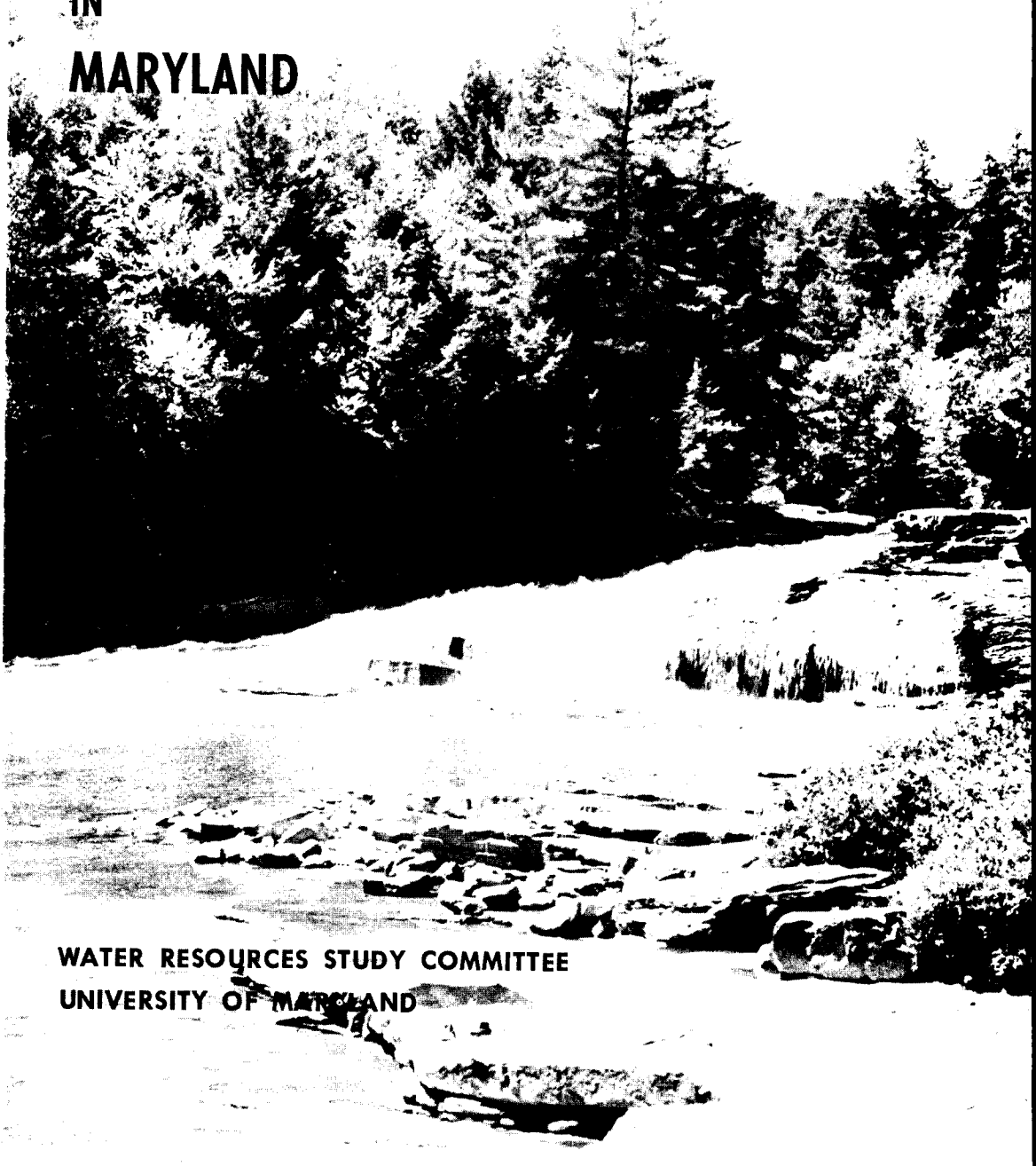
WATER RESOURCES MANAGEMENT IN MARYLAND



WATER RESOURCES STUDY COMMITTEE
UNIVERSITY OF MARYLAND

WATER RESOURCES MANAGEMENT IN MARYLAND • UNIVERSITY OF MARYLAND

WATER RESOURCES MANAGEMENT IN MARYLAND

A Study

for

The Department of Water Resources
State of Maryland
Annapolis, Maryland

by

The Water Resources Study Committee
University of Maryland

COLLEGE PARK, MARYLAND
AUGUST, 1967

Other Publications of the

Water Resources Study Committee
University of Maryland

MARYLAND WATER LAW

Paul M. Galbreath *(October 1965)*

WATER RESOURCES MANAGEMENT IN MARYLAND

Appendices (December 1966)

"Status of Hydrologic Data in Maryland" by John W. Wark
"Economic Data for Water Management" by David F. Bramhall
"Water Rights and Legislation in the Eastern States" by Harold H. Ellis

SELECTED OPINIONS OF THE ATTORNEY GENERAL OF MARYLAND PERTAINING TO WATER RESOURCES MANAGEMENT IN MARYLAND

Compiled by

Paul M. Galbreath *(December 1966)*

MARYLAND'S ROLE IN WATER RESOURCES DEVELOPMENT

Lyle E. Craine *(February 1967)*

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August 15, 1967

Mr. Paul W. McKee, Director
Department of Water Resources
State Office Building
Annapolis, Maryland

Dear Mr. McKee:

Water resources development, management and conservation are of utmost importance in the future quality of Maryland's environment, both as a place to live and with respect to economic development. Therefore, the State must take a fuller role to assure maintenance of water quality and equitable distribution between users.

It is the considered opinion of this Committee that the Department of Water Resources must be aggressive in its leadership role in water resources management and especially in planning.

There is an urgent need for a basin by basin plan for Maryland surface waters and aquifer by aquifer for underground waters. While the Department of Water Resources is assigned the leadership role, all agencies concerned with utilization of water resources must contribute to and support a master plan for it to be effective. The conflicts of supply and demand cannot be reconciled in the future with the water supply and sewage systems preempting stream capacity for assimilation of sewage effluents. Some State agencies, together with local governments, are working to attract resource developers while others are trying to maintain sport and commercial fishing and still others, water based recreation.

The master plan must be based upon recognition of the principle that, although demands for water are increasing and the population continues to increase in the State, no user has the right to pollute or degrade water resources which are public resources. Assuring optimal future use by all legitimate claimants will require a high level of both foresight and resource management. Development of the plan, obtaining concurrence of other State and local agencies, will be a monumental achievement. Continued strong support from the Executive and Legislative Branches of the State government is essential.

Progress has been made. The Committee believes that with adequate budgetary support the Department can grow to fulfill the vital management role essential to Maryland's future well-being.

Respectfully,

R. L. GREEN, *Chairman*
Water Resources Study Committee

PREFACE

In 1964 the Maryland General Assembly enacted legislation reorganizing some agencies with responsibilities for the planning, development and management of water resources of the State. Subsequently, the Bureau of the Budget directed the newly formed Water Resources Department to have a study made to clarify its role and to make recommendations for fulfillment of its responsibilities.

The efforts of this committee and its consultants have been in response to that requirement.

This study is specifically oriented towards identifying responsibilities of the Department which, by law, are explicit or implied. However, because other departments or agencies are involved in management, development and conservation of water resources of the State, the role of the Department of Water Resources cannot be fully developed without concern for the interdepartmental relationships.

The Study Committee and its consultants have been concerned with broad concepts. However, attention has been given to identification of the responsibilities to logical subdivisions which require recognized competencies in specific scientific or engineering disciplines. Some attention has also been given to the level of competencies necessary for fulfillment of the Department's role and whether these competences are necessary on a continuing or intermittent basis. However, it is the consensus of the Committee that the Director of the Department and his staff must have the ultimate responsibility for the internal staff organization and allocation of specific responsibility. Water resources management is not a single-discipline science but an amalgamation of several scientific and engineering disciplines; therefore, it is necessary for the staff to be organized around the

strength of its personnel, and such organization will not be static. For intermittent needs, services may be obtained more economically through cooperation with other agencies or by short term appointment of consultants.

It is of utmost importance that the Water Resources Department and other agencies be adequately staffed with highly competent personnel to meet the opportunities and challenges of the future.

ACKNOWLEDGMENTS

The Water Resources Study Committee expresses its appreciation to the following persons for their contributions:

The UNIVERSITY ADMINISTRATION for encouragement, advice and allocation of time of Committee members.

DR. LYLE E. CRAINE, Chairman, Conservation Department, School of Natural Resources, University of Michigan, who, with assistance of 22 graduate students, utilized Maryland Water Management as a subject of a graduate seminar at the University of Michigan and summarized this year of study in "Maryland's Role in Water Resources Development."

MR. JOHN W. WARK, Water Resources Division, U. S. Geological Survey, who prepared the report, "Status of Hydrologic Data in Maryland."

DR. DAVID F. BRAMHALL, Associate Professor, The Johns Hopkins University, who prepared the report, "Economic Data for Water Management."

MR. HAROLD H. ELLIS, Economic Research Service, U. S. Department of Agriculture, who prepared the report, "Water Rights and Legislation in the Eastern States."

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In addition to the above, other individuals contributed through advice and consultation. Among these are the following:

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Dr. John V. Krutilla, Resources for the Future

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The Maryland-National Capital Park and Planning Commission for the use of its publication, "Sediment Control Program, Montgomery County, Md.," appearing as Appendix "D" to this report.

Appreciation is also due the following Directors and staff of State agencies for meeting with the Committee and discussing the parallel and overlapping interests and responsibilities in water resources management:

Mr. Paul W. McKee, Director, Department of Water Resources and his staff

Mr. Joseph H. Manning, Director, Department of Chesapeake Bay Affairs and his staff

Dr. Kenneth N. Weaver, Director, Maryland Geological Survey and his staff

Mr. George B. Shields, Director, Department of Game and Inland Fish and his staff

Mr. Robert M. Brown, formerly Director, Bureau of Environmental Hygiene, State Department of Health and his staff, together with James B. Coulter, who is now Assistant Commissioner for Environmental Health Services, State Department of Health

Mr. James J. O'Donnell, Director, State Planning Department and his staff

Dr. Gordon M. Cairns, Chairman, State Soil Conservation Committee

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Summary

A CRISIS IN WATER MANAGEMENT

The State of Maryland now faces a crisis in the management of its water resources. Rapidly growing pressures from increased population, urbanization and industrial growth have created very serious problems of water quality and pollution control management in the State. Maryland is simply not yet doing an adequate job of managing its water resources. Water quantity is not the problem – the State fortunately enjoys an abundant supply. Nor is the adequacy of existing legislation generally a problem although some desirable changes are recognized and others will be identified in the future. Existing State and federal laws provide an adequate legal and administrative basis for excellent management programs to be initiated in Maryland under the leadership and responsibility of the State Department of Water Resources.

Dr. Lyle E. Craine[1] of the University of Michigan School of Natural Resources points to the need of adoption of forward looking policy and positive action for the fullest implementation of such policy in his statement that:

[1]Craine, Lyle E. *Maryland's Role in Water Resources Development*, p. 12. Water Resources Study Committee, University of Maryland, February 1967.

> Maryland has a wide area within which it can stake out as significant or insignificant a role as it may choose. Water development decisions are going to shape the Maryland of the future; the question is to what extent Maryland as a sovereign government will undertake to shape and direct its water development.

The water problem in Maryland is not of recent origin as is evident by passage in 1789 of legislation authorizing drainage of the Long Marsh in Caroline and Queen Anne's Counties. However, the term water problem differs in meaning between individuals, between groups, between geographic locations, between seasons of the year, between years, and certainly between decades or longer periods of time. The differences influence attitudes of people as individuals, as occupational groups or other capacities with respect to definition of the problem and proposals for solutions.

Dr. Craine observes further that more people choosing to live in ever-increasing population centers aggravate, to crisis proportions, incipient water supply and pollution problems. He adds that in Maryland the problem is not one of water shortage but is a shortage of water resource development which he defines as investment in technological measures to increase the capacity of a hydrologic unit to provide benefits to society. Based upon the emerging water problems in Maryland, he suggests that the State has three general types of responsibility regarding water resource development: (1) to prosecute Maryland's interest in interstate waters; (2) to assure optimal use and development of natural waters under its jurisdiction; and (3) to assure efficiency in water supply and sewerage service in the overlapping metropolitan areas around Baltimore, Washington and Annapolis which contain four-fifths of the State's population.

It logically follows the above reasoning that Maryland's principal water problem is now and, for the rest of the Twentieth Century, will be attributable to her rapid population growth and especially to the concentration of the growth in Baltimore City and the seven counties of the METRO area. Increasing domestic consumption, increasing requirements of industry and agriculture, increasing size of power generating and other industrial plants, increasing complexity of pollutants, increasing affluence and leisure time of urban residents, all these aspects of late Twentieth Century point to a continued geometric increase in scope and complexity of water problems with time. Atomic and nuclear scientists and engineers speak of the half-

life of radioactive particles, the period of time necessary for one half the atoms to disintegrate. Perhaps those concerned with water and other natural resources need a predictive tool for the "double-life," or the time for doubling the magnitude of problems of supply, demand or quality.

Perhaps the greatest factor of change is one of attitudes; people are more concerned than ever before for the quality of their environment. Perhaps the reason for this concern was effectively described by Mark Hollis, who was then Assistant Surgeon General, at a water resources research seminar in 1961. He said that our population explosion had voided

> "the classical solution
> for problems of pollution
> through diminution
> by dilution."

The Department of Water Resources, established in 1964, has not yet programmed enough expert personnel, enough equipment, nor enough budget to fill adequately its responsibilities as assigned by law. The personnel and other support requested in the recommended budget for 1967-68, a major step in the right direction, was realistic only in consideration of the difficulty of recruiting professional personnel who are in short supply. However, more augmentation will be essential by 1969-70. This key agency must have personnel adequate in both competency and numbers who are provided with enough equipment and other budgetary support to manage the State's water resources in the best public interest.

Failure of the State to provide adequate support for the Department of Water Resources will continue a situation under which the future requirements for public health, safety and general welfare are not adequately safeguarded. Such failures will require much greater expenditures of public funds for correction at some future date. Good public policy and wise budget management both require that more adequate funds be provided immediately in order to eliminate the need for more costly corrective measures in the future.

Implications

(1) The mission of Maryland Department of Water Resources is critical in development of a State Program of excellence in resource management. To meet this challenge the Department will require:

(a) significant additions to its professional staff, both "in-house" and as consultants, including experts in natural resource management, ecology, hydrology, engineering, systems analysis and program budgeting, water development planning, water quality analysis, economics, statistics, chemistry, law, geology, and radiation or other nuclear hazards.

(b) appointment of a specialist in intergovernmental resource programs who could assist in obtaining maximum support for a Maryland water resource program from various federal sources available.

(c) more rigorous legislation, or regulation, for pollution control, effluent quality, spoil disposal, mine waste seepage, control of thermal pollution, and sedimentation control.

(d) more extensive inspection together with stronger injunctive and enforcement powers.

(e) adequate budgetary support to finance these activities and administrative management functions related thereto.

(2) The Department must, in cooperation with other responsible

agencies, begin collecting and analyzing the kinds of statistical water resource data identified in the Bramhall and Wark[1] studies as essential to effective water management.

(3) The Department must be provided with additional funding for expansion of research in cooperation with other State and federal agencies for the purpose of analyzing major Maryland water management problems, improving its water management programs, identifying emerging future water needs and problems in the State to optimize its water resources program.

(4) The Department must be encouraged to continue developing a program for excellence in water management as the keystone in a Maryland resource management and development program oriented toward improvement of the quality of environment in the State.

(5) The Department of Water Resources and other State resource agencies have significant immediate need for budget support in developing State policies, procedures and enforcement powers adequate for dealing with emerging environmental problems. Requests for funds should be supported by program budgets.

[1]David F. Bramhall, *Economic Data for Water Management.* Water Resources Study Committee, University of Maryland, 1967.

John W. Wark, *Status of Hydrologic Data in Maryland.* Water Resources Study Committee, University of Maryland, 1967.

Recommendations

It should be recognized that personnel of the Department of Water Resources and other agencies concerned with water problems are aware of the specific problems to which these recommendations are addressed. Close liaison has been maintained during the two and one half years of this study; and implementation has been initiated, at least in part, for several of the recommendations which were made earlier in interim reports. The objective of this report is to emphasize for citizens and for the Legislative and Executive branches of the State Government the needs of the State to facilitate improved public and administrative understanding and support. It is hoped that the brief summary of recommendations in this section will provide an overview of the needs for the reader with limited time or interest. Other sections of this report, together with other publications of the Committee as listed on page ii, will provide details and rationale of these recommendations.

1. It is recommended that a statement of State policy and a Statewide plan for water resource development, utilization and conservation to enhance quality and maximize quantity for Maryland's needs be prepared as expeditiously as possible.

A clear statement of Maryland's overall policy for its water resources is needed. While there is a statement in the law, Article 96A,

Section 10, complete delineation of policy and goals essential to full implementation is missing. In the absence of legislative declaration, overall policy and goals should be developed for executive endorsement and promulgation.

The objective of a Statewide plan is to assure the availability of water for Maryland's future needs adequate in both quality and quantity of surface or ground water. The programs of all public agencies, corporations and private individuals affecting water supplies must be coordinated with this objective. Since 1947 the primary efforts of the Water Resources Department and its predecessor agency, the Water Pollution Control Commission, have been to minimize and regulate industrial pollution. Similarly, the Department of Health has regulated public water supply and sewage disposal since 1914. Simultaneously, counties and municipalities have issued building permits under enabling laws passed by the General Assembly which have determined urban and suburban boundaries, land use and industrial locations. Coordination has been suboptimal.

Standards for water quality and use have been adopted; but more specific plans will, in many instances, be necessary for development of both surface and ground waters. Counties are preparing municipal water supply and sewage disposal plans as required by State legislation of 1966. While primary responsibility for review of municipal water supply and sewage disposal plans is in the Department of Health, the Department of Water Resources' Statewide plan for other uses of water should be ready to permit coordination in 1969.

The planning function is a continuous one; it should be recognized that this function will never be complete, and plans can be no better than the basic data from which projections are made. Implementation of a Statewide plan will provide maximum protection of water quality and enhance the State's ability to comply with the increased surveillance requirements of the Federal Water Pollution Control Act of 1965.

If a Statewide water resources plan is to be implemented, it must be coordinated with long range development plans of urban, suburban or rural areas; water supply demands for domestic, municipal, industrial, agricultural and recreational uses will be in conflict. Historically heavy industrial use, like heavy municipal use, has preempted either quantity or quality from competitive uses.

The most critical heavy industrial water supply demand may well be that of cooling water in steam electric generating plants using

either fossil or nuclear fuel. Requirements for electricity have increased far more proportionately than the population increases.

In developing a Statewide water resources plan, high priority must be given to formulating a State policy on location of major water users and especially power facilities for minimizing total damage to the Maryland environment. Accelerating demands for electricity and other industrial outputs are forcing individual companies and understaffed local governments to take hasty suboptimal local action on location decisions which affect not only the local area represented but may also affect municipalities, counties or even other states. A Statewide appraisal of long-run total requirements and alternative sites is needed to prevent irreversible, unnecessary damage to State waters. Construction of artificial offshore islands in the ocean for desalination and electric power generation as projected for California is one of the kinds of alternatives requiring consideration and analysis.

2. It is recommended that a computerized system for acquisition, storage, retrieval and analysis of water resource data be established.

The Department of Water Resources, as the principal water resource management agency, should provide the leadership for establishment of a computerized system for acquisition, storage, retrieval and analysis of water resource data. As a part of this effort the Department should invite the other 16 State and federal agencies, together with Maryland industry and municipalities concerned with water resources, to cooperate in the system which should, in turn, make data analyses for these agencies or for any individual or corporation. The feasibility of cost-sharing among agencies should be investigated and reasonable charges for industrial users established.

Complete knowledge will never exist for decisions on water resource development, allocation, utilization and conservation. A computerized system makes practical, for the first time, the possibility of calculating the interrelationships between rainfall, land treatment, runoff, stream flow, aquifer yield, evaporation and transpiration losses and other factors with given rates of withdrawal and given rates of waste loading from municipal, industrial or other sources.

3. It is recommended that regulations be developed to mini-

mize pollution from sedimentation throughout the State and especially from areas of urban and industrial development.

The Maryland Attorney General ruled in 1961 that silt is a pollutant and subject to regulation by the Water Pollution Control Commission. Responsibility for enforcing this ruling was conveyed to the Department of Water Resources when it was established.

The Maryland State Roads Commission, in January 1967, added to its general specifications for all construction contracts specific requirements to minimize sediment producing erosion. This addendum to specifications was developed by the State Roads Commission with cooperation from the Soil Conservation Service, U. S. Department of Agriculture, and a committee appointed by the Board of Natural Resources following endorsement by Governor J. Millard Tawes of a recommendation by the Department of Water Resources. The State Roads Commission is to be commended for being the first state road authority to adopt such forward looking procedures. The Department of Water Resources is also entitled to commendation for its contribution to development of these specifications.

The Department of Water Resources should continue this leadership in the development of criteria and specifications for reduction of erosion sediments from all State, county and municipal construction; from urban, suburban, and industrial development, from agricultural operations and from all construction on federal land within the State. Statewide criteria, specifications and regulations for adoption by the Water Resources Department and which could be also adopted by local governments or by agencies should be developed in cooperation with the Maryland Association of County Commissioners, the Maryland Municipal League, the Maryland Association of Soil Conservation Districts, the Soil Conservation Service and the Soil and Water Conservation Research Division (Agricultural Research Service) of the U. S. Department of Agriculture, other departments or agencies of the Board of Natural Resources, University of Maryland College of Agriculture and the Maryland Department of Public Improvements.

In Appendix D the Sediment Control Program of Montgomery County as adopted in June 1965 is reproduced. Also included as Appendix C is a standard for a desilting basin as developed by the Soil Conservation Service. Montgomery County deserves credit for being, to our knowledge, the first county of the nation to adopt

such a program. However, the Committee believes that specific time of exposure of non-vegetated construction sites should be specified if such programs or regulations are to have optimal effect.

4. It is recommended that a Statewide plan of flood plain zoning be developed.

Historically people have settled along streams for the advantages of transportation, water for agriculture, for manufacturing processes, for waste disposal and for recreation. It has been said many times that people build in a flood plain and then ask the government to provide flood protection. The cost of flood protection is continually climbing because of the escalation of the costs of construction and land values which protective works must preempt either for improved channels or for levees.

There is an increasing need for recreational areas together with increasing recognition of the fact that flood plains are good areas for recreation. It is also a well established principle in the science of hydrology that any construction in a flood plain which restricts flow will raise the water level in the flood plain of the stream above such an obstruction during subsequent floods. Present law is specific in requiring the Department of Water Resources to regulate changes in the course, cross section or current of a stream. The General Assembly, in 1967, included the 50-year flood plain of free-flowing waters in the definition of "waters of the State." This action makes it necessary for proposed construction within the 50-year flood plain to have a permit from the Department.

It is in the public interest for private owners to refrain from flood plain encroachment. However, it should be clearly understood that the interest of individual owners is not necessarily the same as public interest. In order to flood-proof lands adjacent to Maryland streams and thereby reduce the hazard of flood damage or the cost of flood protection, it will first be necessary to delineate flood plains as a basis for flood plain zoning at either the local level or throughout the State.

In developing a flood plain zoning plan the Department of Water Resources should seek cooperation and assistance of the Maryland Geological Survey and the U. S. Army Corps of Engineers in flood plain delineation. The Department of Water Resources should develop regulations for flood plain zoning on a Statewide basis, together with special regulations which might be adopted by the Department

or by local governments for specific areas. In the preparation of such regulations, the Department should seek cooperation and assistance from the Maryland Geological Survey, the Maryland County Commissioners Association, the Maryland Municipal League, the Department of Forests and Parks, Zoning Commissions and any other agencies or groups concerned.

5. It is recommended that future permits for dams and reservoirs be issued only after consideration for optimal use of reservoir sites in the overall development of Maryland water resources.

Legislation of 1933 required that proposed construction of dams or reservoirs be permitted after review by the Water Resources Commission, authorized at that time, with due regard for public safety and welfare. That Commission, and subsequently the Department of Geology, Mines and Water Resources, administered the law under the interpretation that its concern was only for public safety.

In recent years, it has been recognized by leading water resource planners and users that a limited number of potential reservoir sites exist which are adapted to multipurpose usage for water supply, recreation, stream flow augmentation, flood prevention and agricultural water supplies. In the management of water resources for the future, it is essential that all sites be protected and evaluated in terms of optimal water resource management. Interpretation of the law should be clarified by appropriate ruling of the Attorney General or by legislative action so that no question remains as to the Department's authority to refuse permits for sub-optimal site development. Implementation of the concept of optimum site development may well be administered in the interim period with a two-stage review. In the first step, the concept of optimal site development may be reviewed and, in the second, structural design for safety may be examined.

6. It is recommended that water users, other than domestic, be required to obtain permits for water use.

For this recommendation, domestic use is defined as use for home consumption, livestock and poultry watering, watering of lawns and family gardens and use for a single or duplex housing unit. Such uses shall not exceed 15,000 gallons per day the equivalent of ap-

proximately 10 gallons per minute of continuous pumping.

It is essential that reporting of water use be initiated in order that the Department may effectively plan future withdrawals from a given source whether it be from surface or ground water supplies. It appears most practical to arrange a reporting system with frequency inversely proportional to quantities used; that is, large users would report most frequently.

Preparation of a Water Resources Plan may have limited value in view of the exemptions for uses by municipal water supply systems and for agriculture. Municipalities currently withdraw much of the daily water requirements of the State; on the other hand, agricultural use of water is relatively small at the present time. However, agricultural use may rapidly increase because rainfall distribution is a production hazard; and other costs have increased so that for crops of intensive culture farmers can no longer afford to gamble on production without irrigation capability. We know that municipal demands will continue to increase.

However, it should again be recognized that riparian and other vested property rights cannot be preempted by the State and such appropriation permits must be in accord with plans for river basin or smaller streams and aquifers which provide for needs of all owners of such rights.

The Department should develop a revised management system as related to appropriation permits. In order that both present users and future permit holders have maximum assurance possible that water will be available to meet their needs, all users of ground or surface waters, other than domestic, should have to register present uses and/or obtain permits for future use. Neither municipal water supply systems nor farm use in excess of 15,000 gallons per day should be exempt from appropriation permits. Such uncontrolled use may preempt water supply from nearby users drawing from the same surface stream or underground aquifer and thereby deplete available water below existing requirements to the detriment of established uses.

7. It is recommended that laws and regulations pertaining to licensing and supervision of well drillers be modified so that well drillers may effectively contribute to this aspect of water resources development and management.

Management of ground water resources is difficult, because knowledge of subsurface geological formations can never be complete. The prediction of ground water supplies is based upon interpolation or extrapolation of yield between wells at known points together with knowledge of geological formations of an area. Predicted well yields are only as good as the known sources of water and the knowledge of geological formations and especially knowledge of the aquifer from which water is to be obtained.

Regulation of well drilling and well construction in the State by the Department is in the interest of public welfare because of its critical importance to public health and to water resources. Well drillers should be skilled not only in the operation of the necessary equipment and machinery but also should have knowledge of safe construction standards. It is believed that the practical knowledge of well drillers can be utilized to a better advantage.

Well drillers may also contribute to the knowledge of geological formations encountered in drilling operations by accurately reporting materials found at different depths. Completion of a well includes test pumping to determine yield and drawdown characteristics for a given location. Reporting of this information to the Department of Water Resources and through it to the Maryland Geological Survey adds to knowledge of ground water supplies for benefit directly to the public as well as providing a better basis for management decisions.

More complete knowledge is essential to overall planning for management of groundwater resources to assure that rights and needs of legitimate users, present and future, may be fulfilled to the maximum possible degree. The ultimate goal is sufficient knowledge to predict accurately the maximum sustained yield (withdrawals equal recharge) for all aquifers in the State and to protect adequately these ground waters from pollution including salt water intrusion in those areas adjacent to saline waters.

8. It is recommended that an assistant Attorney General be assigned as full time legal counsel for The Department of Water Resources.

The Department should continue its practice of reviewing laws, regulations and procedures and, with advice of the Attorney General, recommend such revisions or additions as necessary.

The Department has broad water resource responsibilities which require it to resolve disputes that will arise from ever increasing

water uses. These conflicts may involve competition for a single use or may result from competitive alternative uses and involve both water quantity and water quality. For these reasons it is believed that hearings before the Department will become more and more adjudicative.

For the Department to fulfill its responsibilities equitably and effectively, additional legal services from the Attorney General's Office will be needed. Counsel (Assistant Attorney General) should be present at most hearings conducted by the Department. Of equal importance is that counsel be available to the Department in preparation for hearings in order that they be conducted in an orderly and judicious manner.

9. It is recommended that the procedure be amended so that appeals from Department rulings will be made directly to the courts on points of law but will continue to be made to the Commission of the Department of Water Resources on questions of policy or interpretation of facts.

Applicants to the Department for any permit it is authorized to issue have the right of appeal. Article 96A Section 54 of the Code of Maryland Laws prescribes that appeal from a Department ruling shall be made to the Commission of the Department of Water Resources and, if the appellant desires, subsequently to the Courts.

Under the law as cited above, if points of law are the basis of an appeal, the Assistant Attorney General assigned to the Department and who normally would have advised the Department staff could not ethically serve as counsel to the Commission in hearing an appeal on which he presumably would have previously given advice. The Commission would then have to obtain other legal counsel who might generally be less well informed on water law to advise on points of law. It seems unlikely that an appellant would be willing to accept adverse rulings on points of law without further appeal to a Court. Therefore, it seems desirable to eliminate appeals to the Commission on points of law to minimize expenses and conserve time of appellants, Departmental staff and the Commission.

Conversely, the Commission is responsible for determination of water resources policy; and appeals to the Commission on implementation of policy appear to be reasonable and proper. Similarly,

the Commission must be presumed competent to interpret facts about water resources and thus qualified to hear appeals from Department rulings relating to such facts.

10. It is recommended that two regional Water Quality Laboratories be established, one on the Eastern Shore and one in Western Maryland to provide prompt routine services to these areas. It is also recommended that increased use be made of technicians both in field inspections and for routine laboratory analyses. It is further recommended that an automatic monitoring system be established so that water quality can be continuously recorded and warning given in the event of catastrophic accidents affecting a stream or other body of water.

As water pollution problems become more urgent and complex in Maryland as the result of exotic chemical wastes, thermal pollution and other threats, the Department of Water Resources will need to continually upgrade its scientific and operational capabilities for dealing with future problems. It should plan now to acquire appropriate equipment and skills. Helicopter service could increase the capability to identify and correct serious problems of sedimentation, fish kills and other damage to water resources. New techniques of aerial color photography and high altitude observation and monitoring could be used for detection of water damage and for early warning. New types of instrumentation and automatic, continuous water quality monitoring will be necessary. Modern technology, which has created most of our water problems, must now be redirected to correct serious natural resource damage.

11. It is recommended that a listing of research needs be developed and systematically updated with priorities indicated for guidance of research agencies. It is further recommended that the Department budget funds for support of research, in response to specific urgent needs, by appropriate agencies which would not otherwise be undertaken or promptly completed.

Successful performance of its mission will require an expanding research base beyond the survey, description, and surveillance func-

tions carried on by the Department incidental to its management and regulatory functions. However, it should be noted that legislative intent in establishing the Department of Water Resources recognized that it was to be a management agency. To the Maryland Geological Survey was assigned the basic responsibility for research pertaining to both surface and ground waters, and it was intended that the Department of Water Resources should contract for other specific research requirements.

To an increasing extent the Department is facing pressure to utilize Maryland waters for the discharge of exotic chemical, thermal, organic, radioactive and other wastes whose effects are largely unknown but which cumulatively alone or by interaction may cause irreversible damage to State water resources. Because of the importance of knowing *in advance* the full implication of these new impacts, comprehensive, long run research is a basic essential for wise management of Maryland water resources.

The Department must, therefore, have ready access to adequately staffed basic and applied research capabilities in appropriate fields. The Department should provide information of needs to such groups as the University Water Resources Research Center and the Institute of Natural Resources. Faculty of the Johns Hopkins University have traditionally conducted research and have been readily available for consultation on water resource matters. The value of this association is recognized and the Department should utilize the complementarity of all research capabilities to the fullest degree possible. A necessary counterpart of strengthening the ability of the Department to fulfill its responsibilities will be to strengthen associated water research agencies, especially the Institute of Natural Resources, which can provide research tailored to the unique estuarial water problems of Maryland.

In order to make maximum use of basic and applied research in water management, the Department will need personnel well qualified to apply research findings to water management and who are also able to interpret water management problems to research agencies.

Because research is underway in many State and federal agencies and most institutions of higher learning, it will be necessary for a senior staff member to have research liaison as his principal duty to assure that results of current research are available to the Department staff.

12. It is recommended that the Department develop an effective information and education program.

Public cooperation and support are essential if the water resources planning and management function of the Department of Water Resources is to be effective. Unless citizens are well informed as to what is to be done and why, they can neither effectively cooperate with nor support plans and programs for water resource development, management and conservation. Many aspects of the water resources program of the immediate as well as the long-range future will be new or will include major changes in emphasis; therefore wide dissemination of new technological information is essential.

An effective information and education program should include the following:

A. News releases, leaflets, non-technical summaries of research or other technical reports, filmstrips, slides and motion pictures should be available for distribution to mass information media, schools and to the public.

B. Educational meetings, seminars or workshops should be conducted at such times and places as may be needed in cooperation with other State and federal agencies. For example, informational meetings should be conducted for potential users of water from an aquifer where regulations are established to limit withdrawals to a safe, continuous yield or to protect an aquifer from possible salt water intrusion.

C. Seminars, workshops or other types of educational meetings should be conducted for well drillers, food processors or other specifically identifiable groups for new technology or requirements pertinent to a specific group.

D. In view of the anticipated shortage of personnel, the Department should prepare literature depicting career opportunities in Water Resources. Such literature should not only be concerned with opportunities in the Department itself but also with those in industry, in education and in other State and federal agencies. Such literature should be widely distributed through schools and youth programs.

13. It is recommended that the State of Maryland take the necessary steps to insure maximum benefits from all federal water resources programs and that these benefits be equitably distributed among the people of the State.

Numerous federal programs offer different forms of assistance to the State in the planning, development and management of its water resources. A number of these programs offer financial assistance, many require various levels of matching funds, while in some programs outright grants are available.

With seventeen State and federal agencies concerned with water resources in Maryland no one State agency can be expected to keep fully informed with all aspects of all federal water resources programs. However, the State should insure that maximum benefits, both financial and otherwise, are received and that each agency is aware of those phases of programs that offer assistance in line with the duties, responsibilities and programs of the respective department.

With the large number of State and federal agencies operating in the water resources field and with the numerous sources of federal assistance available there is a definite need for coordinating this assistance in order to receive maximum benefits to the State and to have these benefits equitably disbursed among the people of the State. An example is the specific case of potential benefits by participation in the Small Watershed Program under Public Law 566 administered by the Soil Conservation Service. Cost of reservoirs for flood storage is paid entirely from federal funds; additional storage for water supply or recreation must be paid in part from non-federal sources. In those instances where municipalities or counties will have future need for such storage but cannot immediately pay direct costs, it would enhance overall water resource development for the Department to have funds which could be advanced.

14. It is recommended that in planning operations to manage the State's water resources, the Department should make full use of recent advances in program budgeting, cost effectiveness and benefit-cost analyses which have proven effective in government systems management.

Program budgeting requires a clear statement of objectives, analysis of alternative programs for achieving objectives, selection of most efficient, cost-effective programs, provision for coordination with re-

lated agencies, continual monitoring and evaluation of results and periodic revision of programs as required. Considerable progress has been made in applying and refining these techniques in the Department of Defense, Bureau of the Budget and in other nearby federal agencies. The University of Maryland, at the request of federal agencies, is offering short term as well as longer degree programs for civil servants in these new fields. The Department of Water Resources should take an early initiative in hiring experts in these fields, in sending its staff to such courses, and in instituting these management procedures on the State level.

It is further recognized that water resources planning, development and management require education and training which differ from that traditionally associated with water supply, sewage treatment and pollution abatement. Crash programs being instituted to meet the nationwide crisis make it imperative that personnel policies affecting recruitment of water resource engineers and physical and social scientists, critical to the Department, must be modified to meet the Department's specific needs with respect to both position descriptions and salary levels.

In this era of rapidly changing technology there will be a continuing need for staff members to participate in short courses, workshops and even to return to academic institutions for advanced programs of study if the Department is to have adequate competence for future needs.

15. It is recommended that additional senior personnel be appointed to relieve the Director of routine duties or to represent the State's interest in interstate water resource planning development and management groups.

Maryland has a long history of cooperation with adjacent states, the District of Columbia and the federal government. Because approximately three-fourths of the flow of Maryland streams originates outside the State, Maryland must continue to cooperate in interstate development planning and must also know future needs within the State to participate effectively in conferences and compacts. It follows then that the Department should keep interstate stream supply, demand and quality projections up-to-date, coordinated with other State agencies, and be represented at all conferences by the Director or senior personnel. Participation in such important activities should

be definitely programmed as part of the regular work load of senior personnel to assure effective participation.

16. It is recommended that the Department include plans for full participation in the "Graduate Corps" in the programming of its personnel needs.

Governor Spiro T. Agnew, in his address at the graduation exercises of the University of Maryland on June 3, 1967, recommended the establishment of a Graduate Corps. He envisioned such a program as a means of providing internships for outstanding students which would give agencies benefit of their competence and simultaneously provide the trainees with insight into State government and an appreciation for the problems, challenges and opportunities of public service careers.

This imaginative program is especially appropriate for the Department of Water Resources because of its integral part in all aspects of the life of every Maryland citizen, his subsistence, his economic opportunities and the quality of the environment in which he lives. In determining its ability to utilize Graduate Corpsmen, the Department should also evaluate the possibility of traineeships for undergraduates for seasonal technician needs or in a combined work-school program for continuous needs.

17. It is recommended that the Commission of the Water Resources Department be increased by the addition of commissioners to represent the general area of well drilling and the general area of resource economics.

When the Department was organized in 1964, legislation specified that members of the Commission would represent the general fields of public health, industry, agriculture, municipal administration and natural resources. The Commission is required to adopt regulations for well drilling but does not now have, and under existing law may never have, a member cognizant of specific problems of this trade. It is believed that this representation, in lieu of a separate Board for Well Drillers as has been previously considered, would greatly enhance cooperation between the well drillers and the Department and thereby contribute to the acquisition of maximum knowledge of subsurface formations and ground water and the regulation of the industry.

Similarly, members of the Commission may have a general knowledge of economics and water resources development. However, successful recruitment of personnel with outstanding ability in the socio-economic aspects of water resources development is not likely under existing requirements. In the areas presently represented on the Commission the impact of technological change may usually be identified qualitatively and frequently quantified, but analysis of the relationships between water resource development, economic development, population pressures and social change is a highly complex area of increasing importance worthy of specific representation.

18. It is recommended that each year a highly competent consultant or team of consultants be employed to review a part, and periodically all, of the Department's program.

Water resources technology is the subject for more analysis and research than ever before. The technology is advancing at ever increasing rates. The demands for highly qualified specialists will far exceed the number available in the foreseeable future. As short term consultants it may be possible to attract nationally and internationally recognized authorities in the different disciplinary divisions of the Department program. Such consultants could materially enhance the program operation and round out capabilities of Department personnel.

19. It is recommended that the Board of Natural Resources be enlarged by adding as ex-officio members the Chief Engineer of the State Roads Commission, the Executive Director of the Maryland Port Authority, the Director of the Department of Public Improvements and the Director of the Department of Economic Development. In order to relate further the water and other natural resource development, management and conservation to local governments which make many irrevocable decisions on resource use, both the Maryland County Commissioners Association and the Maryland Municipal League should be invited to be officially represented at meetings of the Board of Natural Resources.

The need for action in the direction of this recommendation was recognized by the Maryland General Assembly at its 1967 session. The Department of Economic Development, the State Roads Commission and the State Planning Department were authorized to have representatives serve the Board in an advisory capacity.

The Board of Natural Resources as reorganized in 1964 is composed of appointed members, directors of natural resource departments or agencies and ex-officio members from departments or agencies with related activities. The Board is responsible for coordination of public and private activities related to natural resources.

With respect to water resources development, management and conservation, the composition of the Board appears to have insufficient breadth. A majority of the members are primarily oriented towards conservation and management of natural resources and secondarily towards development of resources.

Conversely, the State Roads Commission, the Department of Economic Development, the Port Authority and the Department of Public Improvements are concerned in the fullest sense of the term with water resource development, although the Department of Public Improvements is primarily concerned with resource development as related to construction of State facilities. These agencies are not represented on the Board of Natural Resources.

Therefore, it should be no surprise that communications are rare between the Board composed of managers and conservationists on the one hand and the developers on the other. Communications which do occur are not necessarily concerned with alternative uses of resources; in fact, it is most likely that any communication would be a request for concurrence with a single specific approach to a single problem which might have been developed without benefit of advice from the resource management agencies. Optimal conservation, management and development of water and other natural resources can only be attained by full consideration of alternative uses.

The Role of the State, Present and Future

A Philosophy of State Control of the Development and Management of Water Resources

I. Excellence in Water Resources Management as the Key to Environmental Quality in Maryland.

Water plays a critical role in human affairs generally and is a fundamental resource in State development. Maryland now has an opportunity and obligation to pursue excellence in water resource management as a key element in a program of natural resource management designed to protect and improve the overall quality of environment in the State.

Water is not merely another natural resource. Rather, it is a vital link in the system of natural resources which are essential to sustain all life, including human life. In planning for river basin development, resource management, or economic development, water is the key element and common denominator. There is a growing body of scientific literature which indicates that current expansions of population, industrialization, and urbanization are poisoning our water and air. Deterioration in the quality of the environment has threatened or destroyed many species of fish, animal and bird life of this State and others. These are indicators whose significance for human

life we cannot afford to ignore. Lake Erie, for example, and its tributaries are so badly polluted that it is questionable whether even large expenditures over long periods can restore the damage.[1] It will be necessary for Maryland to act decisively and effectively if it is to avoid a similar penalty for lack of management of the State water resources.

The length and quality of human life are directly affected by the quality of our water resources, which we depend upon for drinking, for agriculture, for industry, for production of sea food, and for disposal of our waste. Even swamps and marshlands play an important role in the life cycles of some species of fish, fowl, and other life. Man exists in a complex, ecological relationship with other forms of life supported by natural resources whose interrelationships are apparently delicately balanced but not fully understood. The quest for clean water and excellence of environment is, therefore, more than a limited objective sought for purposes of enlarging and improving recreation opportunities. As the globe becomes more crowded, industrialized, and urbanized, the quest for excellence of water management will be essential to the preservaton of the quality of human life.[2]

The State is currently confronted with the necessity for making far-reaching decisions of great complexity on water management problems. For example, the age of nuclear power is here today, and specific locations in Maryland are already being considered as sites for nuclear plants. These proposals involve very serious problems of thermal pollution, thermonuclear accidents, and disposal of radioactive materials. The initiative for making these monumental decisions is currently assumed by the power companies with review powers left to county and State agencies. In order that the State of Maryland can properly discharge its responsibilities for protecting the health and welfare of its citizens and in order that it can protect its water and other resources in the face of these new forces, it will need in the immediate future to strengthen effectively its policy planning, its professional staff and its enforcement powers in the Department of Water Resources and other resource agencies. This need is critical and immediate.

[1]U. S. Department of Health, Education and Welfare, *Report on Pollution of Lake Erie and Its Tributaries.* Public Health Service, Parts I, II, and III, Washington, D. C., July 1965.

[2]The President's Science Advisory Committee, *Restoring the Quality of Our Environment,* Report of the Environmental Pollution Panel, Washington, D. C., November 1965.

By exercising its resource planning and management powers and responsibilities, the State can do much to create a program of environmental excellence. By making a commitment to a policy of excellence in management of water and other resources, the State of Maryland can take new and positive steps toward improving the quality of government service, quality of environments, and quality of life for its citizens.

Maryland is in no immediate danger of running out of water. However, rapid increases in population, industrialization and urbanization in the State are creating very serious problems of maintaining water quality and allocating its distribution wisely and fairly among competing users and competing areas. Failure of the State to take vigorous action can result in massive pollution problems, misappropriation of water resources to low priority uses, and permanent loss of water resources to Maryland residents.

II. Problems and Opportunities

In designing a policy of excellence in water resources it will be necessary to have an awareness of emerging developments which create both problems and opportunities in State resource management. These are some of the major problems:

(1) Rapid growth in Maryland of population, industrialization, and urbanization increase the competing demands for water use while simultaneously increasing the pollution threat.

(2) Part of Maryland's water supply is dependent upon sources, particularly the Potomac and Susquehanna Rivers, originating in other states. Part of its water borne waste load originates in other states. In turn, Washington, D. C. and Virginia consume water from Maryland. Maryland must therefore cooperate with other regions in water planning and management but must have a strong positive water resource plan of its own.

(3) Changing technology is adding new pollutants to the water from which effects over the long run from accumulation and combination are not fully known but which may be fatal to one or more important links in the ecology of the earth.

(4) Water management is a complex problem which requires the inter-disciplinary skills of engineers, ecologists, biologists,

hydrologists, health officers, lawyers, geologists, economists, planners, chemists, systems analysts, statisticians and administrators, and which cuts across numerous state, federal, and local agencies and jurisdictions.

(5) Some of the essential statistical information on water supply, demand, and quality is not currently available, creating the need for widespread additional data collection and analysis.

(6) Water use and disposal by individuals, enterprises, and communities are characterized by significant shifting of costs and benefits. The upstream polluter of water imposes costs upon the downstream user, who must treat the water, or forego its use. Downstream use is related to and is dependent upon upstream development. The assessment of equitable and efficient benefit-cost arrangements between competing water users becomes a more difficult problem as population, urbanization and industrialization pressures grow. Market mechanisms cannot be relied upon exclusively to result in efficient, equitable water allocation, and complementary public programs of research and management are therefore necessary.

(7) Washed off soil and sedimentation from construction activities are filling many streams, killing aquatic life and have become a problem of major magnitude in Maryland. Immediate attention, planning, and action are necessary now in order to prevent irreversible damage to our water resources from siltation and sedimentation.

But, some significant opportunities exist for achieving new levels of excellence in the management of water resources in Maryland:

(1) With rising levels of income, education and leisure in Maryland its residents are more concerned with the quality of water in the State and with the quality of resource management in the State, particularly as they affect recreational opportunities and the general quality of the environment.

(2) In recognition that pollution problems have

(a) in part resulted from national economic development policies,

(b) in some instances require federal or interstate cooperation and

(c) may be beyond the capacity of state fiscal resources to solve,

Congress has recently approved extensive legislation and financing to assist states in solving their water problems through research, through clean river restoration projects, through land acquisition, through assistance in financing pollution control projects, through river basin planning, and through other programs. The potential use of federal assistance raises problems as well as opportunities and makes it even more essential that the State have a strong, positive water program of its own.

(3) There is a growing awareness that water is a critical resource, especially in Maryland, wise management of which can serve as the focus for a general program of excellence in resource management in the State. There is also growing awareness that a commitment to a policy of environmental excellence and outstanding resource management will attract to the State in the future those types of high income growth activities, such as research and development, recreational and cultural centers, and planned communities, which can contribute positively to the achievement of regional development objectives and to improving the quality of general development in the State.

(4) Rigorous professionally and scientifically based policies of controlling and eliminating resource pollution will tend to protect the State from entry of activities which deteriorate the quality of the environment and raise costs of pollution control.

(5) The opportunities are very great for bringing science and technology to bear on water problems such as achieving better methods of marine life management, development of safer agricultural chemicals, improvement of waste disposal practices, control of mine waste and seepage, and better control of algae, jelly fish, milfoil and water chestnut.

(6) Water resources are systems within larger systems of resources which can best be understood and managed within a general framework of explicit state objectives for development and management of resources.

(7) The water resources of the Chesapeake Bay and its tidewater tributaries with more than 3,000 miles of shorefront pro-

vide unique opportunities in Maryland for satisfying growing recreation requirements. However, little is known concerning the waste and heat disposal capacities of estuarial waters; and extensive research will be required to provide the basis for protecting the delicate ecological balance of tidal waters for rehabilitating the sea food industry and for protecting the quality of estuarial waters for a multitude of legitimate uses.

(8) Recent developments in the fields of economics, resource management, and systems analysis offer new opportunities for improving State water management through use of taxes on polluting activities, use of better planning and zoning, more effective use of federal assistance and other programs.

While the Department of Water Resources has primary concern for fresh water resources, it must also share major responsibilities for the salt water Chesapeake Bay and tributaries which dominate the geography of the State and into which its fresh water streams flow. If well managed and protected, the Chesapeake Bay waters, covering 22 per cent of the State, together with its tributaries are of the first order magnitude among Maryland resources in providing opportunities for excellence of resource management and environmental quality in Maryland. They can serve as an attraction to the most desirable and productive enterprises of the future and can offer unparalleled recreational opportunities for swimming, boating, fishing and vacationing to the increasingly affluent, leisured, urbanized population of the State. But even recreational use of water, which has not been intensive enough to raise problems in the past, is now approaching a density which does not permit further delay in planning and action. Time is running out.

Not only is the Bay unique itself, but it also provides a sheltered gateway to the vast wealth of the continental shelf of the Atlantic Ocean. The United Nations Convention on the Continental Shelf, signed by the United States in 1964, grants sovereignty over its sea bed to the United States out to the 200 meter (approximately 650 feet) depth line and beyond this as far as the development of resources can be undertaken. The total amount of area newly acquired by the United States under this act has been estimated to exceed that acquired through the Louisiana Purchase.

On the West Coast, California has taken an imaginative and sophisticated lead in exploring the development of its continental shelf resources for recreation, sea food, and other uses in advancing the

general achievement of State development goals.[1] With its ideal access to the Atlantic through the Chesapeake, Maryland should explore thoroughly the opportunities for development of its share of the continental shelf resources with a view to creating outstanding leadership on the East Coast for wise development of ocean resources.

The 1966 Marine Resources and Engineering Development Act established the Sea Grant College program which may achieve the same success in developing ocean resources as did land grant colleges in agriculture. Introduced by Senator Claiborne Pell of Rhode Island[2] this program, which will be administered by the National Science Foundation, could have major significance for Maryland.

[1]University of California, *California and Use of the Ocean.* Institute of Marine Resources, LaJolla, California, IMR 65-21, October 1965.

[2]Luther J. Carter, "Sea-Grant Colleges: Idea Gains Adherents," *Science,* Vol. 152, No. 3727, June 3, 1966. pp. 1358-1360.

Water Rights and Regulations

RIGHTS TO THE USE OF WATER AS DEVELOPED THROUGH COURT DECISIONS: COMMON LAW

Rights to the use of water in Maryland have developed through court decisions as part of the Common Law of the State. This Common Law development grants to landowners certain rights to the use of water that flows in a watercourse over or adjacent to their property. The owners of land also have rights to the use of underground water that exists beneath their property. These rights of use are property rights attached as part and parcel of the land itself.

The rights of landowners to make use of the water from a surface stream or watercourse are rights in common. Therefore, each landowner's rights of use are limited by the equal rights of other riparian landowners along a stream to make a reasonable use of the water. What constitutes a reasonable use depends upon a number of factors such as the size and flow of the stream, the needs of other riparian owners at the time, etc.

The right of use exists only while the water is adjacent to or beneath the landowner's property. Once it passes beyond the limits of an owner's land all rights of use are lost.

This right of landowners to use water, being a vested property right attached to land, is entitled to the same constitutional protection as other property rights. Both the federal and State Constitutions prohibit the taking of these rights, even by the State, without just compensation.

Common Law development of rights to use water as well as statutory enactments pertaining to the water resources of the State are covered in detail in "Maryland Water Law," published by this Committee in October 1965.

Landowners with rights to use surface and underground water constitute only a small percentage of the people of Maryland, and their total water needs represent only a small fraction of the water resources that can be developed and made available for use within the State. There is then surplus water over and above the needs of those with Common Law water rights available for development and use to meet the needs of all the people of the State. If the use is for benefit to the public, such as for a public water supply, the power of eminent domain may be made available to use if necessary in acquiring the needed water and other property rights. Eminent domain can also be made available for use in acquiring water rights that will serve the greatest public interest. Public water supply systems include both municipally owned and operated systems and private water companies serving the public.

Water shortages in Maryland over the past years have resulted from lack of planning and development to meet future needs and not as the result of any shortage of available water resources. Data that are now available in the State show large quantities of both surface and underground water that can be developed and managed to adequately meet foreseeable future needs. Presently recognized rights to the use of water as developed through court decisions need not act as any deterrent to this planning and development.

A study for the State Planning Department by Bramhall and Mills in 1965[1] indicated a gradual rise in the percentage of the population of the State to be served by public water supply systems. In 1960, 86.6 percent of the population of the State was served by public systems. Future predictions are that this percentage will increase to 89.3 percent in 1970, 91.4 percent in 1980 and 97. 3 percent in 2010. Data indicate an adequate supply of water resources available for development to meet State needs. Water for use in public systems

[1]"Maryland Water Supply and Demand Study." Bramhall and Mills. April 1965.

rates at the top in the public interest; therefore, there is no legal or water resource limitation standing in the way of the planning for and development of water resources to meet these needs.

The history of supplying water to the Baltimore metropolitan area through the City system during the 20th century supports the observation that future needs will be met only by looking ahead and planning for development to meet needs as they arise. At one time the supply for the City system came from Roland Run. Later water was diverted from the Big Gunpowder River to meet increased demand. This action was followed by storage at Loch Raven and later more storage in the Loch Raven and Pretty Boy Reservoirs, both on the Big Gunpowder River. In 1955 the City started bringing additional water from its Liberty Storage Reservoir on the Patapsco River; and, since 1966, water has been brought from the Susquehanna. Neither existing Common Law rights to the use of water nor the availability of water resources has hindered the planning for and development of water resources for distribution to meet the needs of the Baltimore Metropolitan Area through the City system.

Each time the City has found it necessary to develop additional water supplies to meet future needs, it has presented plans to meet these needs to the General Assembly of Maryland. After due consideration of all interests involved the Legislature has authorized use of eminent domain, subject to such limitations and conditions as deemed appropriate in acquiring the needed water and other property rights.

ROLE OF THE STATE UNDER ITS POLICE POWER

In the interest of the public health, safety and welfare of its citizens, a state under its police power may regulate the use of all property within its borders insofar as is reasonably necessary. This power includes regulation of uses that are made of water resources within the state.

In some instances it may be difficult to determine just how far a state may go in regulating the use of private property under its police power and when eminent domain must be resorted to. If a state is seeking to protect the public against something harmful, the police power applies; but if the public is seeking a benefit from the use of private property, compensation must be given.

Under its police power a state has both the authority and the duty

to assume responsibilities with respect to its water resources. In exercising this responsibility a state is acting in the role of a sovereign and not in any proprietary sense. Of course, the state does have a proprietary interest in water rights attached to state owned land.

The Department of Water Resources, created as successor agency to the Water Pollution Control Commission by the legislature in 1964, is assigned broad responsibilities with respect to the development and use of the water resources of the State. A major responsibility assigned to it by the legislature is the supervision and planning for multiple purpose development of the waters of the State for the best interests of all its inhabitants. The Department must develop a general water resources program which contemplates the proper conservation and development of the waters of the State in a manner compatible with multiple purpose management on a watershed and/or aquifer basis. The program shall serve as a guide to the Department in the performance of other duties assigned to it by the legislature.

The importance of developing a plan for the proper conservation, allocation and development of all the waters of the State to serve as a guide in the issuance of water, water power, dam, reservoir and other permits was recognized when the original Water Resources Law was enacted in 1933. Neither the Water Resources Commission, created in 1933, nor its successor - The Department of Geology, Mines and Water Resources - was able to carry out these assigned duties. The present Department of Water Resources and other State agencies are aware of the need and importance of developing plans for the multiple purpose development and management of the waters of the State. Water development and management problems of both quantity and quality can no longer remain the sole responsibility of the individual or corporate users with water allocations determined in the market place and disputes settled in the courts, although both will continue to be important.

The Maryland General Assembly in 1966 enacted Senate Bill No. 335, now Chapter 562 of the 1966 Laws of Maryland, requiring the governing body of each county to be responsible for the preparation of plans for public water supply and sewerage systems throughout the county. The governing body of each county is required to develop and submit to the State Department of Health a county plan no later than January 1, 1970. The Department of Health, prior to its approval, is required to submit each county plan to the Department of Water Resources which shall advise on water allocation,

adequacy of industrial waste treatment and the effect of the proposed withdrawals and waste discharges on waters of the State. This legislation is a major step toward planning for the development of water and sanitary systems to meet future needs.

Such a statewide plan will serve two major purposes: one, to provide the orderly development and management of water resources to meet future needs as they are projected; two, to provide Maryland with a basis for full and effective participation in federal-interstate river basin planning of the Susquehanna, Potomac and Ohio River Basins and in the Appalachian and the North Atlantic regions.

Until statewide plans are available in the Department of Water Resources as a guide for reviewing applications for permits for the use of water, for construction of dams or reservoirs and for water quality control, the Department will be at a disadvantage when applications are presented and there is no general plan for the future development and use of water from a particular source. The Department has already been confronted with this problem. Maryland must also have a plan of its own if it is to effectively participate in interstate river basin planning, since the State must look to interstate waters to meet a large portion of its increased future needs.

Planning is a continuing process; plans for the future should provide sufficient flexibility for adjustments to meet changing demands as they become apparent.

Up to the present time each water user whether he be an individual, an industry, a municipality, etc., has been left in most cases to locate and develop his own plans for providing the water that is needed. Following this course in the future is certain to result in conflicts between water users. Each will seek that source of supply which will meet its needs in quantity and quality at the lowest cost. Development of water resources costs money as does maintaining water quality. The development of additional water supplies will be at a greater cost since the cheapest sources have been developed first. Natural stream flows have been used both as a source of supply and a means of disposing of municipal and industrial wastes. More and more storage and more and more waste treatment before discharge must be the course in the future. Someone must pay for the costs of this storage and treatment. Some of the plans for development and treatment will still be the choice of the individual while others should be made by the public through its appropriate agencies.

As we look at water rights and water law an emerging concept must be recognized. In the eastern humid region water rights as depicted

in Common Law and statutory law have been largely based upon riparian doctrine. In the arid or semi-arid western states prior appropriation doctrine has been the basic philosophy underlying legal developments. However, in all cases the appropriation and use of water has been predicated on a property right providing access to water; or in order to use water one must own property or a right-of-way to the water.

On the contrary, any land owner, tenant or lessee in a watershed may contribute to the pollution of a stream. A user at the highest point in a watershed may obtain water from wells or municipal systems, from within or without a watershed, and may use and pollute the water. It matters not whether the user is *a riparian or non-riparian land owner!* When the water is released, the law of gravity will arrange for the pollution of a stream.

In order to maintain high standards of water quality in streams it is essential to consider discharges for an entire watershed or sub-watershed, not only discharges from riparian owners.

Some Limitations of Existing Law

1. Court Decisions

Court decisions defining Common Law rights to the use of water are few in number and do not cover all potential controversies. For example, no cases have gone to the Maryland Court of Appeals specifically over the use of percolating ground water. Court decisions in other eastern states are available as a guide where Maryland decisions are lacking.

A clarification of rights to the use of water through legislative enactments to serve as a guide by making people aware of the extent of these rights might appear desirable. However, such an attempt would be difficult and probably undesirable for the following reasons:

1. It would be impossible to adopt a set of rules for all controversies that might arise over the use of water.
2. Legislative enactments might operate to prevent desirable development of the Common Law.

The publication, "Maryland Water Law," together with the "Selected Opinions of the Attorney General of Maryland," both published by this Committee, should be helpful to the Department in answering many legal questions. However, there will be questions from time to time requiring the Department to seek legal advice and con-

sultation. The Attorney General of Maryland should be in a position to provide this help.

2. Coordination of Planning and Management Activities

The Department of Water Resources has overall planning responsibility for the development of the water resources of the State. It is not implicit that all other agencies and/or subdivisions of the State are required to coordinate their plans with the Department of Water Resources. An exception is legislation enacted in 1966 requiring counties to develop plans for public water supply and sewerage systems. These plans are to be submitted to the Department of Health, which is in turn required to submit the county plans to the Department of Water Resources prior to approval. All plans for water resources development and management regardless of the originating agency and/or subdivision should be coordinated with the statewide plan of the Department of Water Resources.

3. Appropriation or Use of Water

The present law makes it illegal for anyone to appropriate or use any waters of the State, surface or underground, without a permit from the Department of Water Resources. The use of water for domestic and farming purposes or for an approved water supply of any municipality is exempt from this permit requirement, as is any use in existence on January 1, 1934, provided such use is not abandoned.

The use of the words "appropriation or use" contained in the law could raise questions in the minds of some people. Under Maryland water law, as developed through court decisions, it cannot mean the adoption of the prior appropriation doctrine applicable in western states. Under this doctrine, as applied in the West, a permit from the state grants the applicant a water right independent of land ownership for a specific use. Under Maryland law the granting of permits constitutes a regulation of water use under the police powers of the State and not the granting of any positive property rights for the use of water.

The General Assembly has provided that the Act shall "not be construed so as to impair any riparian or other vested right." These words of caution indicate the need for a thorough understanding of the nature of each permit issued, both by the Department in issuing the permit and by the party to whom it is issued; and questions should be ruled upon by the Attorney General.

In granting any permit authorizing any use or appropriation of water the Department may include such conditions, terms and reservations as it may deem reasonably necessary. This provision of the law could permit the Department to provide for a review and reconsideration of any permit. Legislation enacted by the Maryland General Assembly in 1967 specifies that the Department shall review all permits every three years; and if the quantity of water authorized is not needed or is not being used, the terms of the permit shall be reduced accordingly. This legislation requires a review of all outstanding water use permits. It should be noted that the Department has no influence on water withdrawals by municipalities or agriculture under present exemptions.

As previously mentioned the Department of Water Resources is responsible for planning and supervising the multiple purpose development and for preparing and developing a general water resources program which contemplates the optimum conservation and development of the waters of the State. The program is to serve as a guide to the Department in the performance of its duties.

As Dr. Lyle E. Craine stated in his paper, "Maryland's Role in Water Resources Development," published as a part of the overall study of this Committee:

> A sound water resources planning function is an essential foundation for (1) effective participation in federal and interstate negotiation regarding Maryland's right to interstate waters, (2) establishing necessary planning and operational relations between fresh water management and the problems of the Chesapeake Bay, (3) encouraging optimal water use through administration of the water appropriation law, the approval of dams and reservoirs and the development of regulations regarding public access to fresh water empoundments for recreation, and (4) effective participation with federal agencies regarding pollution abatement, and particularly the development of stream standards required by the Water Quality Act of 1965.

4. Dam and Reservoir Construction

The number of good reservoir sites in the State with multi-purpose development potential is limited. Once a site is developed for a single purpose such as flood prevention, it is very difficult to modify the structure to include other purposes from engineering, economic and

legal viewpoints. Historically, control over dams and reservoirs has been administered in the interest of public safety and welfare. The State should encourage or even require optimal multiple purpose development of those reservoir sites that offer the potential. The Soil Conservation Service, in administering the Federal Watershed Protection and Flood Prevention Act, now favors developments for multiple purpose as part of its program as has the Corps of Engineers, U. S. Army, in recent plans. If control over dams and reservoirs is limited only to their effect on public safety, the State cannot require that developments follow a previously prepared and accepted plan. Applicants for permits to construct dams and reservoirs are generally limited in their specific needs and interests whether a private individual or corporation, a state or a federal agency. The State should require optimal multiple purpose development of its water resources when issuing permits to build dams for the impoundment of water including consideration for alternative uses of such sites.

5. Divided Responsibility for Pollution

The maintenance of a satisfactory level of water quality is the most important objective of water use and management in the State today. At the same time it may be the most difficult to achieve.

Since 1914 the Department of Health has been responsible for sewage and human waste disposal. From 1947 until 1964 the Water Pollution Control Commission was responsible for all other aspects of pollution abatement. The latter responsibility is now assigned to the Department of Water Resources.

In the absence of master plans there have been conflicts of jurisdiction over alternate uses of the assimilative capacity of a specific body of water. All indications are that present liaison between these two agencies provides coordination; however, coordination has not always been adequate so that information to the public has sometimes been inconsistent and actions which might be permitted by one agency would be prohibited by the other. While this problem of coordination might be solved by integration of these two jurisdictions, even greater problems of coordination between other related agencies could be created.

It has been said that capable men of good will can make any organizational structure function well and, conversely, that regardless of the quality of organizational structure satisfactory results cannot be obtained by personnel of little competence.

The above statements are intended to emphasize two facts, (1) personnel in these agencies should be highly competent and (2) no administrative or legislative action should ever be taken without due consideration for the complexities of water quality maintenance and the problems of coordination between all agencies whether local, state or federal. It is important to note that the proposed Waste Acceptance Service currently being studied for feasibility will comply with Water Quality Standards as established by the Water Resources Department. There is an implication of potential de-emphasis of the role of the Department of Health in sewage disposal. Such change will require careful planning for essential coordination.

6. Administration of Well Drillers Law

The Department of Water Resources is charged with the responsibility of licensing well drillers and the issuing of permits to drill wells. As a condition to the issuance of a permit the Department may require that samples of the materials encountered in drilling the well be preserved and submitted to the Department. Upon completion of the drilling of any well or wells, a final report shall be filed by the driller with the Department, giving the log of each well, and size and depth thereof, the diameters and lengths of casing and screen installed therein, the static and pumping levels and the yield of the well, and such other information as the Department by its rules and regulations may require.

The data included in well driller's reports are valuable to well drillers, to the public, to the Department of Water Resources and to the Maryland Geological Survey. The more data available for a specific location the more accurate predictions of ground water yields may be for future wells in the vicinity. Also, the more data available the more precisely the effect of additional wells on ground water supplies and existing wells can be predicted. For these reasons every effort should be made to upgrade the quality of completion reports. A series of seminars jointly sponsored by the two departments and the Maryland Well Drillers Association should be conducted periodically.

Specifically, the Committee believes that a better procedure is needed for permitting technically qualified well drillers to contribute to the development of standards, regulations and plans of implementation.

7. Special Commissions for Watersheds, River Basins or Aquifers

Bills were introduced in both the 1966 and 1967 sessions of the Maryland General Assembly to establish a Patuxent River Commission. The objective of these bills was to establish a Commission representing the counties through which the river flows to develop and implement a river basin plan.

The establishment of such commissions for Maryland rivers could be useful. County and other local representatives could facilitate overall basin planning for categories of use and water quality standards, for flood plain zoning, for coordination of other local zoning regulations as well as development for parks and related recreational uses.

The Department of Water Resources already is charged with State water use plans and multipurpose river basin plans. In 1966 the General Assembly passed legislation requiring each county to submit to the Department of Health a county plan for future development of water supply and sewage disposal. Prior to approval by the Department of Health of such plans they must be reviewed by the Department of Water Resources, and where estuarine waters may be used for waste assimilation there should be a review by the Department of Chesapeake Bay Affairs.

A commission such as proposed for the Patuxent could be an excellent supplement to the existing organizational structure. The Department of Water Resources might well establish standards, etc., in accord with an overall State plan; and a commission for a particular basin might develop a plan for a specific area which might propose higher categories of use, prohibit certain uses or otherwise be more restrictive. The Department of Water Resources is responsible for industrial pollution control; the Department of Health is responsible for sanitary pollution control; the Department of Game and Inland Fish is responsible for fresh water fishing regulations; the Department of Chesapeake Bay Affairs is responsible for boating and fishing regulations in the Bay and its estuaries. Therefore, it seems most desirable for such basin commissions to be advisory commissions whose recommendations on water resource management would be promulgated as regulations of the appropriate Department.

The appropriate Department would also be responsible for enforcement of such regulations, and the local support which such a

commission could provide would materially enhance the enforcement capability. Testimony by a local person that a misuse of water resources is detrimental to an area is often of more value in enforcement than that of State enforcement officers; in fact local support for wise resource management may prevent or eliminate misuse without necessity for legal action.

Department of Water Resources Responsibilities

1. Overall Planning

There is an urgent need for an overall water resources program for all State waters. In addition to internal requirements the State must anticipate an increasing interest by out-of-state users in the potential for diverting water now flowing into Maryland.

The objective of an overall program is to reconcile, to the maximum degree possible, alternative demands on water resources for municipal, domestic, industrial, recreational and agricultural uses and to direct development, management and conservation of surface and ground water resources to obtain the greatest benefits for the State and its citizens. There will be an increasing need for factual data to support Maryland requirements for interstate waters.

For development of an overall program it is necessary to establish the relationship between available water resources and projected alternative uses within the diverse regions of the State and to prepare general plans of development, management and conservation for optimal allocations. Supply and demand studies have been made by the State Department of Planning; and much information is available from the Maryland Geological Survey, the U. S. Geological Survey and within the Department of Water Resources. However, before a complete program can be developed, these data must be amplified, evaluated and the following phases completed in more detail.

a. Delineation of specific stream basins, aquifers or geographic units as appropriate.

b. Description of physiographic and geologic characteristics of each unit.

c. Collation and evaluation of hydrologic data for each unit.

d. Summarization and projection of water demand data by user category (i. e., municipality, industry, agriculture, recreation).

e. Summarization of basic data on pollution from municipal, industrial and agricultural wastes and from sedimentation.

f. Evaluation by areas of supply versus demands for different uses or combinations of uses.

g. Integration of supply and demand projections into a development and management program with commitment of resources to specific priorities for alternative uses.

h. Coordination of planned commitments with other agencies, federal, State and local.

The Department should proceed with all possible speed to complete development of a general statewide water resource program with more detailed plans for specific river basins or other bodies of water. The Department must coordinate its plans with other agencies while simultaneously fulfilling its assigned leadership role.

Additional professional staff will be required, together with technical and administrative support personnel and operating funds, in the engineering or scientific disciplines as follows:

a. biology
b. chemistry
c. data processing
d. ecology
e. engineering
f. geology
g. hydrology
h. law
i. natural resource management
j. radioisotopes & radiation safety
k. resource economics & planning
l. systems analysis
m. water quality analysis
n. information and education

2. Data Collection, Storage, Retrieval and Analysis

There are seventeen State and federal agencies collecting supply and demand data on Maryland water resources. Each agency designs

its collection, collation and interpretation systems for its own specific requirements. There is no central data bank nor is there an adequate system for exchange between all agencies. The result is some duplication of effort while simultaneously specific decisions in a single agency may be made without full utilization or knowledge of information which might be available elsewhere. The most serious aspect of the entire problem is the fact that usable water facts cannot be acquired quickly; therefore, basic hydrologic data collection must be initiated far in advance of the time of use and the data stored for availability.

The objective is to provide the Department, other State and federal agencies and the public with the essential data which, together with correct analysis, will give maximum assurance of optimal decisions.

A computerized system for automatic data storage, retrieval and analysis must be established. Liaison between agencies must be organized to provide a standardized input system with sufficient breadth to meet all agency and public needs for retrieval, analysis and tabulation. Interagency liaison should identify data collection deficiencies and minimize duplication.

The Department should provide leadership in establishing an inter-agency organization to facilitate collection of hydrologic and other water resource data and for development of a plan for computerized storage, retrieval and analysis of such data. Such an organization should meet at regular intervals to exchange information about operating programs of the agencies and to optimize collection programs. In view of the number of agencies involved, it is possible that the entire computer system may not be at a single location. In addition to digital computers for storage, retrieval and analysis, the complementary use of analog computers should be developed.

Some members of the staff will need training in the use of computers, and a computer programmer will be required. Acquisition of a computer system or arrangement for computer time on a permanent basis will be essential.

3. Water Quality Surveillance and Control

Water quality surveillance and control are presently below adequate levels and appear to be far below that required under the enacted Federal Water Quality Act of 1965. In addition to known pollutants such as organics, established manufacturing process wastes, sewage and heat, there is a continuing hazard of pollution from new exotic chemicals for which standard laboratory equipment and procedures

are inadequate. In some cases, specific pollutants may not be serious hazards alone but in combination with new contaminants may become serious.

The objective is to provide adequate information on water quality to meet State needs and federal requirements including analysis for both well known pollutants and exotic chemicals.

Water quality determinations must be increased in both number of observation sites and frequency of sampling. Analyses must be made either on site or within permissible time limits. When analyses indicate need for pollution abatement, follow up inspections must be made more frequently than at present to assure compliance with orders.

An automatic water quality monitoring network should be established. The exact location of monitors should be coordinated with stream gaging stations of the Maryland Geological Survey to facilitate interpretation and application of data gathered. Industrial waste outfalls should be inspected with increased frequency, and inspections should be programmed for the increased number of sites that development obviously will require. Rather than increasing the present laboratory to meet the full increase in load required, laboratories should be established in Western Maryland and on the Eastern Shore to facilitate service to those areas. Regional laboratories should be equipped to perform standard analyses and the existing or central laboratory equipped with the more sophisticated equipment for non-routine procedures for petro-chemicals, pesticides, herbicides and metallic pollutants which may be highly toxic in minute concentrations.

Establishment of an automatic water quality monitoring network will obviously require equipment for on-site instantaneous measurement of water quality indicators such as acidity, temperature, turbidity, dissolved oxygen, etc., together with a communication system which will enable data recording at a central location.

Increased number of water quality observations from an increased number of sites together with increased frequency will obviously require more personnel. In the interest of economy, engineers can be used for those observations, samplings, etc., where engineering competence is essential and engineering technicians employed for routine observations and sampling.

Increased complexity of water quality analyses will require the addition of at least one outstanding analyst in the laboratory. There will be an increasing need for at least one bacteriologist for more

prompt analysis than is sometimes possible through the Health Department. The establishment of laboratories in Western Maryland and on the Eastern Shore will require at least one chemist each; however, laboratory technicians for performing routine analyses, under professional supervision at all three locations, will provide the most economical means of laboratory support for quality control work. Additional laboratory equipment will be needed to overcome present deficiencies and to meet future needs.

4. Sedimentation

Sedimentation has long been recognized as a major cause of degradation of water quality. Urbanization, industrial park development and highway construction cause severe damage to many streams and estuaries.

The Department must establish and enforce sedimentation control regulations as soon as possible in order to minimize sedimentation. In order to make such regulations effective, they must apply to all public agencies as well as private industry or individuals.

The Department staff should develop regulations, enforcement of which will minimize sedimentation. In order to arrive at practicable regulations, advice and counsel should be obtained from the State Roads Commission, the Agricultural College and the State Soil Conservation Committee, the Maryland Geological Survey, the Soil Conservation Service and the Agricultural Research Service of the U. S. Department of Agriculture and from county engineers. Every effort should be made to obtain assistance of planning and zoning commissions which may require sedimentation control plans as an antecedent condition to approval of construction and development plans.

Additional personnel will be required for sediment control activities. The principal competence needed by such personnel will be in engineering, geology, and hydrology. There may be need for enabling legislation to permit zoning or other local authorities to require sedimentation control plans as a part of applications for zoning or construction permits.

5. Information and Education

A lack of public understanding of the objective of the Department to optimize development, management and conservation of water resources for public benefit means the Department does not receive full cooperation and support. The public needs to be well informed

of available water supplies, current and projected alternative demands and methods to be followed in development, management and conservation of water resources in order to improve both public and State, local or federal agency understanding and support.

The objective may be attained by publishing materials of an informational nature addressed to the general public for local, basin or statewide programs, changing the present annual seminar on industrial pollution control to a general series on water resources if unable to do both, and conducting seminars for well drillers and other special groups at different locations within the State. A water resources educational program should be established in line with above objective.

A public information officer is needed to provide the Department with the desired educational capability. The competence needed is ability to translate technical reports into everyday language, together with the ability to organize and conduct meetings, thus relieving professional employees from educational programs except in their specific technical fields of competence.

6. Appropriation, Dam and Reservoir Permits; Their Review and Revision

Permits for appropriation of water have not been subject to review and adjustment of allocations even if required in the public interest. However, legislation enacted in 1967 requires that all permits to use water be reviewed every three years; so now this weakness in the law has been corrected. The terms of the permit are subject to revision if upon review it is found that the quantity authorized is not being used or is not needed. Exemptions from appropriation permits materially weaken the potential management capability of the Department.

The present law as administered since its enactment in 1933 has limited review of applications for construction of dams or reservoirs solely to consideration for public safety. This limitation also materially weakens the potential management capability of the Department.

7. Review and Revision of Laws, Regulations and Procedures

The Department should continue its present practice of reviewing laws, regulations and procedures and, with the assistance of the Attorney General, propose such changes as necessary to permit the De-

partment to effectively fulfill its responsibilities. The need for legal counsel will continue to increase. Present support by a part time Assistant Attorney General is inadequate.

The educational program should disseminate information pertinent to proposed changes well in advance of effective dates so that citizens may be informed and have an opportunity to express their viewpoints.

The above objective can be accomplished by continued attention of Department staff with the assistance of an Assistant Attorney General full time and the public information officer referred to previously.

8. Efficiency of Sanitary Service In Metropolitan Maryland.

The Baltimore, Washington, Annapolis Triangle.

Projections of future growth (Appendix B) indicate a further concentration of the State's population and industrial activity in this area. Future needs require adequate sanitary facilities to serve within the region. Although waste discharges — both municipal and industrial — are, for the most part, made into salt or brackish waters, the effect of these discharges upon the waters of the Chesapeake Bay and tributary estuaries must be considered when developing plans for providing the needed sanitary service to the region.

An adequate and efficient sanitary service will meet the area needs and assure that waste discharges will not degrade materially the waters of the Chesapeake Bay and its estuaries.

The study now being made of feasibility for a statewide Waste Acceptance Service will, hopefully, project the best future plan for this critical METRO area. This plan, recommended by a special Governor's Committee, proposed a single waste management agency to serve the entire State. There can be no doubt of the critical nature of needs in this specific area for expanded capacity and coordination.

Regardless of the course of action selected, the Department should make a major contribution to the final plans and their implementation.

9. Participation in Interstate Water Resources Planning and Development

As Maryland's future water needs expand, the State must place increased dependence upon the waters of the Susquehanna and the

Potomac, both interstate streams. This statement applies equally to other states in the two river basins. Any use of water affecting either quantity or quality in any state is of concern to the entire basin. Both streams discharge into the Chesapeake Bay; therefore, quantity and quality of these discharges will have an effect upon the marine life within the Bay and the use of water for recreational or other purposes.

The objective is to insure that the State can depend upon interstate streams as a source of water to meet a good portion of its future fresh water needs and to insure that the quantity and quality of water coming into the State in interstate streams does not degrade the waters of the Chesapeake Bay and the Potomac estuary.

Maryland must determine its future needs and decide what portion of these needs, with respect to quantity, quality and time, should come from the Susquehanna and Potomac. The effect of lowering either the quantity or quality, or both, of water entering the Chesapeake Bay and the Potomac estuary from these two rivers must be predicted and provisions made to minimize detrimental effects rather than attempt corrective measures after actual damage becomes apparent.

Maryland should join with other states, the District of Columbia, and the federal government in developing comprehensive plans for the development and use of the waters of these two river basins to meet the projected needs of all jurisdictions. The Chesapeake Bay as part of both river basins must be given due consideration in such plans.

Effective participation in interstate water resources planning and development functions appears to require two kinds of staff personnel: (1) a full range of professional competencies to participate in special task-force and sub-committee studies, and (2) official representations on interstate bodies who can speak for the top policy levels of State government and adequately and effectively present and support the interests of the State in these interstate waters.

10. State Coordination of Federal Assistance

Numerous federal programs offer assistance to the State in the planning, development and management of its water resources. Many of these programs require matching funds. It is important that Maryland participate fully in coordinating these programs in order to receive maximum advantage of the opportunities they offer and to have

their benefits distributed equitably among the different areas of the State. Otherwise maximum benefits may be lost to the State, and some areas may fail to share in these advantages while others receive full benefits.

The objective is to coordinate and channel all programs of federal assistance available to the State in order to insure maximum benefits and that these benefits be distributed equitably among the different areas of the State.

The Department of Water Resources should become familiar with all federal water resources programs that have a bearing on the duties and responsibilities assigned to the Department. These programs should fit into and become part of Maryland's program for water resources development and management. Where there is joint responsibility, as is the case of pollution control, the affected departments should work together to insure maximum benefits from both the federal and State programs.

The Department will need personnel to study and analyze federal water resources programs in order to determine opportunities that are available. Water resources planners within the Department should take maximum advantage of available federal programs in developing a multipurpose program for managing the water resources of the State.

11. The Need for Research on Water Development Problems

In order for the State to take advantage of the latest available technology and methods, the Maryland situation discloses need for special water resources research effort in several areas of particular importance to the State's future. Illustrative are such things as:

1. factors affecting waste assimilation on the tidal estuaries.
2. ecology of estuaries particularly with reference to the effect of fresh water inputs and thermal pollution upon their biological productivity.
3. methods of alleviating oxygen depletion in the Potomac estuary as alternatives to large upstream storage for low flow augmentation.
4. control of erosion and sedimentation from urban and suburban development activity.

5. identification and location of waste water outfalls and character of discharges.

The objective is to identify research needs, encourage appropriate research, and follow up to assure that the research results are brought to bear on Maryland problems.

The Department should, looking well into the future, make every effort to identify research needs and bring these needs to the attention of the proper research agency. Other State agencies and organizations should be encouraged to do the same. Water resources research activities in the State should be coordinated in order to prevent unnecessary duplication of effort.

After identifictaion of research needs the Department of Water Resources must determine the part it should play in carrying out the needed research. Those research needs not to be carried out by the Department should be brought to the attention of the proper research agency. Provision should be made within the State for coordinating all water resources activities in order to obtain maximum benefits and prevent unnecessary duplication of effort. Research results should be promptly applied to solving Maryland water problems.

The Department of Water Resources is primarily a regulatory agency, so it has limited research responsibilities. Most of the research needs of the Department should be either undertaken by the proper research agency — State or federal — or they should be carried out through contracts.

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Actions by the State of Maryland Leading to Present Role In Water Resources Development and Management

In paragraph three of the opening summary of this report it is stated that legislative cognizance was given to water problems at least as early as 1789. It is noteworthy that in 1789 the General Assembly gave approval to a course of action which would permit cooperative effort to solve the water problem as it existed at that time in a specific area.

In this appendix principal actions since 1914 are summarized. Only those directly pertinent to the present organization are included. The history of actions leading to the present organization, laws and regulations for water resources essentially began at that time. It is especially noteworthy that during the past 64 years recommendations of competent commissions have received favorable action of both the Legislative and the Executive Branches of the State government. Both branches deserve commendation for actions leading to the appointment of technically competent committees or commissions and for acceptance of recommendations of such groups.

1. In 1914 the Maryland General Assembly (by Chapter 810 - 1914 Laws of Maryland) gave the State Board of Health general super-

vision and control over the waters of the State, insofar as their sanitary and physical condition affect the public health or comfort. This supervision and control applied to water and ice supplies, sewerage, trade wastes and refuse disposal and for the maintenance, alteration, extension, construction and operation of systems and works related thereto. The basic law has been amended and broadened over the intervening years.

2. The Maryland General Assembly passed an Act appearing as Chapter 247, Laws of 1931, for the appointment of a Water Resources Commission to review the underground and surface water resources of the State and to formulate a plan for the preservation, allocation, control and regulation of such water resources for the maximum public benefit, safety and use. The Commission was appointed with Dr. Abel Wolman as its chairman and its report was made to the General Assembly of Maryland in January 1933. Following the recommendations of the Commission, the Maryland General Assembly, at its 1933 Session, enacted a Water Resources Law regulating the appropriation or use of both surface and underground waters in the State and exercising control over the construction, reconstruction or repair of dams and reservoirs.

3. The Maryland General Assembly by Senate Bill 310, Chapter 508, Laws of Maryland, 1941, created the Department of Geology, Mines and Water Resources to supersede the State Geological and Economic Survey Advisory Commission, the Bureau of Mines, the Water Front Commission, and the Water Resources Commission, and to take over all the personnel, powers and duties exercised by these agencies.

4. By House Bill 45, Chapter 697, Laws of Maryland, 1947, the General Assembly created the Water Pollution Control Commission, giving to it broad water pollution control responsibilities with respect to all types of water pollution in State waters. The granting of these broad pollution control responsibilities to the Water Pollution Control Commission was not to be construed to alter, change, modify or restrict the jurisdiction of the State Department of Health as set forth in Article 43 of the Code of Laws of Maryland. The State Board of Health retained water pollution control responsibility with respect to its effect on the public health and comfort of the people of the State.

5. The Maryland General Assembly, at its 1955 Session, passed House Joint Resolution Number 6, called for the appointment of a

Commission to study the water resources problems in Maryland and report to the Governor, the members of the General Assembly and the Legislative Council, including in the report such findings and recommendations as it may deem desirable.

The Commission, consisting of 25 members with Harry H. Rieck, Sr., as chairman, was appointed by the Governor. The Commission made a preliminary report entitled "Water in Maryland" in January 1956, recommending further study by it or a similar Commission.

The General Assembly at its 1957 Session passed House Joint Resolution No. 13, requesting the appointment of a Commission to continue the study of the water resources problems in Maryland. However, this Commission was not appointed.

6. In August 1957, State Senator Louis L. Goldstein, President of the Maryland Senate, appointed a Legislative Council Study Committee consisting of legislators and farm leaders with Senator Joseph A. Mattingly of St. Mary's County as Chairman. This Committee was to make a study of water rights and irrigation. It made its report to the Legislative Council prior to the 1958 Session of the Maryland General Assembly.

7. The Maryland General Assembly, in 1959, by House Joint Resolution 31, called for the appointment of a Commission to study the economic development problems relating to water use and to give consideration to any legislation needed to clarify water rights as they may be related to such development. The Commission was appointed with Delegate E. Homer White, Jr., of Wicomico County as Chairman.

The Commission submitted a progress report to the Legislative Council in October 1960. This report cited the fact that the Commission had requested the State Planning Department to assemble detailed data on water resources and water requirements in the State. The Commission strongly recommended that the State Planning Department's request for funds for this purpose be favorably considered. Appendices to this progress report included the results of an Irrigation Survey for the crop year 1959 and the results of a county by county study of water problems in the State. The Commission submitted its final report in July of 1962. One of its recommendations was that the recent report of the State Planning Department, "Future Administration of State of Maryland Water Resources Activities," be given careful study and consideration in order to provide the most practicable water resources administration in the State.

8. At approximately the same time that the White Water Study Commission began its work, Governor Tawes requested the State Planning Department to conduct a water management study. This Study was completed and submitted in March 1961 entitled "Future Administration of State of Maryland Water Resources Activities." The Water Study Committee recommended that the report of the State Planning Department be "given careful study and consideration in order to provide the most practicable water resource administration for the State," as stated above.

9. In the fall of 1962, Governor Tawes appointed an Advisory Committee for Conservation and Development of Natural Resources with Dr. R. L. Green as Chairman. This committee reviewed programs of the resource departments, the proposed reorganization of these agencies, made informal recommendations to the Governor, and, together with representatives of the Planning Department and Board of Natural Resources, participated in pertinent hearings of the General Assembly in 1963 and 1964.

10. The Maryland General Assembly in 1964 enacted legislation reorganizing State agencies with water resource responsibilities. This reorganization and reassignment of duties and responsibilities implemented most of the recommendations of the State Planning Department in its report, "Future Administration of State of Maryland Water Resources Activities." This legislation, among other accomplishments, created the Department of Water Resources and assigned to it all the duties and responsibilities previously the responsibility of the Water Pollution Control Commission, numerous duties and responsibilities previously the responsibility of the Department of Geology, Mines and Water Resources, as well as other water related responsibilities assigned to a State agency for the first time. This legislation made the Department of Water Resources the major water regulatory agency of the State.

11. In August 1965 the State Planning Department published the results of a study conducted for it by Dr. David F. Bramhall and Dr. Edwin S. Mills entitled "Maryland Future Water Supply and Demand Study."

12. In 1965 the University of Maryland undertook, for the Department of Water Resources, the study herein reported to determine the needs of the Department to carry out the numerous duties and responsibilities assigned to it.

APPENDIX B

Statistical Data Relative To Population and Water Use

Maryland Sub-Regions covered in the following tables include the areas given below:

REGION I, SOUTHERN MARYLAND: Calvert, Charles and St. Mary's Counties.

REGION II, WESTERN MARYLAND: Allegany, Frederick, Garrett and Washington Counties.

REGION III, BALTIMORE METROPOLITAN AREA: Baltimore City and Anne Arundel, Baltimore, Carroll, Harford and Howard Counties.

REGION IV, WASHINGTON METROPOLITAN AREA: Montgomery and Prince George's Counties. (This Sub-Region does not include the District of Columbia.)

REGION V, EASTERN SHORE: Caroline, Cecil, Dorchester, Kent, Queen Anne's, Somerset, Talbot, Wicomico and Worcester Counties.

Table 1

MARYLAND POPULATION PROJECTIONS (000)[1] BY SUB-REGIONS, ACTUAL 1960, PROJECTED 1970-2010

	REGION	1960	1970	1980	1990	2000	2010
				High			
I	Southern Maryland	87	117	154	209	282	356
II	Western Maryland	268	296	345	425	539	676
III	Baltimore Metropolitan	1,804	2,217	2,833	3,526	4,426	5,381
IV	Washington Metropolitan	698	1,073	1,472	1,954	2,528	3,080
V	Eastern Shore	244	283	349	425	523	630
	Maryland	3,101	3,985	5,153	6,539	8,298	10,124
				Medium			
I	Southern Maryland	87	111	138	175	220	262
II	Western Maryland	268	282	310	357	421	497
III	Baltimore Metropolitan	1,804	2,113	2,542	2,952	3,457	3,967
IV	Washington Metropolitan	698	1,023	1,320	1,634	1,974	2,265
V	Eastern Shore	244	271	313	356	408	464
	Maryland	3,101	3,799	4,623	5,474	6,481	7,453
				Low			
I	Southern Maryland	87	107	127	151	178	199
II	Western Maryland	268	272	285	307	340	378
III	Baltimore Metropolitan	1,804	2,044	2,336	2,541	2,787	3,000
IV	Washington Metropolitan	698	989	1,213	1,406	1,591	1,714
V	Eastern Shore	244	261	288	306	329	351
	Maryland	3,101	3,675	4,248	4,711	5,224	5,642

[1]Maryland Future Water Supply and Demand Study by Bramhall and Mills, April 1965

Table 2

POPULATION SERVED BY MUNICIPAL WATER SUPPLY SYSTEMS[1] (000) MEDIUM PROJECTIONS

REGION	1960	1970	1980	2010
Maryland	2,687	3,393	4,227	7,251
Region I—Southern Maryland	33	51	76	210
Region II—Western Maryland	177	200	236	447
Region III—Baltimore Metropolitan	1,569	1,881	2,313	3,888
Region IV—Washington Metropolitan	698	1,023	1,320	2,265
Region V—Eastern Shore	210	238	282	441
Percent of Total Maryland Population Served by Municipal Systems	86.6	89.3	91.4	97.3

[1]Maryland Future Water Supply and Demand Study by Bramhall and Mills, April 1965

Population projections indicate a 2010 population of 2.4 times the 1960 level (Table 1)

Projections of comsumptive use of fresh water in 2010 indicate an increase of over 4 times the 1960 comsumptive use (Table 3)

Table 3

CONSUMPTIVE USE[1] OF FRESH WATER IN MARYLAND ESTIMATED 1960 – MEDIUM PROJECTIONS 1970-2010[2] (000) GALLONS PER DAY

	REGION	1960	1970	1980	2010
I	Southern Maryland	6,552	15,062	34,327	83,089
II	Western Maryland	16,303	23,174	35,432	57,967
III	Baltimore Metropolitan	385,936	485,584	669,766	1,368,139
IV	Washington Metropolitan[3]	123,626	204,277	293,512	657,963
V	Eastern Shore	65,405	105,949	178,143	335,132
	Maryland	597,822	834,046	1,211,180	2,502,290

[1]Consumptive use is the excess of withdrawals over returns, i.e., the amount of water consumed in use. It includes not only the incorporation of water into industrial products, evaporation and transpiration, but also water discharged into salt and brackish bodies since this water is no longer available for use as fresh water. These data do not include the amount of water that must be left in the stream for waste assimilation. They include the following uses: household, commercial, institutional, municipal, industrial, agricultural, recreational and thermal electric generation. Consumptive use occurs if the water is not returned to the place from which it was withdrawn, or if it is returned but changes in the time, place or quality of the return makes further use impossible or prohibitively expensive.

[2]Maryland Future Water Supply and Demand Study by Bramhall and Mills, April 1965.

[3]These data for Washington Metropolitan do not include use within the District of Columbia that will require water from the Potomac River, a Maryland stream.

In addition to the projected fresh water requirements for consumptive use included in table 3, there are other water need requirements among which are the following:

1. The amount of water that should be maintained in the stream for:
   a. waste assimilation
   b. maintaining the desired water quantity and quality for fish and wildlife and

c. water quantity and quality needs for recreation.

Recommendations by Bramhall and Mills in their Maryland Future Water Supply and Demand Study are as follows:

1. Higher level of waste treatment than at present before discharge.
2. Construction of 60,000 to 440,000 acre feet of reservoir capacity in the Potomac watershed in Western Maryland and Pennsylvania.
3. The Baltimore Metropolitan Region to have assurance of as much as 750 million gallons per day from the Susquehanna River over and above the 250 million gallons per day to which rights now exist and for which an aqueduct has been constructed.
4. The State of Maryland should continue its study of water management and should expand the collection and analysis of data on water use and supply.

APPENDIX C

Guide Standard for Temporary Desilting Basin (Debris Basin)

Definition

A barrier or dam constructed across a waterway or at other suitable locations to form a silt or sediment basin.

Purpose

To provide a temporary means of trapping and storing sediment from erodible areas in order to protect locations below the installation from excessive siltation.

Conditions Where Practice Applies

This practice principally applies to areas where construction operations for building developments and surface mining operations are in progress. It is used as a temporary measure until areas above the installation are permanently protected by vegetative and mechanical measures.

Scope

This standard is limited to temporary desilting basins comprising a dam or barrier not more than 10 feet above the elevation of the

streambed or waterway and limited to reservoirs with a storage capacity of less than one million gallons.

The requirements for larger structures are specified by State law; and construction permits for all such installations must be obtained from the Maryland Department of Water Resources, Annapolis, Maryland. (Article 96A, Section 12, Maryland Water Resources Law 1964)

Site Conditions

The site should be selected to provide adequate storage for the expected sediment load. Consideration should be given to periodic cleanout to reduce size requirements. In addition, site conditions should be such that a structure can be installed with a mechanical spillway or a combination of mechanical spillway and emergency earth spillway which will safely pass the following peak flows from the contributing watershed.

a. Sites with minor or no downstream hazards — 10 year frequency storm.

b. Sites with high downstream hazards — 25 year frequency storm. Runoff computations should be based on soil cover conditions prevalent during the anticipated life of the structure.

STRUCTURAL CRITERIA

1. Core Trench

A shallow core trench or keyway should be excavated along the centerline of the dam extending up the abutments to an elevation equaling the crest elevation of the riser to the pipe spillway. The minimum bottom width of the trench should be 8 feet with side slopes no steeper than 1:1. Its minimum depth should be 1 to 2 feet except in highly permeable soils it may be necessary to extend the core trench into a less pervious strata, particularly where downstream hazards are present.

2. Earth Embankment

Proportions. Side slopes should be no steeper than 2:1 on either face. Top width should be a minimum of 8 feet.

Freeboard. The top elevation of the settled embankment fill

should be at least 1.0 feet above the maximum design storm elevation in the reservoir.

3. Pipe Spillway

A pipe spillway should be provided with the minimum capacity to discharge base flow and low intensity storm flows from the contributing watershed without discharge through the earthen spillway. It should consist of a standpipe or box type riser joined to a horizontal pipe which extends through the embankment. The riser will be perforated or fashioned to provide a gradual drawdown in the reservoir to a planned elevation after each storm event. The period of drawdown from design storm stage in the reservoir to the crest elevation of the riser should be no less than 1 hour. The minimum discharge capacity for the combination of perforated riser and horizontal pipe (pipe spillway) should drain the pool from the crest elevation of the riser within 5 days. The hydraulic efficiency of the pipe spillway may be increased by using a riser which has 1.5 times the area of the horizontal pipe.

Crest Elevation. When used in combination with earth spillways, the crest elevation of the riser or standpipe should be at least one foot below the crest elevation of the earth spillway.

Anti-seep Collars. Conduits through embankments, consisting of materials with low silt and clay fractions, should be provided with anti-seep collars where the pipe diameter is 10 inches or greater.

4. Earth Spillway

Capacity. The minimum capacity of earth spillways should be that required to pass the peak outflow expected from the design storm less any reduction creditable to pipe spillways. Where earth spillways are used, the channel bottom should have a minimum width of 10 feet. The components and controls through an earth spillway are listed below:

COMPONENT	CONTROL
1. Entrance channel	—Minimum 1% grade up to the control section
2. Control section	—Flat grade, minimum 10 feet in length

3. Exit channel —Minimum 3% grade down from control section

5. Vegetative protection

All exposed areas of the embankment and earthen spillway should be protected with vegetation or other suitable means. (R.C.A. Job Sheets 1 through 4).

CONSTRUCTION SPECIFICATIONS

1. Site Preparation

Areas under the embankment and any structural works should be cleared, grubbed and stripped to remove all trees, vegetation, roots or other harmful material. The pool or reservoir area should be cleared of all trees and woody vegetation. Stumps should be cut as low to the ground level as possible.

2. Embankment

Material. The fill material should be taken from designated borrow areas. It should be free of roots, woody vegetation, oversize stones, rocks or other objectionable material. Frozen material should not be used. The constructed embankment should be built to an elevation which provides for anticipated settlement.

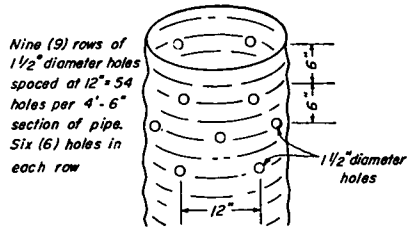
Placement. Areas on which fill is to be placed should be scarified prior to placement. Fill materials should be placed in maximum 6″ lifts which are continuous over the entire fill area.

Compaction. The movement of the hauling and spreading equipment over the fill should be controlled so that the entire surface area of each lift will be traversed by not less than one tread track of the equipment.

3. Structural Backfill

Backfill material should be of the type and quality conforming to that specified for the adjoining fill material. The material should be placed in maximum 4 inch lifts and hand compacted to equal or exceed the density specified for adjoining fill.

Courtesy Soil Conservation Service, USDA.

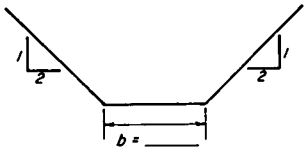


Riser Detail

Locotion Sketch

Design Capocity

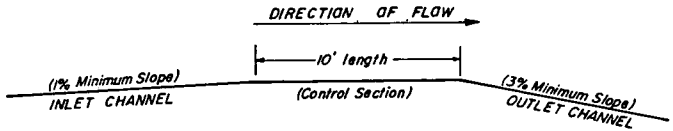
Droinage Area	Spillway Width (b)
41-60 acres	12 ft.
61-70 acres	14 ft.
71-100 acres	20 ft.



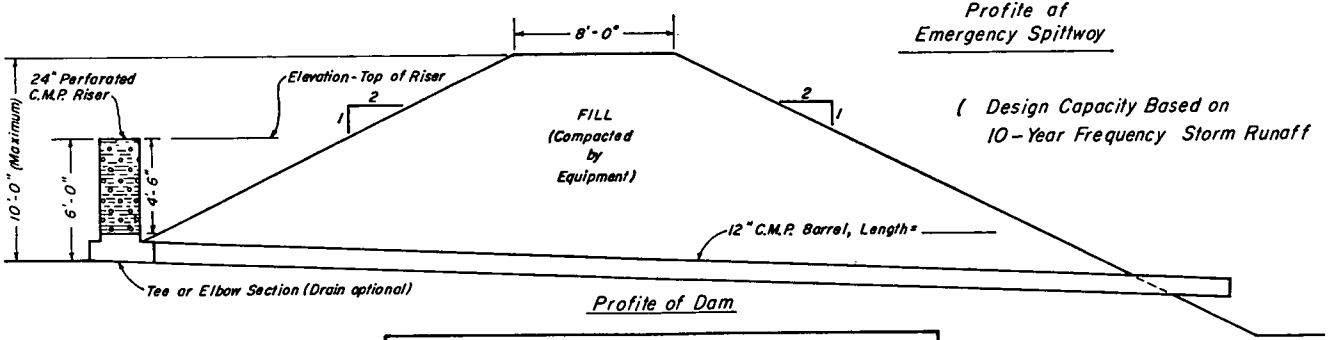
Crass Section of Emergency Spiltway

Dota and Notes

Elevation - Riser Base _____
Elevation - Pipe Outlet _____
Elevation - Top of Riser _____
Elevation - Top of Dam _____
Elevation - Crest of Emergency Spillway _____
(One Foot Above Top Of Riser)



Profite of Emergency Spiltwoy



Profite of Dam

(Design Capacity Based on 10-Year Frequency Storm Runoff)

TEMPORARY DESILTING BASIN
(For drainage areas of 41 to 100 acres)

Sample Design Sheet

Project _____ Date _____

Courtesy: Soil Conservation Service, U.S.D.A.

APPENDIX D

Sediment Control Program for Montgomery County, Maryland

Adopted June 1965

Prepared by the Staff of Montgomery County Council, Montgomery Soil Conservation District, Maryland-National Capital Park and Planning Commission (Montgomery County Planning Board), Washington Suburban Sanitary Commission; *with the assistance of* USDA — Soil Conservation Service, Maryland State Office, College Park, Maryland, Interstate Commission on the Potomac River Basin, Suburban Maryland Homebuilders Association.

I. INTRODUCTION

The people of Montgomery County formed the Montgomery Soil Conservation District in 1945 to combat soil erosion in the county. The District now operates an effective conservation program in the open areas of the county with voluntary cooperation from land owners, farmers and the many federal, state and local agencies and groups concerned.

However, excessive quantities of soil are eroding from the areas of the county undergoing development. These losses range up to 2300 tons per square mile per year in some watersheds; small areas lose soil at many times this rate. This is due to the rolling topography, the

intensity of rainfall, the erodibility of the soils, and the extent and duration of exposure of bare soils during development.

This erosion is removing fertility, cutting rills and gullies, and washing out roads, road banks and fills on the lands affected. The resulting sediment is clogging storm sewers and road ditches, muddying streams, and silting valley lands, lakes, and reservoirs. It also contributes to blocked navigation channels, reduced recreational opportunities, and general unsightliness in the Potomac River.

Erosion damages are costly to repair, often requiring regrading or replacement of the washed out soil and replacement of damaged pipes and pavements. Sediment damages are also very costly. Sediment is expensive to remove from the water itself and from the channels, reservoirs, or other areas where it is deposited. Sediment limits the use of water for most beneficial purposes.

Public sediment damages are increasing due to increased public ownership of valley lands, the increased use of waters of the county for recreation and water supply, and the expansion of development in the county.

The water pollution aspects of sediment are recognized by the State of Maryland by the inclusion of sediment as a pollutant subject to regulations under the water pollution control laws.

Property owners suffering unreasonable damage from sediment and flooding of property at downstream sites as a result of disturbance of watershed areas upstream often must seek protection from the courts against such damages.

The Interstate Commission on the Potomac River Basin has focused attention on the sediment problem in its Technical Bulletin 1963-1 "A Program for Sediment Control in the Washington Metropolitan Region."

Erosion and sediment control measures developed in the soil conservation district program with the technical assistance of the USDA – Soil Conservation Service and other agencies can be readily adapted to urbanizing areas.

Erosion and sediment control are in the public interest in Montgomery County.

II. BASIC PRINCIPLES

In Montgomery County, the sediment control program for the urbanizing area will involve the following basic principles:

I. Sediment control in the urbanizing area should become a stated policy of the county government and all concerned public agencies operating in or having jurisdiction in the county. All departments and divisions should cooperate in implementing the program.

II. A public information and education program on sediment control is necessary to obtain public and industry support.

III. Competent technical personnel, workable procedures and regulations, and enforcement are essential for successful sediment control.

IV. Sediment control provisions should be incorporated in the planning stage for most effective application in the construction stage of development.

V. Practical combinations of the following technical principles will provide effective sediment control when skillfully planned and applied:

A. The smallest practical area of land should be exposed at any one time during development.

B. When land is exposed during development, the exposure should be kept to the shortest practical period of time.

C. Temporary vegetation and/or mulching should be used to protect critical areas exposed during development.

D. Sediment basins (debris basins, desilting basins, or silt traps) should be installed and maintained to remove sediment from run-off waters from land undergoing development.

E. Provisions should be made to effectively accommodate the increased run-off caused by changed soil and surface conditions during and after development.

F. The permanent final vegetation and structures should be installed as soon as practical in the development.

G. The development plan should be fitted to the topography and soils so as to create the least erosion potential.

H. Wherever feasible, natural vegetation should be retained and protected.

VI. Research, evaluation studies, and observations should be conducted to provide needed information for improvement of the program.

III. STATEMENT OF POLICY

In view of the need for sediment control in the county and the feasibility of erosion control measures, the attached resolutions state the intent of the Montgomery County Council, the Washington Suburban Sanitary Commission, the Montgomery Soil Conservation District, and the Maryland National Capital Park and Planning Commission to provide for a sediment control program in Montgomery County.

IV. INFORMATIONAL AND EDUCATIONAL PROGRAMS

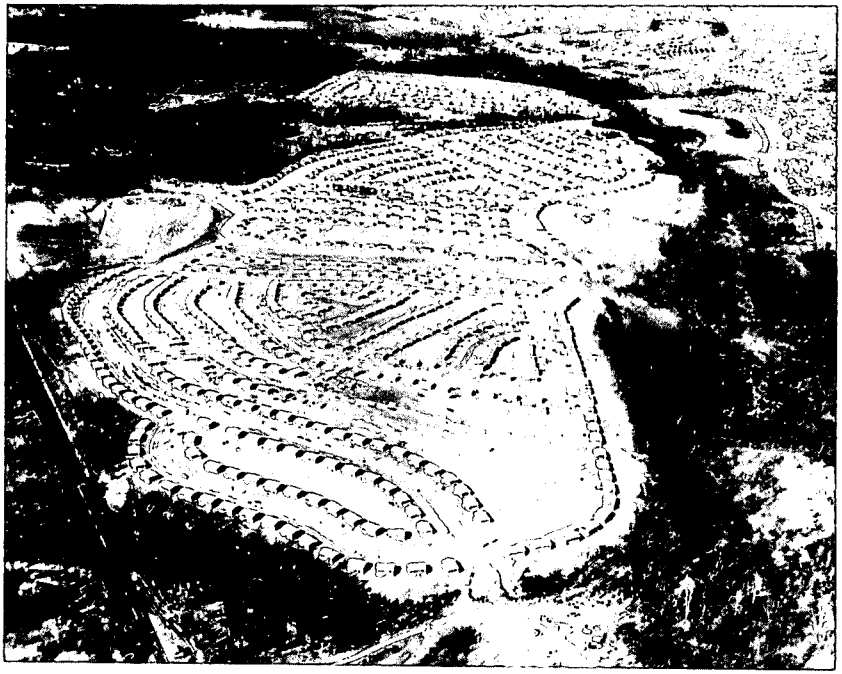
To enlist public awareness and support, an informational and educational program will be conducted in Montgomery County. This will involve the various departments of county government, the Park and Planning Commission and the Planning Board, the Soil Conservation District, the Sanitary Commission, and the Extension Service.

Included in the program will be:

1. Publications — such as an illustrated issuance of this Sediment Control Program, copies of standards and specifications for urban sediment control practices, etc.
2. Publicity about the program.
3. Recognition of outstanding sediment control work of individual developers and engineers.
4. Informational program for developers and engineers.
5. Distribution of research results.

V. EROSION AND SEDIMENT CONTROL MEASURES

Erosion is caused by rainfall and run-off water. Splashing of rain drops actually displaces particles of soil on inadequately protected land. Water running over such land and in downstream channels moves soil materials in proportion to the water's volume and velocity. Deposition occurs as the water slows down or spreads out.



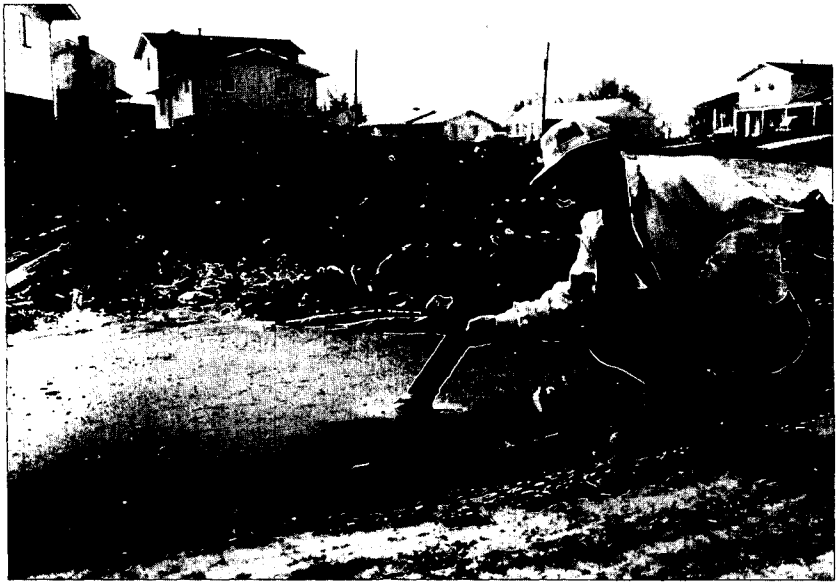
Massive grading of entire development sites leaves land in a condition to fall victim to the destructive ravages of erosion. Both the land and the downstream recipients of the sediment become losers.

From these causes of erosion and deposition come the technical principles of this erosion and sediment control program. In essence, they involve (1) reducing the area or duration of exposure of soils, (2) covering the soils with mulch or vegetation, (3) mechanically retarding the rate of run-off water, and (4) trapping the sediment in the run-off water.

The application of these principles to planning the developments includes keeping the most intensive developments on leveler ground and thereby avoiding the creation of erosion hazards from the steep topography and the more massive earth moving projects. It also includes greater care and attention to this phase of state and county road construction and maintenance and to state, county and other public building projects.

Erosion and sediment control practices or measures singly or in combination can be applied to both public and private developments with effective results at moderate cost. A brief description of some of these follows:

Non-critical Area Stabilization — In areas of good soils on moderate slopes, the establishment and maintenance of good vegetative cover are relatively simple as compared to "critical areas". These areas can usually be stabilized by utilizing the standard plants and establishment techniques recommended by local agencies or landscaping services. Soil tests should be made as a basis for adding the plant food necessary for plant establishment and maintenance.



A Soil Conservation Service technician checks depth of silt washed from raw ground above. Disturbed land, left unprotected, sends tons of silt into streams below. Proper conservation measures can reduce this problem.

Critical Area Stabilization — Cutting, filling, and grading soils with heavy equipment result in areas of exposed subsoils or mixtures of soil horizons. Conditions, such as acidity, low fertility, compaction, and dryness or wetness often prevail which are unfavorable to plant growth. Excessively long slopes and steep grades are often encountered or created. Water disposal structures are normally subjected to hydraulic forces requiring both special establishment techniques and grasses which have high resistance to scouring. However, plans and techniques are available to provide both temporary and permanent protective cover on these difficult sites.

Temporary Measures — Heavy grading or construction of cuts and fills is often carried out in several stages interrupted by lengthy periods during which the land lies idle and is subject to heavy erosion. Similarly, final grading or filling may be completed at a season not favorable for the immediate establishment of permanent vegetative cover. These sites can be temporarily stabilized by seeding fast growing annuals such as rye, rye-grass, and sudan grass, which provide quick protection yet can be worked into the soil when the site is prepared for final seeding of permanent species.

An alternative method is the application of mulch for immediate protection. Where final grading is not completed, mulch can either be removed or worked into the soil after it has afforded protection while areas lie idle. Areas brought to final grade during midsummer or winter can be mulched immediately, and they may be successfully overseeded at the proper season with a number of permanent grass and legume species.

Permanent Vegetation — For both sodding and seeding, there is a fairly wide choice of grasses, legumes, and other plants for use on critical areas. The final choice of species should be determined by weighing such factors as adaptability, use, aesthetic requirements, degree of maintenance that can be expected and other special considerations. Plants should be selected that will provide long-lived stabilization with little subsequent management where a "manicured" look is not required. Some species provide excellent protection against scour in waterways and outlets, but most require periodic mowing and fertilization. Where a reasonably high level of management can be expected, the choice of plants is broader. Often, techniques of seedbed preparation and establishment are as important as the selection of the species.

Diversions — A diversion consists of a channel or ditch and a ridge constructed across a sloping land surface on the contour, or with predetermined grades to intercept and divert surface run-off before it gains sufficent volume and velocity to create harmful erosion. The number of diversions and the physical extent and spacing are dependent upon the land slope, soil, and run-off. The water is collected and conveyed laterally along the diversion at slow velocity and discharged into a protected area or outlet channel.

Bench Terraces — Bench terraces are relatively flat areas constructed on sloping land to planned dimensions and grades. These areas are

applied along the contour with the length and width controlled by the natural terrain and the required erosion limitations.

Contour benches may be installed across the slope and designed for widths which will permit construction of a row or tier of housing units on flat areas which generally follow natural contours.

Outlet Channels — This measure consists of the construction of designed channels for the disposal of storm run-off from diversions, bench terraces and other structures. The design is based on the run-off from predicted storm events and includes the vegetative or structural measures required to protect the channel from scour and erosion.

Waterway Stabilization Structures — Waterway erosion control methods include structural devices to dissipate the energy of flowing water by holding the waterway slopes and velocities within non-scouring limits. Drop structures, concrete or other lining could be utilized in an open waterway.

Bank Erosion Structures — The control of bank erosion in main stream channels can be accomplished in various ways. Methods commonly used include riprap, rock cribs, groins, jetties, fencing, piling, etc. The purpose of bank control measures is to install a barrier that will withstand the erosive forces exerted by flowing water or create a bank roughness that will reduce the erosive power by dissipating energy of the water as it moves along the bank line.

Stream Channel Construction — It is often impractical to attempt control of an existing meandering channel. In this case channel straightening, realignment, or the construction of a new channel to designed cross-section and grade is necessary. In doing this, however, the danger exists of creating a new erosion cycle. The design must include considerations regarding the stability of the bed and banks of the proposed channel under the predicted run-off conditions.

Sediment Basins — The construction of a temporary earth fill type dam downstream from a development area serves to regulate run-off and trap sediment. The sediment can be removed mechanically as the storage space behind the dam becomes filled. The whole structure can be removed after stability is reached in the development area or it can be retained and maintained to enhance the area.

Guide Standards for Control Measures

The Soil Conservation District will prepare guide standards for erosion and sediment control measures and practices. These will be issued to landowners and developers and their engineers as part of the consultive technical assistance furnished cooperators of the District.

VI. PROCEDURES FOR INCORPORATING EROSION AND SEDIMENT CONTROL IN SUBDIVISION PLANS

Under this sediment control program, the following procedures are provided to assist landowners, developers, and engineers in the inclusion of required erosion and sediment control measures in the planning and construction of subdivisions:

Pre-application Stage

Optional discussions between developers and the various county agencies are provided for in Section 104-22 of the Subdivision Regulations for Montgomery County. During these discussions consultive technical assistance from the Soil Conservation District, the Department of Public Works, and the Planning Board is available to landowners, builders, developers, and their engineers.

The assistance of the Soil Conservation District is available to owners and developers who become Soil Conservation District Cooperators under informal Landowner-District Cooperative Agreements.

Preliminary Subdivision Plan Stage

A. Under existing procedures, developers submit plans to the Maryland National Capital Park and Planning Commission, where they are:

1. Reviewed for conformance with existing ordinances, master plans, etc.

2. Referred to various agencies for compliance with their regulations and specifications.

The Commission staff will determine on the basis of size, topography, erosion hazards, and other factors relating to sedimentation which plans will be submitted to the Soil Conservation District for review of erosion and sediment control measures. It so indicates on the copies referred to other agencies.

This photo shows the development of a tract of ground where the builder is making good use of the natural topography and preserving part of the natural tree cover.

The Subdivision Review Committee, composed of staff members of the reviewing agencies, resolves any differences which may arise. Soil Conservation District Technical Assistance in developing needed erosion and sediment control measures will also be furnished on request at this stage.

B. After all reviews are completed, the planning staff submits the plan to the Montgomery County Planning Board with recommendations.

Recording Stage

A. After the preliminary subdivision plans are approved by the Planning Board, the planned erosion and sediment control practices are incorporated into the Public Works Improvement Agreement under Section 104-26 of the Subdivision Regulations for Montgomery County.

B. Upon receipt of the Department of Public Works' acceptance of the Public Works Improvement Agreement, the Maryland National Capital Park and Planning Commission records the subdivision plat.

Construction Permit Application Stage

The Department of Public Works reviews the construction permit application plans for conformance with sediment control and other provisions of the approved preliminary plans.

"Sea of Houses" — Typical random pattern of development of the 1950's.

CONSTRUCTION STAGE

A. Consultive technical assistance in establishing the planned erosion and sediment control measures is furnished by the Soil Conservation District on request of the builders, developers, and their engineers, consistent with current operating policies and available resources at the time the work is to be done.

B. The Department of Public Works enforces compliance with the approved plans.

VII. EVALUATION AND IMPROVEMENT OF PROGRAM

Agencies and departments of county government operating in and having jurisdiction in the county will hold at least one annual conference on the progress of this sediment control program. At this conference, the observations and experience of the agencies and the builders associations will be reviewed and needed program improvement discussed.

At the same time, federal and state agencies will be invited to participate in a review of the following:

(1) Hydrologic and Sediment Research Project on North Branch Rock Creek and Northwest Branch Anacostia. (USGS, USDA-ARS, SCS, Md. Geol. Survey, Md. Dept. of Water Resources)

(2) Sedimentation Surveys of Rock Creek Dams #1 and #5 being done by USDA Soil Conservation Service.

Conservation at building sites is demonstrated by this project where trees and other vegetation have been spared and construction has followed the natural contours of the land. Note well-shaped road drain protected by grass in right foreground.

(3) Sediment Trap Efficiency Study being done by USDA Soil Conservation Service and U. S. Geological Survey on Dam Site #1 on Rock Creek.

The assistance of the following persons and organizations in the preparation of this program is gratefully acknowledged:

Carl Johnson, Interstate Commission on the Potomac River Basin

John W. Neumann and A. James O'Mara, Suburban Maryland Builders Association

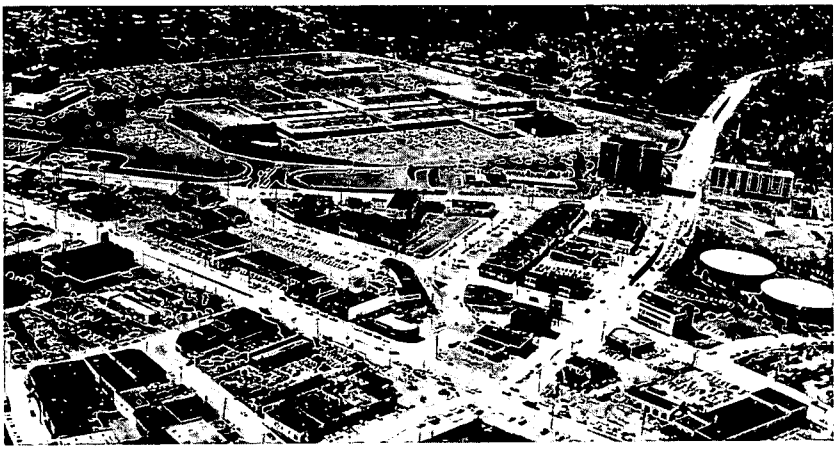
T. John Ritterpusch, Montgomery County Home Builders Association

Among the references used were:

"A Program for Sediment Control in the Washington Metropolitan Area," Tech. Bul. 1963-1, Interstate Commission on the Potomac River Basin. May 1963

"Preliminary Study of Sediment Sources and Transport in the Potomac River Basin," Tech. Bul. 1963-11, Interstate Commission on the Potomac River Basin. June 1963

"Problems Posed by Sediment Derived from Construction Activities in Maryland." Report to the Maryland Water Pollution Control Commission (By M. G. Wolman) January 1964.



Note the area which no longer can absorb the rainfall as it falls. The rain water that must now run off is lost as ground water recharge; consequently there is little or no spring flow feeding the small stream. The once beautiful, meandering stream channel that drains this area is now torn into an unsightly channel that cannot handle the frequent high-intensity storm flows to which it is subjected.

Sediment Control Resolution

COUNTY COUNCIL
MONTGOMERY COUNTY, MARYLAND

WHEREAS, The people of the county have recognized the problems of soil erosion by creating the Montgomery Soil Conservation District, now operating a voluntary conservation program in the open areas of the county, and

WHEREAS, The shifting of land use in Montgomery County from agriculture to urban and suburban development has substantially increased silt and sediment problems on the lands and in the streams and lakes in the county and in the Potomac River, and

WHEREAS, Sediment from developments has been declared a pollutant within the meaning of Art. 96A Ann. Code of Maryland 1957 Ch. 73, Laws of Md. 1964 entitled, "Water Resources", (a legal opinion by the office of the Attorney General of Maryland), and

WHEREAS, Property owners suffering unreasonable damage from sediment deposition or flooding of property at downstream sites as a result of disturbance of watershed areas upstream often must seek protection by the courts against such damages,

NOW THEREFORE BE IT RESOLVED:

1. That it is the policy of Montgomery County, Maryland, to provide for control of soil erosion particularly in the urbanizing areas of the county by the adoption and implementation of a Sediment Control Program for developments on the public and private lands of the county.

2. That the various departments and branches of the county government are directed to develop policies and procedures and to implement this program and the Builders Advisory Committee is requested to work with the county agencies and the builders to assist in this work.

3. That the landowners and developers of Montgomery County are urged to cooperate in this program and to abide by its procedures and regulations.

Sediment Control Resolution

WASHINGTON SUBURBAN SANITARY COMMISSION

WHEREAS, in rural areas undergoing extensive farming operations, soil erosion has been a serious problem, and

WHEREAS, the Montgomery Soil Conservation District, operating on a voluntary conservation program in the rural areas of the County, was formed to provide assistance and direction to the local residents in adopting techniques that would reduce the soil erosion, and

WHEREAS, this Commission has been contributing regular annual payments for soil control measures and soil conservation work in the Patuxent River Basin to the Maryland Association of Soil Conservation Districts, Inc., in an amount totalling $35,000 since 1948 as support for erosion control work in the Patuxent River Basin, and

WHEREAS, the rate of change from agriculture to suburban development in the Patuxent River Basin is increasing, and

WHEREAS, suburban development frequently involves the removal of forests and agricultural grass lands thereby substantially increasing silt and sediment problems during the construction period, and

WHEREAS, the Commission is desirous of seeking improvements in silt control from such suburban construction operations, especially in the Patuxent River Basin, and

WHEREAS, the Commission, on July 8, 1965, agreed to participate financially in the amount of $7,500 annually, subject to annual review, for a proposed ten-year study of silt production by subdivision development and methods of control for such silt production,

NOW THEREFORE BE IT RESOLVED THAT THE COMMISSION:

1. Endorses a program to provide data on the amount of silt produced by subdivision development with an evaluation of the economic impact of this silt on the area and a study of the effectiveness of control techniques.

2. Requests the United States Geological Survey and the United States Department of Agriculture to provide the necessary additional financing and to conduct this study providing the Commission periodic reports on the progress of the work and an annual report so that the Commission can make an advance evaluation on its continued annual participation in the study.

3. Requests the agencies making the study to expand them to include the Patuxent watershed.

4. Will cooperate with the agencies conducting this study to the maximum possible extent so that the necessary study information can be secured.

Sediment Control Resolution

MONTGOMERY SOIL CONSERVATION DISTRICT

WHEREAS, The people of the county have recognized the problems of soil erosion by creating the Montgomery Soil Conservation District, now operating a voluntary conservation program in the open areas of the county, and

WHEREAS, The shifting of land use in Montgomery County from agriculture to urban and suburban development has substantially in-

creased silt and sediment problems on the land and in the streams and lakes in the county and in the Potomac River, and

WHEREAS, Sediment from developments has been declared a pollutant within the meaning of Art. 96A Ann. Code of Maryland 1957 Ch. 73, Laws of Md. 1964 entitled, "Water Resources", (a legal opinion by the office of the Attorney General of Maryland), and

WHEREAS, Property owners suffering unreasonable damage from sediment deposition or flooding of property at downstream sites as a result of disturbance of watershed areas upstream often must seek protection by the courts against such damages,

NOW THEREFORE BE IT RESOLVED:

1. That it is the policy of the District to provide for control of soil erosion in the county by the adoption and implementation of a sediment control program for public and private lands undergoing changes from agricultural to other uses within the County.

2. That the District will cooperate with the various departments and branches of the County Government and other agencies to develop policies and procedures to implement this program.

3. That the District will furnish consultive assistance to develop conservation plans and establish conservation measures for lands undergoing development to the landowners, developers and the public agencies concerned, consistent with current operating policies and available resources at the time work is to be done.

The cooperation of Montgomery County landowners, developers, and the public agencies concerned is solicited to further this program.

Sediment Control Resolution

MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

WHEREAS, The people of the county have recognized the problems of soil erosion by creating the Montgomery Soil Conservation

District, now operating a voluntary conservation program in the open areas of the county, and

WHEREAS, The shifting of land use in Montgomery County from agriculture to urban and suburban development has substantially increased silt and sediment problems on the lands and in the streams and lakes in the county and in the Potomac River, and

WHEREAS, Sediment from developments has been declared a pollutant within the meaning of Art. 96A Ann. Code of Maryland 1957 Ch. 73, Laws of Md. 1964 entitled, "Water Resources", (a legal opinion by the office of the Attorney General of Maryland), and

WHEREAS, Property owners suffering unreasonable damage from sediment deposition or flooding of property at downstream sites as a result of disturbance of watershed areas upstream often must seek protection by the courts against such damages,

NOW THEREFORE BE IT RESOLVED:

1. That the Commission endorses and supports the County Sediment Control Program.

2. That it is the policy of the Commission and the Planning Board to provide for control of soil erosion particularly in the urbanizing areas of the county and resulting transported sediments, through its exercise of the review and approval authority for subdivision developments.

3. That the same policy shall be implemented through the Commission's Park Department in its development and maintenance of park lands, recreation sites, etc.

4. That it shall be the policy of the Commission and the Planning Board to seek comments and/or recommendations from the Montgomery Soil Conservation District with respect to processing of such preliminary subdivision plans as in the Board's judgment will require soil erosion measures to be carried out by public and private interests during the development of such subdivision.