!

While the Bi-County Water Supply Water Supply Task Force was making their study the Corps' Washington Metropolitan Study was also underway. At the request of local governments the Corps' interim report concentrated on solutions that could be implemented within the region served (as opposed to reservoirs in other counties or even other states). Again, it is an over simplification to try to summarize such a thorough study so briefly, but the Corps concluded that the water supply needs of the metropolitan region could be met using WSSC's Little Seneca plus an interconnection between either the Occoquan or the Patuxent Reservoirs and the Potomac River. The study also pointed out that these were local decisions.

As part of the Corps' interaction with local and state agencies, the District Engineer established a Federal, State, Interstate Regional Advisory Committee, for the water study (FISRAC). At the FISRAC meeting in the fall of 1979, all members concluded that the solution was indeed local. The Corps' recommendations could be implemented if the local governments and water supply agencies chose to do so. The FISRAC members also concluded that the success of the Bi-County Water Supply Task Force suggested a Washington Metropolitan Water Supply Task Force be formed to solve this problem and asked the Washington Suburban Sanitary Commission to see if such a task force could be organized.

In January 1980 the Presidents of the District of Columbia, Fairfax, Prince ,George's and Montgomery Councils met at WSSC and agreed to form such a task force. This was a major step forward. The four regional governments had met and agreed to solve their water supply needs regionally.Because of the success of the Bi-County Water Supply Task Force the D. C. Metro Task Force was organized the same way. The task force consists of the President (or Chairman) of the four Councils. A strong Citizens Advisory Committee of 12 (three from each jurisdiction) has been formed and they have been involved in each step of the study and decision-making process. The technical committee, using the resources of the Washington Aqueduct Division, the Fairfax County Water Authority and WSSC, has provided the data and analysis for the task force's consideration.

Shortly after the first meeting the task force approved the following work plan:

Demand	--	The first step of the task force would be to analyze all available data and previous studies to determine the demand for the region.
Existing Capacity	--	Next a study of the existing capacity of all the regional facilities including Bloomington and WSSC's planned Little Seneca Reservoir.
Options to meet	--	Expecting that existing capacity would Shortages not meet the demand, the task force would then consider a range of options to meet any shortages.

Public Workshop	-	At this point the task force planned a public workshop to,obtafn public understanding and hopefully concurrence on the demand, existing capacity and the options to meet the demands.
Action Plans	-	The options would be analyzed and a plan selected.
Public Hearings	-	A series of public hearings in the four jurisdictions to explain the adopted plan and receive public input.

Select Action Plan - Following the public hearings and after consideration of the input the task force would select a plan for information.

For the regional water needs it was decided to use the Corps' Washington Metropolitan Water Supply data. There was some consideration that changes in population projections since the Corps' study might have caused a significant change in demand. However, it was found that this was not the case and the Corps' projections were accepted.

The task force next turned to the analysis of existing capacity. During the period the task force was beginning its work another important regional decision was made. At the recommendation of the Interstate Commission on the Potomac River Basin, it was agreed to form the CO=OP Section. The purpose of this section was to develop a computer water supply operating model that would enable the region to more accurately forecast river flows *and* predict demand and thereby manage supply better. It is important to note that the CO-OP Section and model are regional in nature. In analyzing the capacity the task force decided to use this model. In conjunction with the Interstate Commission on the Potomac River Basin we developed the model to predict daily *demands* based on the Corps' analysis of regional demand, predict daily flows, and then simulate releases from the reservoirs. Again, the nature of this model is extremely important because all facilities; Fairfax County's Occoquan Reservoir, WSSC's two Patuxent Reservoirs, the Savage Reservoir in Allegheny County, the newly completed Bloomington Reservoir *and WSSC's* proposed Little Seneca Reservoir *(which* at that time was intended solely for the use of Prince George's. and Montgomery County) are included as regional resources.

The technical Committee (WSSC, WAD and FCWA) in conjunction with the Director of ICPRB CO-OP found that the region had adequate water through the year 2000 if:

ALL the facilities were operated on a regional basis

The CO-OP model logic analysis was sound

The legal, financial and political implications of regional cooperation could be solved.

We studied the model logic further, discussed it with the experts from the Corps, and concluded that the logic was indeed sound.

After thorough coordination with the Citizens Advisory Committee, it was recommended to the task force that the regional water supply needs (through 2000) could be met if the entire regional capacity was operated regionally and if Little Seneca Reservoir was shared. The task force approved this concept and directed the Technical Advisory Group and the citizens to develop recommendations on cost sharing and regional operating agreements. This is indeed a significant point in the water supply situation for the District of Columbia *and* Metropolitan region. A solution acceptable to all the jurisdictions, implementable within the jurisdictions, had been agreed upon. Only the details of implementation remain to be resolved.

The ruining work for the task force is the cost sharing arrangements and a regional operating plan. Also, it may be necessary to modify the Potomac River Low Flow Agreement. Side issues that have to be resolved are the inter-relationship of the Potomac Water Authority and the regional jurisdictions in regard to repayment to the Federal government for-the water supply storage in Bloomington Reservoir and the question of the operating and maintenance coats for Savage Reservoir which are currently borne by Allegheny County.

Extensive negotiations among the water suppliers in the region have been conducted during. the spring, summer- and fall of 1981 and we are prepared to recommend to the Task Force the cost sharing arrangements below:

a. We will recommend that Fairfax County Water Authority, WSSC and Washington Aqueduct purchase all the water supply storage in Bloomington Reservoir. We do not feel that the counties and users upstream of the Metropolitan region need to share in the cost of Bloomington because they are non-consumptive users.

b. We will recommend WSSC pay 50%, the Washington Aqueduct pay 30% and Fairfax County Water Authority pay 20% of the costs of Bloomington Reservoir. The Citizens Advisory Committee has reviewed these recommendations and concurs.

c. We will recommend that Fairfax County, Prince George's County, Montgomery County, District of Columbia and Allegheny County share the 0&M costs for Savage Reservoir five ways.The Savage Reservoir will be used primarily to dilute the acidic releases from Bloomington and therefore is an integral part of water supply for the region and cost sharing is appropriate.

d. We will recommend that the Fairfax County Water Authority, .WSSC and the Washington Aqueduct share the costs of Little Seneca Reservoir and that the reservoir be part of the regional water supply.

e. Our recommendation is that Fairfax pay 10%, WSSC pay 507 and the Washington Aqueduct pay 40%. Again the citizens committee concurs.

The regional operating plan will, in essence, be a document that incorporates the principles and logic of the CO-OP water supply model into an agreement to be signed by the three supply agencies. The model is programmed to direct releases from various reservoirs, giving due consideration to predicted demand, predicted river flows., reservoir status and, the 4 to 7 day travel time of releases from Bloomington Reservoir to insure an adequate supply of water. As stated earlier, we have satisfied ourselves that the concept of the model is accurate and sound. Since a computer program is not a very good vehicle for an agreement we must incorporate the principles of the model into a document that can be signed. This should not be difficult.

The Technical Group has identified a part of the Low Flow Agreement that must be resolved. The Low Flow Agreement freezes the percentage allocated to each user after 1988 unless the parties agree to change. While we are very confident that the Low Flow Agreement will never be needed if the system is operated regionally and if Little Seneca is available, there does remain. the possibility a drought two to three times more severe than any drought in the past that would cause shortages. The Low Flow Agreement, which allocates river flows during shortages would then be invoked. The Technical Group is still pondering whether the so-called "freeze" is still appropriate under a regionally operated system wherein the costs of all water storage are shared and the regional facilities are operated to meet everyone's needs. We expect to complete our work and coordinate it with the Citizens Advisory Group in early January 1982. We will then submit our recommendations to the task force *and* with their approval proceed with the construction of Little Seneca Reservoir and a solution to the water supply problem that has been plaguing the District of Columbia and the Metropolitan Region for more than twenty years.

Water supply is a regional or local problem. While we appreciate the significant assistance of the Federal government through the Corps of Engineers in resolving this problem, we recognize our responsibility and are on the threshold of solving this matter once and for all.

APPENDIX H

"CO-OP"

"THE ICPRB SECTION FOR
COOPERATIVE WATER SUPPLY OPERATIONS ON THE POTOMAC"

The Fickle Potomac River

In January 1974, the Potomac Basin Interleague Committee of the League of Women Voters published an analysis of the water supply situation in the Washington Metropolitan Area. The report, subtitled "The Fickle Potomac River," concluded that increasing water use meant that the free-flowing Potomac River could no longer always supply the amount required.

The League report is one example of many studies of the issue done over the past twenty years, most of which have concluded the same thing.

Solutions have invariably included more dams and reservoirs--a highly unpopular solution vigorously opposed by citizens throughout the river basin.

Beginning in 1979, a special section of the Interstate Commission on the Potomac River Basin began work on the water supply issue. But instead of the traditional approach of more dams and reservoirs, this section approached the problem form a revolutionary viewpoint--that water supply needs could be met by cooperation instead of construction.

The Demand for Water

The flow of water in the Potomac River provides about 67 percent of the water used in the Washington Metropolitan Area. Other sources of water include a Virginia tributary of the Potomac (the Occoquan River), supplying 13 percent from a reservoir; and the Patuxent River, which supplies 14 percent before it flows into Chesapeake Bay.

An average of about 300 million gallons of water are withdrawn from the Potomac each day for water supply in the Washington area. But averages do not tell the whole story--extremes are more important. The river can reach over 200 billion gallons a day during floods. In droughts, the Potomac often trickles to less than a billion gallons a day. In the drought years of the 1960's, the lowest daily flow of the Potomac was recorded: 388 million gallons. If high demands are placed on the Potomac during low flow periods, shortages are certain to occur.

Although population growth and water demand have leveled off during the 1970's, the demands on the Potomac are increasing. For example, the Fairfax County Water Authority is building a new water intake and treatment plant that will withdraw an average of 50 million gallons of water from the Potomac about 20 miles upstream of Washington. This is the first time a Virginia jurisdiction has directly tapped the main stem of the river for drinking water.

Above Great Falls; the Washington Suburban Sanitary Commission received Congressional approval and built an underwater dam to increase its ability

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Source: From a booklet published by the Interstate Commission on the Potomac River Basin by the same title, May, 1981.

to withdraw water for Maryland use. And, below Little Falls, the U.S. Army Corps of Engineers has constructed an emergency water intake to withdraw water from the Potomac estuary if the upstream supplies run too low during a severe drought.

While these new and enlarged intakes will place increased demand on the river in the years ahead, at the same time, a new major reservoir will be completed. In 1981, the Bloomington Dam and Lake, built by the U.S. Army Corps of Engineers on the North Branch Potomac in Maryland and West Virginia, is scheduled to begin impounding water. The reservoir, above Cumberland, Maryland, will be available to supplement the reliable supply of the river, but it is located far upstream. The reservoir itself will not be enough to satisfy the water supply need, unless it is coupled with cooperative operation of Washington area reservoirs and treatment systems.

Cooperative Operation

With water supply systems in the Potomac Basin undergoing significant changes, it became apparent in the late 1970's that the users of the river had to reach some basic agreements regarding the use of the river for water supply

The first agreement, among the District of Columbia, Maryland, Virginia, the federal government and water suppliers, was the Potomac River Low Flow Allocation Agreement. Signed in early 1978, this basic agreement outlined procedures to be followed during a severe drought. With strict water conservation, it will be possible for all jurisdictions to share the burden of drought equally.

A second agreement, among many of the same jurisdictions and water suppliers, was broader in scope. Under the Interstate Commission and the Potomac River Basin (a regional water resources compact agency formed by the States of the basin and the federal government) a special section was established. Participants agreed to analyze the risks of drought, examine ways to predict flows in the river using sophisticated techniques, and develop methods of coordinating reservoir releases and river withdrawals in the region.

The ICPRB Section for Cooperative Water Supply Operations on the Potomac (CO-OP) is developing the technical management tools required to implement coordinated operation in an effort to solve the Washington area's water supply problems for many years to come.

Much of the information required to set up an operation center is available from the various agencies concerned with water supply in the Washington Area. Universities, state and local governments, and federal agencies have studied the river for many years. CO-OP will guarantee that the information is in a usable format for scheduling reservoir operations. In particular, CO-OP is working with:

-- The U.S. Army Corps of Engineers in determining optimum operation of the Bloomington Reservoir;

-- The National Weather Service in applying flow forecasting techniques to the basin above Washington;

-- The Maryland Department of Natural Resources and the U.S. Fish and Wildlife Service in evaluating the effects of low flow on the environment of the river near water supply intakes.

CO-OP is continuing to refine its techniques while its recommendations already are being used for planning release and withdrawal schedules. These schedules. are designed to maximize water supply reliability while meeting water quality, flow, recreation, and flood control requirements.

CO-OP is not a regulatory agency, and its recommendations are not binding. Instead, CO-OP, like its parent agency (the Interstate Commission) is relying on its proven scientific credibility to obtain voluntary cooperation among those who use the Potomac for water supply. Because of the overwhelming advantages to be achieved in coordination, voluntary cooperation can eliminate the risk of drought-related water shortages for years to come.

Membership and Funding

CO-OP was formed in the Interstate Commission on the Potomac River Basin (ICPRB) in November 1979, following a request from the Washington Suburban Sanitary Commission, the Fairfax County Water Authority, the Baltimore Division Army Corps of Engineers, the states of Maryland, Virginia, and the District of-Columbia.

Under the ICPRB charter, a section may consist of some but not all ICPRB members. The CO-OP Section includes representatives of Maryland, Virginia, West Virginia, the District of Columbia, and the federal government.

Major funding for CO-OP comes from the Washington Suburban Sanitary Commission, the Fairfax County Water Authority, the Department of Environmental)Services of the District of Columbia, and the states of Maryland and Virginia. Funding of the section is completely separate from the Interstate Commission on the Potomac River Basin.

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