REPORT OF THE

STATE WATER COMMISSION

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

SENATE DOCUMENT NO. 42

COMMONWEALTH OF VIRGINIA
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1998

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REPORT OF THE
STATE WATER COMMISSION

to

The Honorable James Gilmore, Governor
and
the General Assembly of Virginia
Richmond, Virginia

I. AUTHORITY FOR STUDY

The State Water Commission is a permanent agency of the Commonwealth directed by statute to (i) study all qualitative and quantitative water supply and allocation problems in the Commonwealth, (ii) coordinate the legislative recommendations of other state entities responsible for water supply and allocation issues, and (iii) report annually its findings and recommendations to the Governor and the General Assembly. (Va. Code § 9-145.8)

During 1997, the State Water Commission examined two issues. The 1997 Session of the General Assembly passed House Joint Resolution 592 (Appendix A) requesting the State Water Commission, with the assistance of the Virginia Water Resources Center at Virginia Polytechnic Institute and State University (VPI-SU), to study the innovative technologies and other options for providing safe, reliable, and affordable domestic water supplies to individual households and small communities in southwestern Virginia. The second issue, on which the Commission received a briefing, was industrial hog farms and their potential impact on water quality. The briefing included presentations by (i) a Department of Environmental Quality official on how Virginia regulates confined animal feeding operations, specifically hog farming, and whether such regulations protect water quality, and (ii) a status report on Pfiesteria by the Chairman of the Virginia Pfiesteria Task Force.

II. COMMISSION DELIBERATIONS

A. INNOVATIVE TECHNOLOGIES FOR PROVIDING DOMESTIC WATER SUPPLIES

1. Background

In 1996, the General Assembly established a joint subcommittee to study drinking water supply problems and possible funding mechanisms to correct drinking water deficiencies in southwest Virginia (HJR 104). The subcommittee sought to identify the water supply problems faced by the residents of this region, the level of need, and the costs for developing a reliable and safe water supply system. This is a region whose inherent problems of geology, topography, and land use activity, characterized by extractive industries (coal mining and agriculture), have made the provision of drinking water problematic. According to the 1990 census, only about one half of the housing units in that region were served by public water systems. The remaining households obtain their water from wells or cisterns, or have to buy their drinking water from stores. For many smaller communities, the terrain makes hook-ups to the traditional linear water supply systems cost-prohibitive, with the average connection cost being as high as $12,000 to $15,000 and a $30 per month customer fee. Even for those households which can develop their own water supply using wells or cisterns, the costs of treating the water for contaminants is sometimes as high as $200 per month. Based on estimates made by local planning officials, the costs of developing water supply projects that would meet the drinking water needs of the areas in southwest Virginia covered by Planning Districts 1, 2, and 3 will be about $276 million.

The subcommittee concluded that:

- Most of the "easy" cost-effective water supply projects have been completed. What remains to be resolved is how best to provide water to the small, isolated communities where the cost could exceed $10,000 per connection.

- Where feasible, the development of water systems should be regional. Hence, the establishment of new public service authorities or water utilities should be avoided and current systems should be consolidated or restructured to allow for the most cost effective extension of water lines to unserved populations.

- For a number of areas, it will be difficult or too costly to provide public water in conventional ways. In these instances, small water-system models must be developed which will provide water to these small, isolated communities.

- Additional funding and technical assistance in the development of drinking water supplies are needed.

The subcommittee made several recommendations to address these issues:

- The General Assembly should request that the three Planning District Commissions (PDCs) in southwest Virginia jointly study the most cost effective means of providing drinking water to their residents, and that a comprehensive regional water supply plan be developed for the areas within the three PDCs. The plan should place a priority on providing the most feasible water service to residents without concern for traditional jurisdictional boundaries. The 1997 Appropriation Act included an allocation of $57,000 to each of the three PDCs to complete this effort.

- The Virginia Department of Health, together with the Virginia Water Project, should develop a manual of best practices for the cost effective planning, development, and operation of small systems. This guide would provide information to system owners on how to operate more efficiently and at lower costs by emphasizing ways to improve water capacity and the proper maintenance of infrastructure.

- In light of testimony regarding the level of contaminants found in the wells and springs in southwest Virginia, the Department of Health, public service authorities, and local water utilities should provide (i) more resources for testing and monitoring water supplies and (ii) more information to homeowners and developers regarding water supply and possible health risks.

The subcommittee recognized that the conventional means of providing water service through the extension of existing water system lines, because of distance and terrain, was impractical and prohibitively expensive. Unconventional sources such as coal-seam aquifers and mine cavities, along with newly emerging collection, storage, and treatment technologies, including the development of small package plants and telemetry of operating small water systems, represented possible options for providing a reliable and affordable source of drinking water for the small communities in the region. It was recommended that Virginia Water Resources Research Center at VPI-SU conduct a two-year study of innovative technologies and other options for providing safe, reliable, and affordable domestic water supplies to individual households and small communities. Although the original HJR 592 requested the Center at VPI-SU to perform the study, during the 1998 Session the resolution was amended giving the State Water Commission, with the assistance of Virginia Water Resources Research Center, responsibility for conducting the study.

2. Documenting Water Supply Problems

The State Water Commission heard from several individuals who were particularly knowledgeable about water supply problems in southwestern Virginia. Dr. John Randolph of VPI-SU recently completed a study "Water Supply Options in the Virginia Coalfield Counties." (See Appendix B.) He noted that limited progress has been made in providing public water supplies to the coal regions of the state. In 1970, approximately 37 percent of the households in the coal counties obtained their water from public sources. Twenty years later (1990), still less than half (48 percent) received water from public sources. During this same period, the number of households that used groundwater (private wells) as their primary source of water actually decreased from 38 percent in 1970 to 37 percent in 1990. The lack of progress in providing water resources to households in this region is attributable to a number of factors, according to Dr. Randolph. Much of the state has plentiful amounts of groundwater, but in southwest Virginia the geology (Cumberland shale/limestone, Ridge and Valley karst) limits the quantity and quality of the resource. In addition, the sensitivity of natural waters in the region, such as the Clinch River with its unique aquatic ecology, places constraints on the development of these resources for water supply. The topography, with its steep terrain, not only inhibits the extension of water lines, but it quickens run-off and limits groundwater recharge. The presence of land intensive industries, such as coal mining, tobacco/other agriculture, and forestry, also limits the availability and quality of water resources. Underlying these conditions is the region's lack of financial resources for the development of water supplies.

As mentioned before, nearly half of the region's households do not receive public water supplies. For these households, Dr. Randolph discussed other options, such as extending water lines, use of springs and wells, extraction of water from coal seams and mine cavities, withdrawal from surface water catchments, and water harvesting.

He made several recommendations. First, there should be further research to (i) obtain a reliable estimate of the amount of funding needed to develop community water systems, (ii) identify the most critical water quality and health needs, and (iii) evaluate innovative technologies, including water harvesting and cistern storage, small surface reservoirs, and cost effective treatment. Second, existing water resources should be preserved through water conservation and watershed, well-head, and spring protection measures. Third, there has to be adequate funding. Grants and a funding pool are needed to leverage other sources of funds to support the high costs of providing new service while keeping rates at an affordable level for low-income households. Fourth, only reliable, cost-effective water projects should be developed, and these projects should be targeted to the most critical needs. Lastly, an institutional mechanism should be established to provide needed fund-raising, creative financing, project proposal evaluation, and fund distribution.

This institutional structure should be the vehicle for effective regional water development planning.

Ms. Mary Terry, executive director of the Virginia Water Project, urged the Commission to examine the lack of water and wastewater facilities, including indoor running water and bathrooms with adequate wastewater disposal. Ms. Terry agreed that many southwest communities are unable to afford the costs of constructing water and wastewater facilities. Even in those communities with such facilities in place, "boil water" notices are a constant reminder of the potential threat to public health and safety of the current water supply. However, she cautioned the Commission that these problems were not unique to southwest Virginia. In fact, if the 95 counties were grouped by region, the two counties of the Eastern Shore would be ranked first in the number of houses per county lacking complete plumbing. The following table shows the ranking of the regions of the state based on the number of houses per county lacking complete plumbing:

Households Lacking Complete Indoor Plumbing By Region

Rank	Region	Number of Counties	Average/Co	Total Numbers
1	Eastern Shore	2	971	1,942
2	Southside	14	570	7,982
3	SWVA	23	480	11,035
4	Shenandoah	7	434	3,037
5	Northern VA	7	424	2,863
6	Central VA	28	287	8,050
7	Northern Neck	7	286	2,996
8	Tidewater/Peninsula	4	191	765

While acknowledging that all the needs could not be addressed at one time, she suggested that by 2050 all housing could have complete plumbing if the state would assist in the financing of needed services.

3. Examining Innovative Technologies and Other Options (HJR 592)

As noted previously, House Joint Resolution No. 592 called for the Virginia Water Resources Research Center to assist the Commission in its two-year examination of innovative technologies and other options for providing drinking water to small communities in southwest Virginia. Dr. Tamim Younos, associate director of the Research Center, reiterated the problems associated with developing water supplies for the region, which include (i) the prohibitive cost of developing a public water system, (ii) the isolation of the households which lack an adequate

water supply, (iii) rough terrain, (iv) inadequate surface and groundwater sources, (v) contamination of available water sources, and (vi) the location of households on high ridges.

The Center is assessing several alternative strategies to provide a safe, reliable, and affordable source of drinking water to these communities. One method is rainfall harvesting, which includes two options: small surface reservoir catchments and rooftop collection and cistern storage. In examining the reservoir catchment option, a number of questions will need to be answered, such as: (i) the availability of land for constructing a small reservoir, (ii) the various costs involved (distribution, pumping, and treatment), and (iii) what permits would have to be obtained. A pilot study at Tammel Gap Mountain in Dickenson County will answer these questions. The components of such a system include construction of a dam and reservoir, and the installation of pumps, water treatment unit, piping, and a holding tank. (See Appendix C for system diagram.)

The feasibility of implementing the second option, the rooftop collection and cistern storage system, depends on such variables as adequate rainfall, adequate roof area, sufficient storage and treatment, and the capability to provide periodic maintenance. The components of such a system are presented in Appendix D. This approach is gaining acceptance in a number of states. The Center's analysis of this option will include an evaluation of existing problems, a survey of cistern use, and the testing of quality of the water being collected. The analysis will result in the publication of a manual for cistern design and maintenance, which will be applicable to all counties.

The investigation of the water-hauling strategy involves the transportation of water by truck from a treatment plant to a holding tank near the households being served. The water is piped from the holding tank to individual households. A computer program will be developed to evaluate the economics of planned water hauling. The computer program will analyze the fixed costs (water trucks, construction costs, and equipment costs) and the operating costs (number of communities and households to be served, travel distance between treatment plant and the community, and maintenance). The end-product of this effort will be a user-friendly computer program for determining the water-hauling costs under various conditions.

The third alternative, using coal-seam water as a source for water supplies, is applicable in Virginia's coal-bearing counties. The Center has already begun to test water in a number of coal seams to determine whether it meets the Environmental Protection Agency's standards for drinking water. The hydrology of the area will be evaluated, with the objective of finding possible source sites and calculating the quantities that may be available for withdrawal. In addition, as in the case of the other alternative technologies, the analysis will include the legal and institutional requirements, including permit restrictions and treatment needs, and the costs of

providing water from this source for domestic use. (See Appendix E for a diagram of such a system.)

While many of these options look promising, it will be another year before the technical experts at the Virginia Water Resources Research Center and the State Water Commission are ready to recommend those options which represent the most cost effective means of providing drinking water to the communities in southwestern Virginia.

B. CONFINED ANIMAL FEEDING OPERATIONS AND THEIR IMPACT ON WATER QUALITY

Because of media reports linking the recent outbreaks of Pfiesteria to the operation of confined feeding operations in North Carolina and Maryland, the Commission requested (i) a status report from Robert O'Reilly, the chairman of the Virginia Task Force on Pfiesteria, regarding Virginia's efforts to identify the organism in Virginia's water and (ii) a description from the Department of Environmental Quality (DEQ) of the Virginia Pollution Abatement (VPA) Permit Program for confined feeding operations.

1. Virginia Task Force on Pfiesteria

Mr. O'Reilly began his status report by noting that Pfiesteria-like organisms have been linked to massive kills of menhaden in North Carolina and small kills of menhaden in localized areas of the Maryland and Virginia portions of the Pocomoke River. Pfiesteria piscicida is a microscopic, single-celled organism which usually behaves as an animal and belongs to a family of plankton known as dinoflagellates because they possess two flagella which can propel the organism through water. Three other unnamed Pfiesteria-like organisms have been identified, and all three Pfiesteria-like cells, in addition to Pfiesteria piscicida, have exhibited toxic lethal effects on finfish (and other seafood species) in laboratory experiments. Pfiesteria piscicida has been documented in North Carolina, Delaware, and Maryland.

Pfiesteria has a very complex life cycle that includes 24 life forms and can thrive as an active, free-swimming animal; an amoeba-like form; or a dormant, sediment-dwelling cyst. Usually, Pfiesteria acts as a nontoxic predator feeding on bacteria, other small algae, and small animals. North Carolina State University researchers have suggested that Pfiesteria has been present in certain aquatic systems for thousands of years. Researchers also propose that, upon stimulation from the appropriate environmental and biological cues (e.g. nutrient conditions and fish secretions, respectively). Pfiesteria cysts are activated, emerge from sediments as free-swimming forms in bloom condition, and can release toxins that attack the nervous system and skin of finfish. Typically fish which recover from acute Pfiesteria toxin exposure develop secondary bacterial or fungal infections known as ulcerative mycosis or ulcerative disease syndrome (UDS). Several

researchers have indicated that UDS is characterized by shallow to deep ulcers with greater than 50 percent of the ulcers appearing near the fish anal area. These ulcers in advanced stages are very dramatic because they can expose internal organs in fish. These researchers indicate that UDS and its characteristic ulcers have been documented since the 1980s from New York to Florida. This information corroborates the Virginia Institute of Marine Science's (VIM's) monitoring results from as early as 1984, when trawl catches from the Rappahannock River included finfish, especially young menhaden, with ulcers. These types of secondary infections have been diagnosed by VIM's pathologists in fish of several species and locations within the Bay during the summer and early fall of 1997.

Research on Pfiesteria has led to hypotheses on the role of the environment on Pfiesteria outbreaks. It is suspected that water areas which exhibit poor flushing and high levels of nutrient enrichment, such as the Pamlico, Neuse, and New River estuaries of North Carolina, are likely candidates for a Pfiesteria outbreak. Deeper, well-flushed areas of moderate nutrient enrichment are thought to be less likely candidates for Pfiesteria outbreaks. Information presented at a recent forum on Pfiesteria indicated that 75 percent of all outbreaks of Pfiesteria have occurred in nutrient over-enriched water areas and the remainder of outbreaks were associated with aquaculture facilities.

In the early to mid-1990s, Pfiesteria caused a number of large fish kills (millions to a billion of mostly menhaden) in several North Carolina estuaries. Some of these kills are reported to have lasted for six to eight weeks. Pfiesteria was linked to an August 6, 1997, fish kill in the Maryland portion of the Pocomoke River. On August 26, a relatively small fish kill started in the Virginia portion of this same river. By August 28, this fish kill, encompassing both Maryland and Virginia jurisdictions, had diminished substantially. By August 30, there were no visible indications of a fish kill. Mr. O'Reilly characterized these fill kills as modest, involving mostly menhaden. Approximately 10,000 fish in Maryland waters and 2,000 in Virginia waters were killed.

According to Mr. O'Reilly, establishing a cause and effect relationship between Pfiesteria and fish kills requires several conditions. First, the affected fish (those exhibiting lesions) must be part of an active fish kill. In addition, the waters or sediments associated with the fish kill must be positively identified for Pfiesteria. Only then is there presumptive evidence establishing that Pfiesteria is linked to a fish kill. A case in point involves the recent fish kill in the Virginia portion of the Pocomoke River that flows mainly through Maryland but empties into the Pocomoke Sound, which is a part of both states' jurisdictions. The Task Force was waiting for the results of toxicity tests conducted on water and sediment from the site of the fish kill. Nonetheless, since there were fish with lesions and a fish kill (predominately menhaden) occurred, a localized area within the Virginia portion of the Pocomoke River was closed from August 29 to October 3, 1997, following the

recommendation of the Task Force and the presence of mainly circumstantial evidence for Pfiesteria toxicity.

Mr. O'Reilly stated that the cause and effect relationship was not as demonstrable in localized areas of the Rappahannock and Great Wicomico Rivers. Pfiesteria-like cells have been found in water samples from these areas, but there has been no associated fish kill. Further, it will take time to determine whether these Pfiesteria-like cells are toxic. Given these sets of circumstances, the Task Force recommended that a general advisory (e.g. do not eat fish with sores or lesions, and do not swim in an area where dead or dying fish are present) was the appropriate action.

A survey of major seafood buyers and distributors conducted by the Task Force indicates that Pfiesteria has negatively impacted sales of seafood products. For example, one prominent Eastern Shore buyer reported that it is very difficult to sell product to the Baltimore market. This buyer also stated that many of the chain stores were not purchasing finfish and roughly 30 percent of his market was lost as a result of publicity about Pfiesteria. A major Hampton buyer and wholesaler said that the Baltimore and Washington markets did not want any Virginia or Maryland fish and noted that the situation in Philadelphia is nearly as bad. This buyer reported that sales to the New York market were not significantly affected as there are numerous restaurants and other outlets there where the public is not the immediate buyer. One Northern Neck wholesale buyer was sending a full truck of fish to Washington and Baltimore until recently. Now the shipments are less. A Middle Peninsula wholesale buyer reports that "you can't send anything north." A Deltaville buyer, who sells to Giant and Kroger stores, cannot sell any Chesapeake Bay fish to those stores.

In an October 6 public hearing on Pfiesteria held by the Chesapeake and Its Tributaries Committee of the Virginia House of Delegates, a number of seafood industry members called on the media to present responsible, science-based information, and facts on Pfiesteria to the public. Recreational fisheries are not reporting extensive impacts. However, the Virginia striped bass fall recreational season in the Chesapeake Bay began October 4, 1997. Recreational club and association leaders have previously expressed some concerns for the economic impacts that lesions on caught striped bass may produce even though it is very unlikely those lesions would be caused by Pfiesteria according to Mr. O'Reilly.

2. VPA Permit Program

The DEQ issues VPA permits for the handling, storage, and disposal of industrial waste, sewage, and other wastes. When issued, these permits authorize the land application of sewage, sludge, animal waste or industrial waste, or the complete reuse or recycling of wastewater. VPA permits are written to ensure that the pollutant management activities are designed to adequately handle the wastes

and that the treatment works are operated appropriately. Any pollutant management activity which does not result in a point source discharge to surface waters may be required to obtain a VPA permit in order to ensure that the activity does not alter the physical, chemical, or biological properties of state waters. The authority for the VPA permits is vested, by statute, in the State Water Control Board. The program is administered entirely under state authority. There are no comparable federal laws or regulations that mandate the VPA permit program.

The VPA permit program provides owners and operators with information on alternative means of disposal for their wastes. According to DEQ officials, the benefits of this program have occurred at animal feeding operations where manure is spread on farm fields rather than running off into streams, at industrial sites where waters are reused and recycled, and at municipal waste treatment sites where sludge and sewage effluent are used to condition soil and provide nutrients for crop growth.

The VPA general permit for confined animal feeding operations is mandated by statute (Va. Code § 62.1-44.17:1), which is part of the Water Control Law. The statute was adopted as a regulation by the Water Control Board in September 1994 and became effective November 16, 1994. The permit is limited by law to a term of 10 years, so it expires on November 16, 2004. The general permit regulation follows the requirements of the Virginia Code very closely. It is applicable only to the management of animal wastes at confined animal feeding operations having 300 or more animal units and utilizing a liquid manure collection and storage system. Three hundred animal units equates to the following:

300 slaughter or feeder cattle;
200 mature diary cattle;
750 swine weighing over 55 pounds;
150 horses;
3,000 sheep or lambs;
16,500 turkeys; and
30,000 laying hens or broilers.

Owners are authorized to operate under the general permit if they file a complete application form and registration statement. The registration statement asks for the name, address, and phone number of the facility's owner and operator, the kind of animals at the facility, and their number and weight. The owner must obtain a certification from the local government that the operation conforms to all local zoning and planning ordinances, and he must have a nutrient management plan that has been approved by the Department of Conservation and Recreation. In filing the registration statement, the owner certifies that the operation will meet all of the requirements of the general permit. Under the law, if the owner files a complete registration statement, the DEQ regional office must register the operation under the general permit. Coverage under the general permit does not

relieve the owner of responsibility to comply with any other applicable federal, state, or local law or regulation.

The general permit requires monitoring for pollutants in groundwater, soils, and animal waste. Groundwater monitoring around the waste storage lagoon is required once every three years, but only if the operation involves the installation of earthen waste storage lagoons that are dug down to within one foot of the water table or below the water table. The regulation recommends a minimum of two groundwater monitoring wells, and the samples are to be analyzed for ammonia, nitrate, pH, and conductivity.

Soil in the area where animal waste is land applied is monitored once every three years for phosphorus, potash, calcium, magnesium, and nitrate content. These parameters are useful in determining the application rates for the nutrient management plan. Likewise, the animal waste itself is monitored to determine its rate of application for the crop being grown on the field. Waste monitoring is required once a year, and the samples are to be tested for total nitrogen, ammonia, phosphorus, potassium, calcium, magnesium, and moisture content. The permittee is required to keep all records of monitoring activities on hand for a minimum of two years. These testing results are to be made available to DEQ upon request.

The general permit also mandates the following management practices:

1. The manure storage lagoon has to be big enough to contain the normal accumulation of waste. It also must be able to retain rainfall up to and including the 25-year, 24-hour storm event, and it must be capable of holding the accumulated waste and rainfall for extended periods of time if the crop fields are frozen or saturated or otherwise unable to accept the material.

2. New waste storage lagoons must either be located outside of the 100-year flood plain or they must be constructed with adequate integrity to withstand a 100-year flood.

3. New waste storage lagoons made of earth must be lined with either a synthetic liner or compacted soil so that the rate of percolation through the bottom of the lagoon is minimized. This construction criterion must be certified by a qualified professional.

4. All lagoons must be sized and maintained so that there is always at least one foot freeboard between the top of the lagoon and the level of the waste in the lagoon. If the lagoon bottom is dug below the water table, there must always be at least two feet of waste material left in the lagoon.

5. The permittee must keep the equipment in proper working order and have the manufacturer's maintenance manuals on hand in case of a problem.

6. The nutrient management plan must be kept on site and made available to DEQ personnel upon request. Nutrient management plans are an enforceable part of the general permit.

7. Buffer zones must be maintained between the land application of animal waste and certain physical features, such as occupied dwellings, wells, surface streams, rock outcrops, and sink holes.

The general permit has reduced the time needed to get a VPA permit from over four months to generally less than 14 days. At the present time, there are 69 confined animal feeding operations covered under the general permit. These include 41 swine operations and 28 cattle operations. The swine facilities report roughly 305,000 head being raised. Eight of these operations are owned by Smithfield-Carroll and they account for about 200,000 head. The cattle operations cover about 3,000 feeder or slaughter head and about 6,000 dairy cattle. During the fiscal year that ended on June 30, 1997, DEQ inspectors visited 14 of the 69 animal feeding operations under the general permit. State law requires that these facilities be inspected every five years; however, DEQ's inspection strategy recommends annual inspections. Due to manpower limitations, the actual frequency of inspections falls somewhere in between these two.

In some cases, DEQ has decided that an animal feeding operation should be covered by an individual VPA permit rather than the general permit. Individual permits are used when the operation is unable to fit the requirements of the general permit or when there is a pollution problem that would not be adequately addressed by the general permit. An individual VPA permit can be tailored to meet the water quality protection needs of the specific operation in question. The application for an individual permit provides DEQ with more details regarding the design and sizing of the waste storage lagoons. It also may (i) require more details about the local groundwater conditions, (ii) have more sampling and monitoring requirements, and (iii) contain more specific management measures than are found in the general permit. There are currently about 50 animal feeding operations statewide that are covered by individual VPA permits. Some of these operations will be covered by the general permit when their individual permits expire. Others will continue under individual permits because they have fewer than 300 animal units, do not use a liquid manure disposal system, or for some other reason cannot meet the requirements of the general permit.

A DEQ representative provided the Commission with an overview of the agency's experience in implementing the VPA general permit since 1994. On the positive side, there are no enforcement cases pending under the general permit. Because of the requirement that local government certify that the operation

conforms to all local ordinances, the localities are aware of the location of these types of operations. A final positive aspect is the requirement that a nutrient management plan be developed which, if followed, assures the proper disposal of nutrients found in animal waste.

On the negative side, there have been several complaints regarding violation of buffer zone requirements for land application as well as minor nutrient management plan infractions. Due to the type of information included in the registration statement, there is uncertainty on the depth to groundwater below lagoons, which raises questions as to whether groundwater should be monitored. The process does not ensure or allow for inspection of the structural integrity or the proper siting or sizing of lagoons prior to coverage under the general permit. These characteristics of the lagoon are not addressed in the nutrient management plan. Finally, DEQ is unclear whether it has authority to verify the applicant's compliance with all general permit requirements after receipt of the registration statement, but prior to issuing coverage.

Respectfully submitted,

Senator Charles J. Colgan, Chairman
Delegate J. Paul Councill, Jr., Vice Chairman
Senator Mark L. Earley
Senator Madison E. Marye
Senator Stanley C. Walker
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The Honorable Charles W. Ahrend
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III. APPENDICES

GENERAL ASSEMBLY OF VIRGINIA -- 1997 SESSION

Appendix A

HOUSE JOINT RESOLUTION NO. 592

Directing the State Water Commission, with the assistance of the Virginia Water Resources Research Center at Virginia Polytechnic Institute and State University, to study for two years innovative technologies and other options for providing safe, reliable, and affordable domestic water supplies to individual households and small communities in southwestern Virginia.

Agreed to by the House of Delegates, February 20, 1997
Agreed to by the Senate, February 19, 1997

WHEREAS, a safe, reliable, and affordable supply of drinking water should be available to all Virginians; and

WHEREAS, according to a recent study, Water Supply in the Virginia Coalfield Counties: Status, Technical Options, Assessing Rate Impacts, "water supply is especially important in the southwest Virginia coalfield counties, where surface and groundwater resources are limited, where community water supplies do not serve most rural households, and where private wells and springs have been impacted by resource extraction industries and agriculture"; and

WHEREAS, in 1990 fewer than one-half of the households in the coalfield region were served by public water systems; and

WHEREAS, water is so precious to this region that existing supplies should be preserved by water conservation techniques and source protection, including watershed, well head, and spring management; and

WHEREAS, recent testing data found E. Coli contamination and unacceptably high levels of iron, manganese, sodium, sulfates, and chlorides in many of the household wells and springs; and

WHEREAS, treatment cost for individual households to remove such contaminants as iron and sulfur can exceed fifty dollars per month, and even with such treatment the quality of the domestic water is at best marginal; and

WHEREAS, groundwater as a water source is not only a concern from a water quality standpoint, but local groundwater sources are also unreliable because of poor water-bearing aquifers and their susceptibility to drought, and because of land use impacts; and

WHEREAS, the most conventional alternative for providing public water supplies to these unserved households and small communities is extending water lines from existing surface water systems; and

WHEREAS, such extensions can be prohibitively expensive because of distance and terrain; and

WHEREAS, unconventional sources such as coal seam aquifers and mine cavities, along with emerging collection and storage technologies such as rainwater harvesting, represent possible alternatives for meeting the drinking water needs of the small communities in southwestern Virginia; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the State Water Commission, with the assistance of the Virginia Water Resources Research Center at Virginia Polytechnic Institute and State University, be directed to study for two years innovative technologies and other options for providing safe, reliable, and affordable domestic water supplies to individual households and small communities in southwestern Virginia. The study shall consider such innovative technologies as water harvesting and cistern storage, small surface reservoirs, and cost-effective treatment, including the development of small package-system models.

All agencies of the Commonwealth shall provide assistance to the State Water Commission for this study, upon request.

The State Water Commission shall complete its work in time to submit its findings and recommendations to the Governor and the 1999 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

Report Summary:
Water Supply Options in the Virginia Coalfield Counties

January 1997
John Randolph
Virginia Tech

Sewage/Plumbing in Coalfield Counties

(Percent of Households)

Census Year	Public Sewer	Septic/ Cesspool	Other Disposal	Lack of Plumbing
1970	24%	37%	40%	41%
1980	28%	58%	14%	13%
1990	30%	63%	7%	6%

Drinking Water in Coalfield Counties

(Percent of Households)

Census Year	Public Water	Private Well	Other Source
1970	37%	38%	25%
1980	43%	39%	18%
1990	48%	37%	15%

Inherent Water Problems in Southwest Virginia

- **Poor groundwater resources:**
  Cumberland shale/cemented limestone, Ridge and Valley karst
- **Sensitive natural waters:**
  Unique aquatic ecology in Clinch, other rivers needs protection
- **Topography:**
  Especially in coalfields, steep terrain inhibits water line extensions, speeds runoff, limits groundwater recharge
- **Land use:**
  Land intensive industry (coal mining, tobacco/other agriculture, forestry) & on-site wastewater impact natural waters and supplies
- **Limited financial resources:**
  Tradition of limited infrastructure development, poor living conditions, and limited local budgets constrain improvements

Potential for and Limitations of Water Supply Options for Outlying Households in the Virginia Coalfields

Option	Potential	Limitations	Further Study
Extend water lines	Most conventional mechanism	Most conventional mechanism	Prioritization based on: cost, number served, relief of problems
Springs and wells	Site specific potential, primarily individual systems	Limited aquifers, poor experience with public GW systems	Cost-effective treatment (e.g., point-of-use) and source protection
Coal seams, mine cavities	Site specific potential	Quality limitations, treatment needs, legal/instituional issues	Potential sites; study of sites, quality, treatment needs
Surface water catchments	Site specific, primarily large community systems	Limited sites; high cost requires scale economies; ecological concerns	Potential sites, cost-effective treatment and source protection
Water harvesting, cisterns	Plentiful annual rainfall	Effects of drought, quality of stored water	Emerging technologies for water harvesting

Keys to Improving Water Conditions in Southwestern Virginia

- **MONEY:**
  Attract financial support, revolving loans, grants, severance tax revenues, other fund-raising to finance water improvements

- **INFORMATION:**
  Continue study and research:
  monitoring, technical options, financing mechanisms

- **COLLABORATION:**
  Form partnerships, involve stakeholders, resolve conflicts, attract political support, engage existing institutions, form new ones as needed

- **PLANNING:**
  Project planning plus watershed, wellhead, & spring protection and water conservation to protect supplies and preserve natural waters

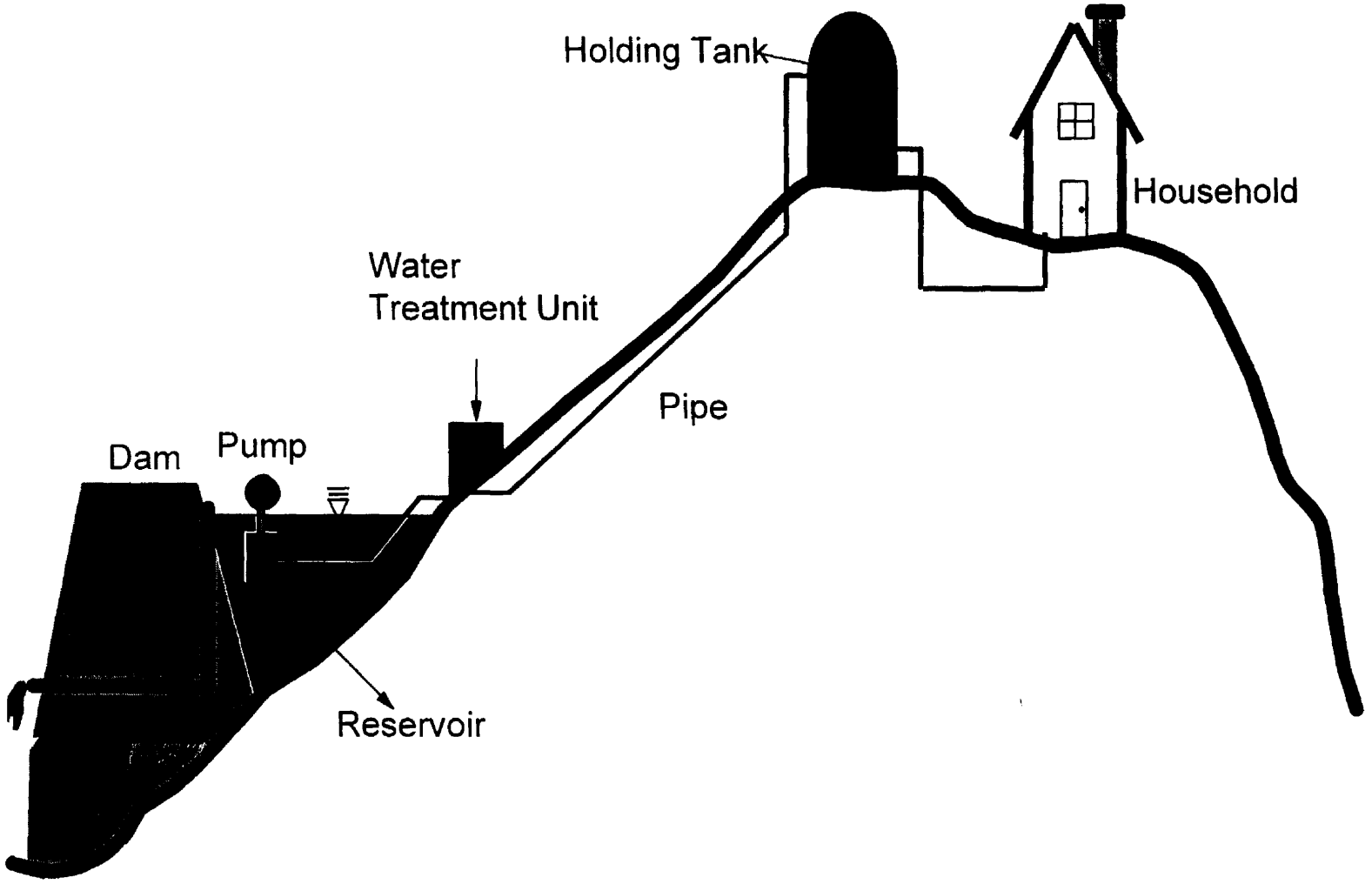
Progress for Improving Drinking Water Conditions in Southwestern Virginia

- **Planning Studies (1990s):**
  - PDC, PSA water supply plans and engineering studies
  - PRP/VEE coalfield water supply study
- **Coal-impacted water replacement legislation (1992)**
- **Monitoring (1994-96):**
  - Cooperative Extension coalfields well & spring testing program
  - VDH assessment of water problems
- **Funding (1995-96):**
  - Coalfield Water Development Fund
  - Federal Safe Drinking Water Act
- **Political Support (1996-97):**
  - HJR 104 (1996): Joint Subcommittee Studying Drinking Water Supply Problems in Southwestern Virginia
  - HJR 592 (1997): State Water Commission Study of Innovative Technologies and Other Options for Providing Water Supply
  - HJR 590 (1997): Cumberland Plateau, LENOWISCO PDC Regional Water Supply Plan

Recommendations

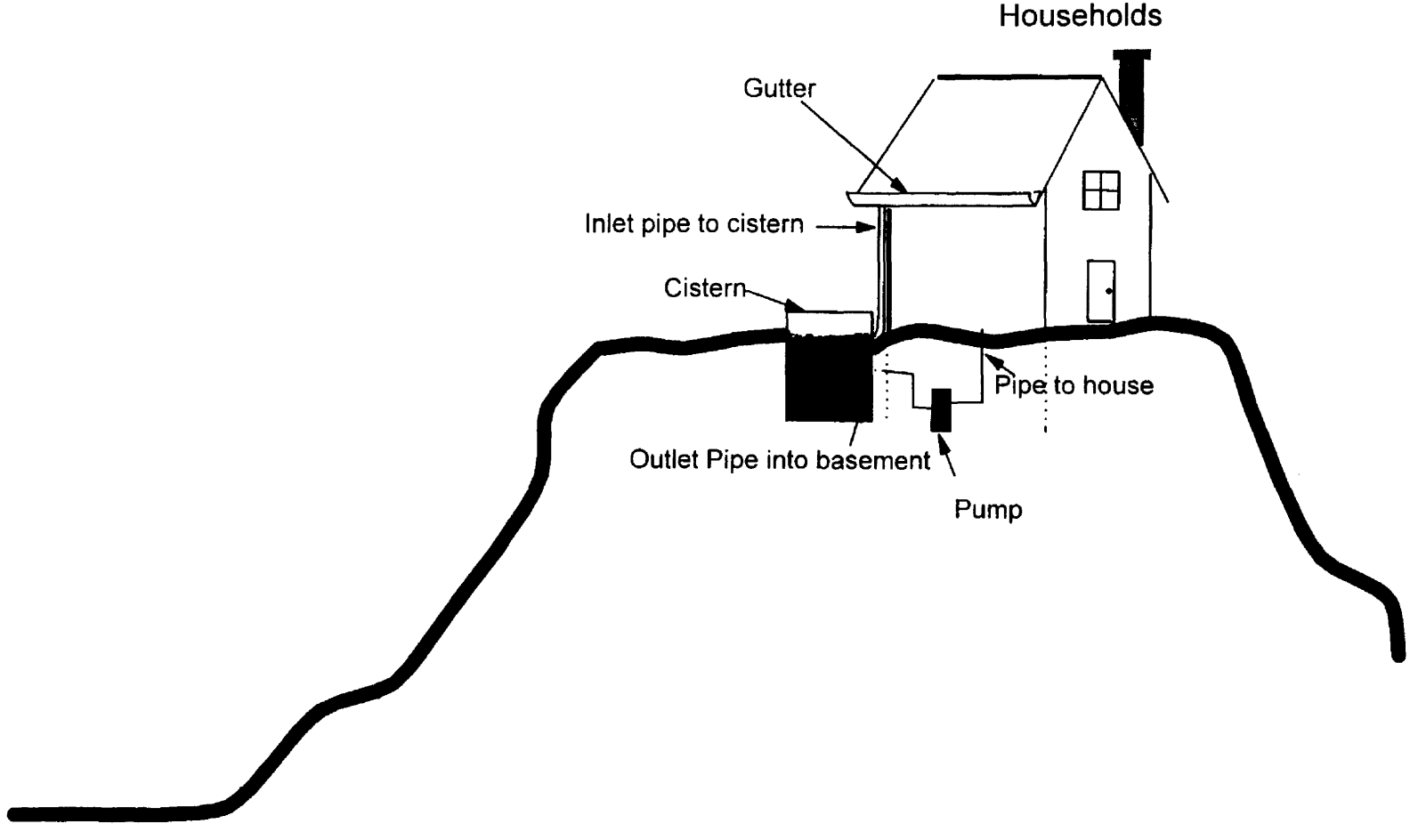
1. **Further research** should be conducted in the following areas:
   - a reliable **estimate of the funding needs** for effective development of community water systems in the coalfield counties;
   - additional **testing of water supplies** of households not served by public water to identify the most critical water quality and health needs;
   - additional **evaluation of innovative technologies**, including water harvesting and cistern storage, small surface reservoirs, and cost-effective treatment.
2. Existing **water sources should be preserved** through water conservation and watershed, well head, and spring protection measures.
3. The counties' water problems will not be solved without **adequate funding.** Grants and a funding pool are needed to leverage other sources of funds to support the high costs of new service, while keeping the rate burden on low-income households at an affordable level.
4. Project selection and design should be based on **good analysis, engineering, and planning,** so that projects are reliable and cost-effective, are targeted to the most critical needs, and minimize the impacts on ratepayers.
5. An **institutional mechanism** needs to be established to provide needed fund-raising, creative financing, project proposal evaluation, and fund distribution, as well as **effective regional water development planning** including public participation, priority analysis, and rate-impact assessment. Existing organizations including the newly established Coalfield Water Development Fund, PDCs, VDH, VWP, water authorities and local systems, and private industry, should be used as the foundation for such an institutional mechanism.

Rain Harvesting: Small Reservoir/Treatment/Distribution



Rainfall Harvesting:

Rooftop Collection/Treatment/Cistern Storage



Potential for Using Coal-Seam Water as a Drinking Water Source