

BOTETOURT COUNTY GROUND/  
SURFACE WATER STUDY

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## INTRODUCTION

This study was prepared by the Fifth Planning District Commission at the request of the Botetourt County staff and Planning Commission, which assisted with its preparation. The study's purpose was:

- (1) to identify existing statutes relevant to the ground and surface water, its use and methods of protection,
- (2) to investigate and summarize precedents in other Virginia localities which have resulted from their attempts to address this issue,
- (3) to identify all state departments' and agencies' roles with regard to extraction, focusing on any responsibilities for assurance of continued adequate and safe water supply for existing development,
- (4) to advise Botetourt County as to what its responsibilities are as a local government for provision and protection of ground/surface water and what legal limitations exist as it attempts to control and guide new growth, and
- (5) to make recommendations aimed at protecting water supply and quality for existing development while simultaneously allowing new development.

The results of this research have revealed a complex mixture of state and local laws and roles. Underlying these are important legal issues, such as the riparian and reasonable use doctrines. These make it somewhat difficult for localities to regulate water use and protection, but several local options are detailed herein. A more hidden issue is the nature of Botetourt County's groundwater. Botetourt County's limestone formations make its groundwater quality and quantity difficult to predict on a site-by-site basis.

## STATUTES FOR GROUND AND SURFACE WATER PROTECTION AND USE

### Federal Laws Affecting Ground and Surface Water

The following federal statutes regulate specific sources of ground and surface water pollution:

#### Clean Water Act

Point and nonpoint source discharges into the waters of the United States are controlled by the provisions of the Clean Water Act. Groundwater discharges are exempt from the Act if an aquifer is not directly connected to a surface stream. The Act does not regulate groundwater, but it has become a source of funds for state monitoring and planning of groundwater. Local and regional governments are given authority to regulate nonpoint sources of pollution according to Section 208 of the Act.

"Section 404 of the Clean Water Act authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits after notice and opportunity for public hearing, for the discharge of dredged or fill material into the waters of the United States..." (Federal Register, Vol. 51, No. 219).

#### Resource Conservation and Recovery Act

This Act is a regulatory statute that imposes hazardous waste management requirements on generators and carriers of hazardous materials and upon owners and operators of treatment, storage and disposal (TSD) facilities. The purpose of RCRA is to prohibit open dumping on land and to require that existing open sites be modified so that they do not harm the environment or public health. Local governments exercise the most discretion over TSDs by controlling the location of new or expanding facilities. This is done primarily through use of local land use powers. However, some states have preempted local land use controls in order to locate hazardous waste facilities in a particular area, regardless of the argument that "home rule immunizes a community from state regulations" (p. 124, Zoning and Planning Law, Vol. 8, No. 5, May 1985). Compensation for this may be in the form of increased public input in site selection, etc.

#### Safe Drinking Water Act

Although this Act does not set any groundwater quality standards, it does provide for the protection of groundwater in two ways. Firstly, underground injection control is implemented at the state level. The states follow minimum standards for underground injections as established by the federal government. Protection of drinking water sources is limited to aquifers that do or can serve as sources of supply for public water systems or for human consumption. Aquifers excluded from protection are those

dedicated to oil and gas protection and those too contaminated to be a supply source.

The sole source aquifer provision is the second groundwater protection program. If the EPA designates an aquifer as the sole source of drinking water for an area, no federal funding or other financial assistance may be used for activities that the EPA determines may contaminate the aquifer through a recharge zone.

Section 1428 of the Safe Drinking Water Act requires each state to formulate a program for local government involvement (including water and sewer authorities) in delineating wellhead protection areas around community wells. Land use and other restrictive measures will be required to protect the well from potential contaminants within the wellhead protection area. States will also have authorization to provide its citizens with technical assistance, education, training and demonstration projects to help implement control measures (A Groundwater Protection Strategy for Virginia, Virginia Groundwater Steering Committee, May 1987, pp. 55-56).

#### Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

This Act provides for the regulation of the release of hazardous material into the environment. The Act requires that all inactive hazardous waste sites be identified and dealt with in such a way as to protect the environment and the public from the risks involved with a hazardous waste site.

The National Contingency Plan (NCP), developed under the Clean Water Act and expanded under CERCLA, provides for the clean up of hazardous waste sites and the corrective measures necessary to prevent them from continuing to pollute the environment. Subpart B of the NCP outlines the responsibilities of federal, state and local agencies in regulating the clean up and continued monitoring of hazardous waste sites.

CERCLA is also the major source of federal and state funding for the clean up of contaminated water sources, thus its nickname of "Super Fund". The Super Fund Community Relations Policy requires regional offices to formulate a community relation plan for each project funded through CERCLA. This plan would serve as a planning and management tool that outlines the communications activities and technical work that will be used for a Super Fund cleanup project.

#### Toxic Substances Control Act

This Act authorizes the EPA to regulate the manufacture, use and disposal of toxic pollutants in order to protect groundwater by controlling the manufacture, use, storage, or disposal of potentially harmful substances.

## Federal Insecticide, Fungicide, and Rodenticide Act

This Act authorizes the EPA to control pesticide use and to review the environmental effects that occur as a result of pesticide use.

## Surface Mining Control and Reclamation Act

Groundwater is protected from contamination as a result of strip-mining under the statutes of the Surface Mining Control and Reclamation Act.

## The National Environmental Policy Act

This Act encourages cooperation and compatibility between people and the environment and promotes efforts to reduce damage to the environment. This Act can help locate and reduce contamination by requiring assessment and examination of all federal actions "for their potential adverse effects on the environment", including ground and surface water (Protecting Virginia's Groundwater: A Handbook for Local Government Officials. Margaret Hrezo and Pat Nickerson - VPI&SU - Virginia Water Resources Research Center, p. 42).

## State Laws Affecting Ground and Surface Water

Virginia law provides for the proper use and protection of surface and groundwater through statutes concerning the State Water Control Law, the Groundwater Act of 1973, proper withdrawal and regulation of water supplies, impoundment of surface water, surface water management areas, and land use management, etc. Below is a synopsis of the different statutes.

### State Policy as to Waters

The Code of Virginia states that "[t]he regulation, control, development and use of waters for all purposes beneficial to the public are within the jurisdiction of the Commonwealth which, in the exercise of its police powers, may establish measures to effectuate the proper and comprehensive utilization and protection of such waters" (Section 621-116).

### State Water Control Law

The purpose of the State Water Control Law is to provide for the protection of "high quality state waters" and to "restore all other state waters" to a condition of high quality; to "safeguard the clean waters of the Commonwealth from pollution"; to "prevent any increase in pollution"; to "reduce existing pollution"; and to "promote water resource conservation, management and distribution, and encourage water consumption reduction in order to provide for the health, safety and welfare of the present and

future citizens of the Commonwealth" (Section 62.1-44.2). The State Water Control Law is enforced through the actions of the State Water Control Board which, according to the Code, has the power "to study and investigate all problems concerned with the quality of state waters and to make reports and recommendations," and "to establish such standards of quality and policies for any state waters consistent with the general policies of [Chapter 3.1, Title 62.1 - State Water Control Law]." The State Water Control Board is also authorized "to establish policies for effective area-wide or basin-wide water quality control and management," and may also "administer programs of financial assistance for planning, construction, operation, and maintenance of water control facilities for political subdivisions in this Commonwealth" (Section 62.1-44.15).

The two permit programs recently developed by the State Water Control Board are good examples of the policies the Board develops to alleviate problems such as those caused by weaknesses in the application of the Riparian Doctrine, for example. The first permit program involves the issuance of a "water protection" permit by the SWCB each time a request is made to build a water withdrawal structure (Code of Virginia, Section 62.1-44.15). The second permit program deals with the designation of surface water management areas (SMAs). SMAs are designated according to the following criteria:

- (1) the stream being influenced has significant instream values;
- (2) historical or current low flow conditions could threaten instream values, or
- (3) flow conditions are aggravated by current or future off-stream uses (e.g., withdrawals) that degrade instream values (Section 62.1-242).

Once an SMA has been designated, "no person shall withdraw or attempt to withdraw any surface water, except for withdrawals exempted under Section 62.1-243, without a surface water withdrawal permit issued by the [SWCB]" (Section 62.1-247). Existing domestic supplies and wastewater treatment plants are exempt from these permit programs (VLA News, Summer 1989, No. 7, p. 3).

#### The Groundwater Act of 1973

The purpose of this law is to "recognize and declare that the right to reasonable control of all groundwater resources within [Virginia] belongs to the public and that in order to conserve, protect and beneficially utilize the groundwater of [the State] and to ensure the preservation of the public welfare, safety and health, it is essential that provisions be made for [the] control of groundwater resources" (Section 62.1-44.84). The Groundwater Act was designed for use only in those areas that have identified

problems with groundwater management. Groundwater management areas (GMAs) are designated by the State Water Control Board according to the following criteria:

- 1) Excessive decline in groundwater levels or artesian pressures;
- 2) Interference between the wells of two or more groundwater users;
- 3) Actual or imminent overdrawing of the available groundwater supply; and
- 4) Actual or expected pollution of groundwater (Section 62.1-44.95).

Once an area has been designated as a groundwater management area, no one can withdraw or attempt to withdraw any groundwater without a permit or a certificate of groundwater right (unless authorized to withdraw groundwater without a permit as provided for in Section 62.1-44.97). The Code also provides for the establishment of a groundwater management area advisory committee (made up of residents from all jurisdictions within the GMA) to advise the SWCB "on the implementation of plans and procedures for the control of groundwater within groundwater management areas" (Section 62.1-44.98). All existing groundwater uses are subject to review by and must be registered with the State Water Control Board. In this way, existing uses can be reviewed for potential sources of groundwater pollution. A more complete listing of exemptions to the permit process can be found in the provisions of the Groundwater Act of 1973, Section 62.1-44.83 of the Code of Virginia.

The construction, alteration, rehabilitation or extension of any well cannot take place within a groundwater management area without a well construction permit as required in Section 32.1-176.5 of the Code of Virginia (Section 62.1-44.101:1).

#### Registration for the Withdrawal of Water

This section of the Code calls for the SWCB to formulate "plans and programs for the management of the water resources of [Virginia]..." so as "to encourage, promote and secure the maximum beneficial use and control [of these water resources]. These plans and programs shall be prepared for each major river basin [in Virginia]," including the James River Basin. The preparation of these plans shall include:

- 1) estimation of current water withdrawals and use for significant categories of water users (e.g., agriculture, industry, etc.);



- 2) protection of water withdrawals for users indicated in #1 above;
- 3) estimation of, "for each major river and stream, the minimum instream flow necessary to maintain water quality";
- 4) evaluation of "the ability of existing subsurface and surface waters to meet current and future water uses";
- 5) evaluation (in cooperation with the Virginia Department of Health) of "the current and future capability of public water systems to provide adequate quantity and quality of water";
- 6) identification of water management problems and alternative water management plans to address these problems; and
- 7) evaluation of "hydrologic, environmental, economic, social, legal, jurisdictional and other aspects of each alternative management strategy identified."

The SWCB may also require each water user who withdraws subsurface or surface water (or both) each year to register water withdrawal and use data for the previous year. The SWCB has the authority to establish advisory committees for assistance in formulating the above-mentioned plans. Residents of the political subdivisions within Virginia may serve on these committees (Section 62.1-44.38).

#### Impoundment of Diffused Surface Waters

Diffused surface waters are defined in the Code of Virginia as waters "which, resulting from precipitation, flow down across the surface of the land until they reach a watercourse; after which they become parts of streams" (Section 62.1-104). These waters may be "captured and impounded by the owner of the land on which they are present and," when impounded, become the property of the owner. The owner must comply with the rules of the SWCB concerning the impoundment of water (Section 62.1-105). Section 15.1-332.1 of the Code states that "no county or municipality shall impound any waters in the Commonwealth within the boundaries of another county or municipality without first obtaining the approval of [that] county or municipality."

#### Expenditures for Promoting Resources

According to the Code, any city, town or county may spend no more than 2% of its locally-derived revenues for the purpose of promoting its resources. However, a locality can spend more than 2% of its locally-derived revenues for watershed projects and the expenditures associated with such projects (Section 15.1-10).

## County Regulations as to Water, Sewer, etc.

"Any county which has adopted regulations under Chapter 11 (Planning, Subdivision of Land and Zoning) of Title 15.1 of the Code of Virginia [which governs] the use and development of land, may also adopt regulations subject to the provisions of Chapter 3.1 (State Water Control Law) of Title 62.1, fixing requirements as to the extent which and the manner in which water, sewer, etc. shall be installed as a condition precedent to the approval of an original plat of a subdivision or a development plan adopted pursuant to Section 15.1-491, or alteration of any such plat or a development plan adopted pursuant to Section 15.1-491. Such regulations may require the water source to be an approved source of supply capable of furnishing the needs of the eventual inhabitants of such subdivision..." (Section 15.1-299).

## Municipal Corporation Regulation of Water Supplies

Section 15.1-854 of the Code of Virginia states that "[a] municipal corporation may regulate and inspect public and private water supplies and the production, preparation, transmission and distribution of water, and the sanitation of establishments, systems, facilities and equipment in or by means of which water is produced, prepared, transmitted and distributed; may adopt such regulations as are deemed necessary to prevent the pollution of such water supplies; and without liability to the owner thereof may prevent the transmission or distribution of water when found to be polluted, adulterated, impure or dangerous." Section 15.1-875 allows a municipal corporation to provide and operate water supplies and water production...facilities within the municipal corporation for the purpose of providing water to its residents. Municipal corporations may also contract with others for water services.

## Underground Storage Tanks (USTs)

The EPA estimates that nearly 12-35% of all existing USTs will eventually leak. In 1987, the Virginia General Assembly created Articles 9 and 10 of the State Water Control Law. These articles authorize the State Water Control Board to administer the Underground Storage Tank Program.

The State Water Control Board's regulations regarding the Underground Storage Tank (UST) systems deal with the permitting, inspection, closure, design, construction, installation, and notification of USTs; the general operating requirements of USTs; release detection, reporting, investigation and confirmation; and release response and corrective action for UST systems containing petroleum or hazardous substances.

## Other Legal Issues Concerning Ground and Surface Water

### The Riparian Doctrine

This doctrine governs the use of surface water and pertains to owners of land that adjoins a stream or standing water. The traditional riparian doctrine is a common law concept which holds that each landowner has the right to make reasonable use of water on his land, provided that water is returned to its natural stream before it leaves the property. The property owner also has the right to receive the full flow of the stream undiminished in quantity and quality.

### Reasonable Use

The reasonable use doctrine states that a landowner has the right to make any rational use of groundwater on the land above the groundwater, or the right to develop property in a sensible manner, even if the water supply of others is affected. This doctrine sounds similar to the riparian doctrine which states that each landowner has the right to make rational use of the water on his land, provided that the water is returned to its natural stream before it leaves the property. Both doctrines address reasonable use of water. However, the riparian doctrine takes the water needs of adjacent property owners into consideration, whereas the reasonable use doctrine is such that a landowner can legally have a detrimental affect on his neighbor's groundwater supply. Virginia case law has determined that the reasonable use doctrine also limits the use of groundwater to the land from which the water is taken.

## Land Use Management Issues

### Dillon's Rule

Dillon's Rule simply dictates that the power of local governments to enact ordinances that control land use decisions is derived from the State's specific delegation of police power to those local governments. This delegation may be either by charter grants or by the enactment of general "enabling statutes". In Virginia, the enabling legislation is found in the Code of Virginia.

In the Code of Virginia there exist several provisions for the protection of water resources through land use management tools such as comprehensive planning, zoning, and the taking clause. These are further explained in the following paragraphs.

## Comprehensive Planning

According to the Code, "the Comprehensive Plan...shall show the [local] commissions' long-range recommendations for the general development of the territory covered by the Plan, including...the designation of areas...for conservation, recreation,...[and] floodplain and drainage." The Plan may include, among other things, the "...designation of areas for the implementation of reasonable groundwater protection measures" (Section 15.1-446.1).

## Zoning

Also in the Code, "[z]oning ordinances and districts shall be drawn and applied with reasonable consideration for the existing use and character of property...the suitability of property for various uses,...the conservation of natural resources, the preservation of floodplains,...the conservation of properties and their values and the encouragement of the most appropriate use of land throughout the county or municipality" (Section 15.1-490). In addition, the Code states that "such ordinance may also include reasonable provisions, not inconsistent with applicable state water quality standards, to protect surface water and groundwater..." (Section 15.1-489).

## The Taking Clause

The taking clause is a clause of the Fifth Amendment to the U.S. Constitution which states that private property shall not be taken for public use without just compensation. The increasing threat to the environmental quality of our land and the water thereon is causing localities to enforce stricter land use regulations, and "takings" are often used as a tool in regulating land use. In Virginia, the State grants power to localities to condemn (or take) property for public use. According to 25.46.2:1 Condemnation of Land for Public Park Purposes in the Code of Virginia, the State has the authority to exercise the power of eminent domain to condemn land or lands within this State for use as a public park or for public park services. The proceedings for the condemnation of land for this purpose shall be in accordance with Title 25, Chapter 1.1. The Code also allows for the determination of just compensation for condemnation in Code Section 25-46.19. According to Michie's Jurisprudence, "[t]he power of eminent domain may be delegated to counties for the purposes of acquiring property necessary for county buildings or other public uses." Also, "[a] city may condemn property for a public park" (Michie's Jurisprudence of Virginia and West Virginia. Volume 7A; The Michie Company. Charlottesville, Virginia, 1985, p. 13). Section 15.1-292 of the Code of Virginia provides localities with the authority to condemn land for the prevention of water pollution.

PRECEDENTS SET AS A RESULT OF LOCALITIES'  
EXPERIENCE WITH GROUND AND SURFACE WATER PROTECTION AND USE

IN VIRGINIA

Rappahannock County, Virginia

As provided for in Section 32.1-176.5 of the Code of Virginia, this county has established a water protection ordinance, effective January 1, 1990. This ordinance states that an applicant shall provide certification of an on-site potable drinking water source to the Rappahannock County Building Official before being issued a building permit(s) for the construction of single-family residential housing units on building lots of less than one (1) acre in area, or for the construction of multi-family housing units.

All tests performed on potential potable drinking water sources must be in compliance with existing SWCB and EPA drinking water quality standards.

When formulating this type of ordinance, a locality must consider the appropriate groundwater elements to test in keeping with SWCB and EPA guidelines, the reasonable costs associated with testing, and the availability of laboratories to perform the necessary testing.

Loudoun County, Virginia

Loudoun County requires hydrogeologic testing for proposed subdivisions, unless the subdivision has less than 10 lots in which case the applicant may have each lot individually drilled and tested. A hydrogeologic report is a special detailed geotechnical report assessing groundwater quality and/or quantity. It should be prepared by a Virginia certified professional geologist and licensed professional engineer. This test for adequacy of supply and water quality pertains only to the site being developed, but it may give some clues to nearby water characteristics. The report must cite the form and source of recharge, and the net water consumption of the subdivision, among other things. The full text of the ordinance is found in Appendix A.

Fairfax County, Virginia

This county has developed a water supply protection overlay district in order to protect its public water supply from potential contamination. It is the intent of these regulations to review and approve residential, commercial, industrial and other development proposals that may have adverse effects on water quality; to encourage land uses and activities compatible with water quality protection; and to ensure that structures and

uses within the overlay district will be such that they "serve the health, safety, and welfare objectives of preserving the environmental integrity of public water supply reservoirs" (Fairfax County Zoning Ordinance, 7-801).

The boundaries of the water supply protection overlay district shall be drawn to include those areas that drain into a water supply reservoir. The boundaries of this overlay district shall be established in the same manner as other zoning district boundaries are established. Permitted uses, special permit uses and special exception uses are the same as those allowed in the underlying zoning district(s). Those subdivisions subject to the provisions of Chapter 101 of the Code or any use requiring the approval of a site plan in accordance with Article 17 shall provide water quality control measures (or BMPs) for the reduction of (by one-half) the phosphorous runoff pollution for the proposed use.

Lot size requirements are the same as those provided for in the underlying zoning district(s).

#### Clarke County, Virginia

In light of its problem with protecting groundwater, Clarke County formulated a water study to deal with the following issues: protection of Prospect Hills Springs as a public water supply; exploratory drilling and blasting for mineral extraction; percolation limitations of existing soils; and petroleum, nitrate and fecal coliform contamination in private wells.

Examination of these issues led the County to take the following actions: adopt a resource conservation overlay zone in the Prospect Hills Spring area (see Appendix B); apply for federal government designation of the Prospect Hills Spring as a sole source aquifer; draft a proposed oil and gas exploration and extraction ordinance; contract with the U.S. Geologic Survey for a 2.5 year Groundwater Resources Study; and propose the development of a Groundwater Protection Plan as part of the County's comprehensive planning program.

In the Clarke County Groundwater Protection Plan, the following elements are discussed: On-site Waste Water Treatment System Management, Sinkhole Ordinance, and Well Standards, among others.

According to the Clarke County Groundwater Protection Plan, the most important elements of on-site wastewater treatment system management are installation and maintenance. Therefore, it was recommended that the County consider a two-phase program in order to protect its groundwater supply from continued degradation.

Phase I discusses siting and installation standards and procedures for on-site systems. These include the following:

A. Standards for soil evaluation and siting

1. Site and structure identification procedures can be referenced from the Virginia Department of "Health's Sewage Handling and Disposal Regulations".
2. Site restrictions - the following are prohibited at wastewater treatment sites:
  - a. unacceptable percolation rate;
  - b. poorly drained soils;
  - c. slope exceeding 25%;
  - d. sinkholes; and
  - e. high shrink-swell soils.
3. Site specifications - wastewater treatment sites must be located a certain minimum distance from certain elements as listed below (see text of regulations for a complete listing):
  - a. free-flowing streams, natural lakes, or impounded waters - 100 ft.;
  - b. intermittent streams or upland drainage ways - 50 ft.; and
  - c. wells or Class 1 or Class 2 sinkholes - 100 ft.

B. Design and Installation

Minimum design standards for on-site wastewater treatment systems can be found in the Department of Health's "Sewage Handling and Disposal Regulations". In addition, the following standards also apply:

1. Low pressure or enhanced flow distribution systems shall be required for septic systems when:
  - a. soils have an estimated or measured percolation rate of 16 minutes or less; and
  - b. soils have an estimated or measured percolation rate of 90-120 minutes per inch and the drain field design requires a minimum of 3,100 square feet.
2. The minimum square footage required for soil horizons containing 15-50% hard coarse fragments must be increased by 15-50% to provide an adequate soil absorption area for septic effluent.

3. Explosive or pneumatic hammers will not be permitted for the excavation of drain fields or septic tanks.

Phase II outlines the on-site wastewater treatment system maintenance program. The three basic elements of the program are:

A. Part-time installation and maintenance technician

Some of the duties of this person (who would be hired by the County) would include (see text of regulations for a complete list):

1. coordinating with the health department, building inspector and contractors on the installation of all new systems;
2. coordinating with real estate agents and the county clerk's office on the inspection of existing systems;
3. inspecting the installation of new systems; and
4. maintaining a file of properties in the program, including well and water data.

B. Licensing standards for contractors

This is suggested for better monitoring of wastewater system construction. A short course and proficiency exam may be administered based on the number of contractors involved in the project. The technician would have the authority to develop the program under the supervision of the County Administrator. It is also recommended that septage pump and haulers be licensed.

C. Public education about septic systems and groundwater protection

The County should educate the public about septic systems and groundwater protection through the following (see Appendix C for further information):

1. all property owners should be given an owners' guide that explains how to protect groundwater;
2. homeowners should be educated about common household chemicals and their effect on septic systems;
3. best management practice workshops should be conducted for residential property owners;
4. importance of and the methods of water conservation should be taught; and



5. methods for handling and disposing of motor oil and other hazardous material should be demonstrated.

The Sinkhole ordinance divides the sinkholes into two classes. Class 1 sinkholes are such that their structure allows for the contamination of groundwater. Class 2 sinkholes are such that contamination of groundwater through them is not likely. The plan allows the County to seek out Class 1 sinkholes (since these provide the greatest threat to groundwater) and exercise the corrective and protective measures needed to effectively reduce and/or eliminate the entry of contaminants into the groundwater. Some examples of protective measures include buffer zones around the sinkholes, removal of harmful substances within the sinkhole and the installation of plastic liners.

The Clarke County Groundwater Protection Plan acknowledges the well construction regulations of the SWCB and the State Board of Health (SBH). The following are additional regulations provided for in the Groundwater Protection Plan:

1. positive surface drainage should be directed away from the well;
2. all wells should be drilled by air rotary method, not by the use of drilling muds or foams; and
3. extensive solution features or voids which are not sources of water for the well should be sealed off.

#### Chesterfield County

The Chesterfield County Planning Department has developed the Upper Swift Creek Plan as a result of increased growth pressure on Swift Creek Reservoir, the major source of potable drinking water in that area of the County. One of the goals of the plan is to maintain the existing water quality of the Swift Creek Reservoir. Some of the recommendations made to achieve this goal are that all development within the Swift Creek Reservoir watershed should use best management practices to protect the water quality of the reservoir; and that development in the area should also use public utilities because of the inability of the soils to support private wells and septic systems, and because of the "sensitivity of the reservoir to [contamination from] runoff or groundwater" (p. 47, Upper Swift Creek Plan).

Chesterfield County will implement this plan through such practices as historic preservation, a zoning overlay district, rezoning, and capital improvements.

Currently, Chesterfield County is conducting public hearings to review the plan.

## Fauquier County

The subdivision ordinance for Fauquier County states that "where a new or unapproved source(s) of water is involved in a proposed central water system, the source must be tested for quality and quantity impacts prior to submission of the final plat." (p. 15, Fauquier County Subdivision Ordinance). The tests required before the final plat is submitted include those required by the Virginia Department of Health and the Water and Sewer Authority. A hydrogeologic report on the site is also required. This report must be prepared by a certified geologist or hydrologist and must "include the characteristics and extent of the aquifer utilized and the effect of pumping required to serve the subdivision on the surrounding wells and the optimal yield of the aquifer." (p. 14, Fauquier County Subdivision Ordinance). The Fauquier County Code allows the withdrawal of one gallon of water per minute per dwelling for residential and commercial uses.

The general standards for special use permits and special exceptions in the Fauquier County Zoning Ordinance state that "the proposed use shall be such that...surface and ground water quality and quantity are not degraded or depleted to an extent that would hinder or discourage the appropriate development and/or use of adjacent or nearby land and/or buildings or impair the value thereof." (p. V-4, Fauquier County Zoning Ordinance).

Currently, no numerical standards exist for the proper enforcement of the above statute. Fauquier County is developing a Request For Proposal for a local consultant for assistance with developing standards to make the regulations more clear and easier to enforce. Currently, Fauquier County receives assistance from a Piedmont Environmental Council (PEC) hydrogeologist in reviewing its well site applications. In one case, the applicant proposed to locate a well in an area located above a fractured geology. The proposal was denied as a result of the PEC's finding that the proposed well would cause serious draw-down in surrounding wells. In another case, the applicant proposed to locate a well in a sandstone basin. This proposal was approved when it was determined that the well would have no impact on surrounding wells. The review of subsequent well site applications are based on the review of the cases listed above.

## ELSEWHERE IN THE UNITED STATES

### Schenectady County, New York

Due to the sensitive nature of the ground overlying the aquifer that serves as a source of drinking water for five municipalities and 80% of the population in Schenectady County, well sites and the areas of influence around those wells have been defined by the County as "critical aquifer areas". Further analysis of these areas moved the County to purchase certain sections of each critical area; purchase restrictive covenants or easements on other sections in the critical areas; enforce specialized zoning of the areas where appropriate (e.g., floodplain zoning, conservation zoning); and designate critical areas under the State Environmental Quality Review Act.

The County has achieved much success in implementing this program for the protection of its source of drinking water.

### Crystal Lake, Illinois

A consultant's study of Crystal Lake and its watershed revealed that agricultural practices and urbanization were contaminating the aquifer, which in turn was causing increasing eutrophication of the lake. As a result, the City of Crystal Lake amended its comprehensive plan and zoning ordinance to create four special watershed zoning districts for the protection of the lake. The ordinance amendments also require developers to provide detailed hydrologic information as part of the project approval process. Since most of the Crystal Lake watershed exists outside of the corporate limits of Crystal Lake, the City uses pre-annexation agreements so that it can proceed with its watershed management policies.

### Southington, Connecticut

This Town has amended its zoning ordinance to provide for aquifer protection districts. These districts function as an overlay zoning district which prohibits such land uses as disposal, storage or treatment of hazardous or solid waste; road salt storage; filling stations and several potentially contaminating industries. The ordinance also regulates the underground storage of fuel by requiring a permit from the fire marshal.

### Fillmore County, Minnesota

This locality has amended its zoning ordinance to protect its groundwater by prohibiting activities that cause "accelerated erosion or sediment damage". Erosion plans for any construction or subdivision plan over 10,000 square feet in size are also required by the ordinance.

Southampton, New York

For greater water quality protection in the wake of increasing development, this Town has adopted mandatory clustering of new residential developments and stringent density controls to reduce the landscaped area of new development within aquifer recharge areas.

STATE AGENCY ROLES & RESPONSIBILITIES  
IN REGARD TO WATER USE AND PROTECTION

The following list (adapted from VDSWC's Virginia's Nonpoint Source Pollution Assessment Report and the Virginia Groundwater Steering Committee's Virginia Groundwater Management Handbook) summarizes the roles and responsibilities of state agencies involved with regulating the use and protection of water resources in Virginia.

1. Virginia Council on the Environment (state coordinating agency for environmental quality issues)
  - executive advisory services (advise Governor and General Assembly)
  - program development and coordination (among the 11 member agencies)
  - environmental impact review
  - environmental information and education
2. Virginia Cooperative Extension Service
  - general education on water issues
3. Virginia Department of Agriculture and Consumer Services
  - regulation on use of pesticides
  - regulation on agricultural production, including fertilizer, liming, etc.
4. Virginia Department of Conservation and Recreation
  - designation of scenic rivers
  - technical assistance on use of land bordering state waters
5. Virginia Department of Forestry
  - lead agency for forestry BMP plans
6. Virginia Department of Health
  - development, implementation and enforcement of regulations on:
    - a. on-site wastewater disposal
    - b. septage management and disposal

- \*c. private well development
- \*d. public water supply wells
- technical review of municipal wastewater treatment permits
- technical review of proposals for sludge management plans and land application of sludge

\*More detailed information is available on these items in Appendix D.

7. Virginia Department of Mines, Minerals and Energy
  - permits for mine water discharges from active coal mine sites
  - permits for active mining sites (excluding coal)
  - reclamation or restoration of old mine sites for drainage control (Orphaned Land Program)
  - regulation of drainage from oil and gas mining sites
8. Virginia Department of Waste Management
  - groundwater monitoring of landfills
9. Virginia Division of Soil and Water Conservation (Virginia Department of Conservation and Historic Resources)
  - coordination of Chesapeake Bay NPS Pollution Program
  - lead agency for agricultural and urban BMP plans
  - implementation of State Erosion and Sediment Control Law through local governments
10. Virginia Marine Resources Commission
  - permits for encroachment (such as building or dumping) on submerged lands of the State
  - enforcement for fish and shellfish laws
  - project review to protect marine habitats (wetlands, coastal primary sand dunes, state-owned bottomlands)
11. Virginia Water Control Board (enforces the State Water Control Law)
  - water quality management planning
  - groundwater management
  - Clean Lakes Program
  - water quality assessment
  - research and standards development
  - nonpoint control agency for hydrologic modifications and groundwater sources
  - permits issued include:

- a. Virginia Pollution Discharge Elimination System
  - b. Virginia Pollution Abatement
  - c. No Discharge Certificates
  - d. Groundwater Management Area
  - e. Surface Water Management Area
- water withdrawal reports (any water withdrawal in excess of a monthly average of 10,000 gpd during any month in a year)
  - underground storage tank regulation
  - pollution incident response (PREP)
  - other related programs

**LOCAL ROLES AND RESPONSIBILITIES  
IN REGARD TO WATER USE AND PROTECTION**

The following list summarizes local roles and responsibilities in regard to water use and protection (list adapted from the Virginia Groundwater Protection Steering Committee's Groundwater Protection Strategy for Virginia):

Activity	Va. Code	Potential Water Relationship
Comprehensive Planning	15.1-446.1.	<p>studies could correlate water demands, alternative sources of water, other land uses, and geologic conditions</p> <p>land use plans could relate residential density and other land uses to groundwater vulnerability and designate areas where conservation and protection measures are most needed.</p>
Zoning Controls	15.1-486	<p>allowed and prohibited uses could be defined for ground or surface water sensitive areas</p> <p>special permit or overlay district could be used for certain areas</p> <p>residential density could be based on water/sewer source</p>
Subdivision Controls	15.1-465	<p>evaluation of soils for wells and septic installation could be accomplished prior to subdivision</p> <p>minimum residential lot size could be based on water/sewer source</p>
Capital Improvements	15.1-1-464	<p>water/sewer extensions could anticipate and avoid water problems or remedy existing problems</p> <p>land acquisition for parks, schools, reservoirs, etc., could protect recharge areas</p>



Public Facilities	Various	<p>government operated landfills, treatment plans, lagoons, corporation yards, airports, etc., could be located outside sensitive areas</p> <p>sewer hookups could be mandated</p> <p>pesticides or fertilizers could be reduced on public lands</p>
Erosion Control	21-89.1	<p>runoff reduction techniques could be used that avoid water-carried pollutants getting into the water source</p> <p>"no-till" practices that increase use of chemicals could be discouraged in sensitive areas</p>
Easements/ A-F Districts	15.1-1506	<p>voluntary development restrictions could be targeted at sensitive areas</p> <p>regulations sometimes waived in A-F may need to be retained to protect water sources</p>
Industrial Revenue Bonds	15.1-1373	<p>performance standards in excess of the minimum could be negotiated in consideration of public investments and comprehensive plan policies</p> <p>development could be targeted away from sensitive areas</p>
Other	Various	<p>sole source aquifer designation could be sought under federal Safe Drinking Water Act</p> <p>local septic and well construction regulations (and stepped-up inspection) could be enacted</p> <p>surface or groundwater management area designation could be sought from the VWCB</p>

In addition to the above regulations, the Virginia Water Resources Research Center's Protecting Virginia's Groundwater: A Handbook for Local Government Officials lists several voluntary strategies for water protection:

- 1) increased emphasis on voluntary Best Management Practices
- 2) water conservation measures such as water-saving fixtures, public education, etc.
- 3) recycling programs
- 4) household hazardous waste clean-up days

Disadvantages of voluntary strategies include the strong need for public education or other incentives for motivation and cooperation. On the plus side, voluntary measures are often considered less intrusive by citizens. However, regulatory tools can be uniformly and fairly administered where voluntary compliance may be lacking.

## RECOMMENDATIONS

For protection of water quality and quantity in Botetourt County, the County should consider the following recommendations:

1. The County Planning Commission should hold a workshop meeting with the SWCB to learn more about the DRASTIC map previously completed by the County staff, Fifth Planning District Commission, and State Water Control Board.
2. The County should undertake a public education program on ground and surface water. This would be a voluntary first step toward protection of water quality and quantity. Appendix C explains what a typical public education program would entail. Excellent educational materials are available from the Virginia Water Resources Research Center (VWRRC) at Virginia Tech. Botetourt County should encourage the use of these materials in schools. Other VWRRC brochures could be distributed to all citizens (or to building permit applicants at a minimum).
3. If over the next few years, voluntary measures appear to be inadequate for water protection, the County should consider use of increased regulatory controls. The County will need to be alert to potential groundwater pollution in the future in order to swiftly enact ordinances should they become necessary. A good example of these controls are those used by Clarke County (detailed earlier in this report). They might include such things as increased septic and well standards/inspection and a sinkhole ordinance. The County also could investigate adoption of a resource conservation overlay district similar to that used in Clarke County (Appendix B). This overlay would restrict allowable uses, set a minimum lot size, establish a maximum lot coverage, and specify additional septic system requirements. The overlay would apply to sensitive groundwater areas as defined by the County. Possibly the DRASTIC map could be used to define sensitive areas (although the County would somehow have to overcome DRASTIC's major limitation, which is its inability to be used accurately for areas smaller than 100 acres). If the County prefers to initially focus on potential public well sites, it may choose to expand on data previously prepared for the County by Thomas Gathright, II. While Mr. Gathright's research primarily looked at potential water supply areas, the DRASTIC mapping goes one step further and examines areas that might be easily polluted.

4. The County should enact well interference restrictions similar to those used in Fauquier County (where zoning and subdivision regulations prohibit well developments that would cause serious draw-downs in surrounding wells). Fauquier County is presently in the process of developing numerical standards for enforcement of these regulations. Before taking any action, Botetourt County should (a) review Fauquier County's numerical standards (presently under development) for enforcement of these regulations and (b) solicit an opinion from the Botetourt County Attorney on these proposed regulations and standards.

APPENDIX A

"Amendment Regarding Safe and Adequate Groundwater  
Supplies", Loudon County, Virginia, 11-7-88

Amend the Facilities Standards Manual to include new section 6.210,  
Hydrogeologic Testing Requirements:

6.210 Hydrogeologic Testing

A hydrogeologic report is a special Detailed Geotechnical Report assessing groundwater quantity and/or quality. The hydrogeologic report shall be prepared by a Virginia certified professional geologist and licensed professional engineer, in general accordance with Section 6.200 of the Facilities Standards Manual.

- A. Applicability of hydrogeologic testing for subdivision water supply approvals
1. The hydrogeologic testing requirements and procedure must be conducted on any new subdivision consisting of any lots less than ten (10) acres, except as provided in subparagraph 2, below.
  2. If the number of proposed lots is less than ten (10), the applicant has the option of preparing a hydrogeologic report or each well can be drilled and tested for quantity and quality in accordance with the requirements of the Codified Ordinances of Loudoun County, Chapter 1040 (Water).

## B. Testing Proposal

1. Background Information. A map shall be provided at a 1:2400 scale (1" = 200') showing the watershed unit(s) which are the subject of the hydrogeologic test and report. This map shall include planimetric features, topography, geologic contacts, major structural features, existing wells and septic fields, and houses within 1000' of the property boundary. The map shall also show springs, watershed boundaries, and groundwater flow net (i.e., groundwater table contours and direction of groundwater flow.)

All information shall be gathered from existing records.

Information concerning existing wells and septic fields is available from the Health Department upon written request and shall be used as the primary source of information if available.

2. Proposal. A proposal shall be prepared based on the field testing requirements in Section 6.210.B. The proposal shall identify the location of all test wells and describe the testing to be performed at each location.
3. Review by County. After submission of a proposal for performing a hydrogeologic test, the applicant shall meet with representatives of the Departments of Health and Natural Resources to review the proposal. The County may direct changes in the proposed location of test wells and other changes as appropriate.

C. Field Testing for Adequacy of Supply.

1. Public Water Supply Systems (Community or Non-community multi, or single user). For any proposed public water supply system, a pump down test shall be performed to provide evidence that such system is capable of furnishing the needs of the eventual inhabitants of the proposed subdivision proposed to be served thereby. Such pump down tests shall be performed in accordance with the latest revision of the Waterworks Regulations of the Virginia Department of Health or local ordinances, whichever is more stringent.

A minimum of two (2) observation wells will be drilled with each proposed test (production potential) well. The location of these observation wells shall be proposed by the consulting hydrogeologist and approved jointly by the Division of Environmental Health and the Loudoun County Department of Natural Resources. The water levels of these observation wells are to be monitored for drawdown effects continually while the pumping test is performed.

2. Standard continuous constant-rate tests of not less than 48-hour duration will be required. The pumping rate shall be equal to or greater than one (1) gallon per minute for each proposed hookup. Pumping shall not be terminated before water levels are drawn down measurably in observation wells.



2. Individual wells. Where private groundwater wells are proposed to be used as the primary potable water source on individual lots, a yield test ~~and/or test~~ shall be performed on each test well to provide evidence that proposed wells will be capable of furnishing the needs of the eventual inhabitants of the proposed subdivision.

a. Number of Test Wells. Test wells on thirty percent (30%) of the total number of proposed lots shall be provided, located such that all geologic formations and land forms containing proposed wells are tested. Each test location should include a well which has been designed to meet Chapter 1040 standards. Well sites will be located as follows:

i. The applicant shall provide the County with a subdivision layout and proposed well sites for each building lot in the subdivision proposal.

ii. The County will review each well location in order to insure that each geologic formation and land form is tested.

iii. A minimum of one test well should be provided for each unique combination of landform and bedrock unit on which wells are proposed for individual lots.

iv. Where individual wells are proposed for each lot, physical or chemical alteration of geologic materials or structures (e.g., hydraulic fracturing, use of explosives, or addition of chemicals) to increase yield of test wells will not be permitted prior to the pump test.

b. Yield tests.

i. Method. A yield test shall be conducted on each test well using the downhole method of pumping.

ii. Duration. Each well shall be tested for a minimum of eight (8) continuous hours of pumping.

iii. Monitor wells. Water levels in the two (2) closest test wells shall be measured throughout the entire pumping test.

The recovery of water levels shall be monitored immediately following the pumping test on each pump test well, as a means to check data acquired from the pumping test.

iv. Pumping Rate. The rate of pumping is to be maintained at or above the estimated rate of yield determined by the drilling contractor. Variations from this rate can be used only after obtaining approval from the Loudoun County Department of Health.

v. Minimum Acceptable Yield. Compliance with Chapter 1040, Appendix IV shall be evidence of an acceptable well yield.

3. Drilling data. A Virginia certified professional geologist shall complete drilling logs (Virginia State Water Control Board Form #GW2) for all test wells. The geologist shall take at least one cuttings sample for each geologic formation, and shall take cuttings samples at no less than twenty (20) foot intervals when in the same geologic formation and shall provide these samples to the County.

D. Laboratory Testing for Water Quality.

1. Community Systems. For any proposed community system, tests shall be conducted to provide evidence that such system is capable of providing potable water to the inhabitants of the subdivision to be served thereby. Such tests shall be conducted in accordance with the latest revision of the Waterworks Regulations of the Virginia Department of Health.

2. Individual Wells. Where private groundwater wells are proposed to be used as a primary potable water source on lots, the following tests are to be conducted on each test well:

- a. Each geologic formation and/or land form shall have one representative sample drawn near the end of the pump test and analyzed in accordance with the provisions of Appendix III, Chapter 1040 of the Codified Ordinances of Loudoun County.
- b. Bacteria test. The sample must meet the quality standards for bacteria as described by the latest revision of the Waterworks Regulations of the Virginia Department of Health.
- c. Primary and Secondary Contaminants: The sample shall be analyzed for contaminants described at Chapter 1040, Appendix III, and results provided to the Health Department.

E. Report of Results, Discussion & Analysis

1. The report shall contain a graphic lithology of each well and a narrative discussing the geologic setting, watershed units, hydrogeologic units, relief, occurrence and movement of groundwater, and interpretation of water data from surrounding areas, including groundwater quality.

2. The report shall contain a map or set of maps at 1:2400 scale (1" = 200') which shall cover the development proposal. This map shall contain all existing planimetric features, topography with 5' contour intervals, Virginia planar grid system, all proposed roads, proposed lot lines, proposed lot sites, proposed house sites and proposed septic fields, and surface water features, including springs. Flow net (i.e., groundwater contours and direction of groundwater flow) shall be illustrated. The map shall contain one or more cross-sections, at true horizontal scale (1" = 200') and vertical scale (exaggerated as required) which depict at least the following information:

- \* drill log data
- \* well site locations
- \* respective elevations of rock and static water surfaces
- \* stabilize pump-down levels of the water surface.

The location of each cross-section shall be shown on the plan view map.

3. The report shall develop groundwater mass balance and recharge estimates for the area. It must include a discussion of the following information, including appropriate supporting calculations and diagrams:

- a. Identification of the form and source of recharge;

- b. The calculated effect of all lots (wells) pumping at a normal daily consumption rate on the piezometric surface;
- c. The average recharge for the subdivision, the recharge in drought years, and the average outflow from the subdivision or geologic unit;
- d. The net water consumption of the subdivision;
- e. Proposals to address wells of inadequate yield on individual lots;
- f. The transmissivity of the various materials evaluated by aquifer tests interpreted using professionally-accepted methods;
- g. The average storage coefficient of the water-bearing materials;
- h. The specific capacity of each well;
- i. Table showing Virginia planar grid coordinates for each test well; and
- j. Results of the laboratory testing for water quality.

## F. Standard Reference Guidelines

The U.S. Geological Survey Water Supply Paper #2220, "Basic Ground-Water Hydrology" is included by reference in these requirements. Except where noted otherwise herein, the definitions, guidelines, procedures contained in that document should be followed. Other reference documents include:

Cooper, H. H., Jr., Bredehoeft, J.D., and Papadopoulos, I.S., 1954, Response of a finite diameter well to an instantaneous charge of water: *Water Resources Research*, v. 3, no. 1, p. 263-269.

Driscoll, Fletcher G., Groundwater and Wells, (Johnson Div., St. Paul, Minn., 1986).

Ferris, J. G., and Knowles, D.B., 1954, The slug test for estimating transmissibility of an aquifer: U.S. Geological Survey, *Ground Water Note* 26, p. 1-7.

Freeze, R. Allan and Cheery, John A., Groundwater (Prentis Hall, Inc., Englewood, Calif., 1979)

Papadopoulos, I. S., 1965, Nonsteady flow to a well in an infinite anisotropic aquifer: *Proceedings of the Symposium of Dubrovnik, International Association of Scientific Hydrology*, p. 21-31.

Groundwater Manual, A Water Resources Technical Publication, U.S. Department of the Interior 1985

APPENDIX B

Clarke County's "Natural Resource Conservation Overlay District" from Protecting Virginia's Groundwater: A Handbook for Local Government Officials, Virginia Water Resources Research Center, 1986



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## 2. Use Regulations (4-H-2)

### a. RC District: (4-H-2-a)

Development and use of land permitted in accordance with the district regulations for the underlying zoning district may be permitted within the RC district, provided the developer presents satisfactory evidence that such use and development is compatible with the general intent and purpose of the Natural Resource Conservation District, as stated in Section 4-H-1, and that such proposed use and development will not have an adverse effect upon the environment. These provisions shall not apply to any uses and structures which otherwise legally existed as of July 20, 1983, provided such existing uses and structures shall be subject to the provisions of Section 8-D of this Ordinance, nor shall these provisions apply to ordinary gardening activities in lawn or garden areas which are primarily for home consumption. No person shall engage in any land-disturbing activity within the district in the absence of an approved erosion and sedimentation control plan prepared in accordance with the provisions of the Clarke County Erosion and Sedimentation Control Ordinance. In no event shall the following uses or development of land within the district be permitted: Mining, and/or extraction of natural resources; drilling, other than for private, on-site source of potable water; sanitary land filling, application, depositing, spreading or spraying of any hazardous or toxic chemical and/or biological materials or substances except applications of such pesticides and/or herbicides as may be required under emergency situations and as such applications of pesticides and/or herbicides may be permitted by the Zoning Administrator upon an affirmative recommendation from the Virginia Cooperative Extension Service; underground storage of any chemical or petroleum products for commercial or industrial purposes; storage, disposal, and/or land application of sludge, residue and/or effluent resulting from treatment, storage, disposal or reclamation of sewage and industrial wastes; animal confinement operations (feedlots). Residential use and development of the land within the district may be permitted in accordance with the provisions of the underlying zoning district, except that such residential use and development shall be subject to the following conditions:

(4-H-2-a-(1))

(1) Any lot upon which a new dwelling is to be located, if such dwelling is to be served by an individual subsurface septic system, shall have a minimum lot area of two (2) acres;

(4-H-2-a-(2))

(2) Maximum lot coverage by all impervious surfaces shall not exceed twenty percent (20%);

(4-H-2-a-(3))

(3) On-site individual subsurface septic systems shall be permitted only in accordance with Page Seventeen (17) of the report of Schnabel Engineering and Associates, Contract V82600, Hydrogeologic and Engineering Study, Prospect Hills Spring, Clarke County, Virginia, dated May 2, 1983, and where applicable, such systems shall be designed, placed and constructed only in accordance with the recommended guidelines for installation thereof set forth in Appendix B of the aforesaid report of Schnabel Engineering Associates (Contract V82600).

*The first ordinance presented is Clarke County, Virginia's overlay zoning regulation. This ordinance allows establishment of a Natural Resource Conservation Overlay District in the groundwater recharge area for the Clarke County Sanitary Authority's Boyce-Millwood Public Water System and in other areas of the county where groundwater needs special protection.*

## H. NATURAL RESOURCE CONSERVATION OVERLAY DISTRICT

### 1. General Intent (4-H-1)

The Natural Resource Conservation District (RC) is designed to apply special regulations to the groundwater recharge area of the Prospect Hills groundwater recharge area of the Prospect Hills Spring, which serves as the source of the Clarke County Sanitary Authority's Boyce-Millwood Public Water System. In addition, one (1) or more of the Districts may also be applied, subject to the provisions of Article 10 of this Ordinance or amendments thereto, to such other areas of Clarke County as may be determined by reasonable scientific investigation and analysis to warrant special protection in the interest of significant public benefit and need. The purpose of the District is to protect those water resources in Clarke County which are necessary to serve adequately and efficiently the public need, health and welfare, to preserve the natural environmental qualities and function of the land to purify water before it reaches such resources, and to prevent the use and development of land in designated water resource recharge areas in a manner tending to affect adversely the quantity and/or quality of such significant water resources or tending to destroy or have a substantially adverse effect on such resources by virtue of pollution of the land and water by foreign substances, including noxious or hazardous biological and/or chemical substances, materials, and/or wastes, whether gas, liquid, or solid.

APPENDIX C

"Community Education Needs" from the Clarke County  
Groundwater Protection Plan, February 1987

## INTRODUCTION

Public education at its best relies on a sense of ownership to accomplish its goals. If the citizens perceive an issue as having a direct effect on them, as opposed to passively affecting their whole community, they will become more involved. Public education strives to create awareness, spark interest, and instill responsibility. Clarke County leaders have recognized the need to educate the residents concerning ground water protection. A general public education program for ground water protection has several important components, which are outlined below.

### PUBLIC EDUCATION PROGRAM COMPONENTS

#### 1. Overview of ground water dynamics and migration of contaminants:

- \* Where does ground water come from? How does it move through the ground? How is ground water affected by the county's soils and "karst" terrain? What is the relationship between ground water and surface water?
- \* How do contaminants migrate through the ground water? Why are they so difficult to trace? How much of a certain chemical or substance does it take to contaminate our water? What will these contaminants do to our health? These topics ought to be addressed in this component.
- \* This component will be most effective if made as specific as possible to the conditions of Clarke County. How particular soil and geologic conditions determine the rate of recharge and movement of both ground water and contaminants is especially important. This provides a sense of immediacy which a more generic introduction might not offer.

#### 2. Ground water contamination from failing septic systems:

- \* Focus on septic systems as primary source of rural contamination (bacteria and nitrates).
- \* Public education on this topic should begin with the Virginia Water Resources Research Center (VWRRRC) homeowner handbooks for septic systems and wells. If cost prohibits the wide spread use of these publications, an option would be to summarize the contents or reprint them in a less expensive format.
- \* Stricter local septic codes should be examined as an appropriate response to limiting environmental factors such as thin soils and fractured bedrock. Also note that septic codes were traditionally designed not with ground water protection in mind, but to prevent the ponding of septic waste on the ground's surface.

### 3. Ground water contamination from agricultural sources:

- \* The County agricultural extension office should be encouraged to develop educational programming for high quality Best Management Practices for feedlot design to minimize the risk of nitrate loading in the ground water.
- \* The County extension office should also place educational emphasis on pilot projects for Integrated Pest Management for orchard pesticides and fertilizers.

### 4. Ground water contamination from household toxics:

- \* Emphasize use of septic systems only for human and organic waste. The thin soils and karst topography which make contamination from bacteria so easy, also make for easy migrations of other harmful chemicals which are much harder to detect and far more expensive to test for.
- \* Make use of any number of very good pamphlets on minimizing the use of household toxics and encouraging the proper means of disposal.
- \* Distribute either a copy or summary of "Hazardous Waste Disposal On the Farm," printed by the Cooperative Extension Service of Michigan State University.
- \* Review citizen groups' interests and local government options for household toxics collection programs which might be applicable to the rural nature of Clarke County.

These components can be presented to the public in a variety of ways, using both existing and created formats. Four formats will be discussed briefly. The first might be described as the printed format. This would entail using existing printed information such as the VWRRC homeowners' guides, or the Michigan State Extension brochure, or less expensive summaries of these publications. Public distribution can be accomplished in a number of ways: handing them out to building permit applicants; when land or house titles change hands; or perhaps when county citizens pay property taxes or purchase their county vehicle stickers. "Institutionalizing" such information in some way is highly recommended.

Another education format which cannot be overlooked is that of the public schools. Virginia is fortunate in that the VWRRC has developed a very good ground water educational module for primary school children. This can be effortlessly integrated into a school's curriculum. At the high school level, addressing the ground water resource needs can be handled by using material available to the general public. Biology, earth science, and chemistry classes can all in their own way contribute to a understanding of the issues. Better yet would be a cooperative effort among different academic disciplines which would not only give a more comprehensive picture of this critical environmental issue, but would reaffirm the interdisciplinary roots of all the sciences.

A third format involves individually tailored group presentations. This can be effective, yet it generally reaches only a small segment of the County population for the effort expended. It would benefit the education of local farmers in the latest in fertilizer and pesticide management for the protection of ground water.

The fourth format combines all the above information on ground water protection into an audio-visual medium. One possible form is a videotape presentation of what homeowners can do to protect their own well water and that of others. This approach would emphasize both the individual role residents can play, and the consumer interest in ground water contamination. Such a product would then be available from the County for civic organizations or any other interested group. As emphasized above, this video presentation would be more effective for its ability to reflect the particular ground water concerns of Clarke County and the Shenandoah Valley.

The rural ground water contamination threat is diffused; it covers a wide area of the region and comes from a wide variety of sources. Ground water protection, to be effective, will require far more than regulatory solutions. It calls for a change of habits and a widened awareness of the consequences of our actions. Effective public education is a critical part of assuring that Clarke County's ground water will be pure and available for many generations to come.

3/1/1 public-ed

APPENDIX D

Excerpts from the Virginia Groundwater Management Handbook: State Agency Programs for Groundwater Protection, Virginia Groundwater Protection Steering Committee, 1988

## Chapter 3 - Virginia Department of Health

### 3.1 Introduction

The Virginia Department of Health (VDH) is charged with protecting the health of the citizens of the Commonwealth through public health programs. Under this broad mandate, the Department has established a range of programs including such diverse services as community health services, nutrition, vital statistics, and communicable disease control. The Health Department is also responsible for significant programs which have groundwater quality implications such as control of on-site sewage disposal, septage management, engineering for municipal wastewater treatment works, and assuring safe drinking water for the public. These latter programs will be reviewed in this chapter.

#### 3.2.2 Private Well Construction

The Division of Sanitation Services has the responsibility for regulating the construction of all private wells used for drinking water or non-drinking water purposes. These regulations address location and construction criteria for private wells designated to protect public health and groundwater resources. The Division is expecting to process approximately 20,000 applications for private well construction permits per year statewide.

#### Agency Responsibilities

There is no formal advisory relation between the Division of Sanitarian Services and other agencies regarding private well construction. However, data collected on well completion forms will be shared with the Virginia Water Control Board and the Division of Mineral Resources. The Division also intends to coordinate well permits with the VWCB on all wells drilled in groundwater management areas. In addition, monitoring wells will be coordinated with the VWCB and the DMW.

#### Permitting Procedure and Standards

The procedure to be followed to obtain a construction permit for a private well is essentially identical to that required for an on-site sewage disposal system.

1. Obtain a permit application from the local health department and complete it, including a sketch of the property and surroundings, such as building dimensions and existing sewage and water systems, which will influence the location of the proposed well.

2. Submit the completed application and make an appointment with the local sanitarian to visit the property and conduct a geotechnical site review.
3. At the site, the sanitarian will review the location of the well, assuring that adequate distances are maintained between the well and any sources of contamination.
4. A construction permit will be issued.
5. The construction permit is then presented to the local building official who has authority to issue a building permit.
6. The local health department must inspect and approve the well before it is used as a source for drinking water. Construction standards require that all wells be cased and grouted in such a manner that groundwater resources will not be adversely impacted during the construction process or in the operation of the well. A water sample will be taken for all private drinking water wells used as a source of potable water. Without an approved water supply, an occupancy permit for a residence cannot be issued. The well drilling contractor should arrange for the final inspection and should provide a well completion statement. In the statement, the contractor must certify that proper construction methods were used to complete the well.

#### On-going Review and Compliance

Once the well is completed and approved, the Division has no additional responsibility to inspect private wells. The permit issued by the Division is a construction permit and not a permit to operate a private water supply. Hence, the Health Department has no clear grant of authority to conduct routine monitoring inspections.

Voluntary follow-up well inspections can occur when a citizen requests a water sample to be tested for coliform bacteria. These samples are routinely collected by the Department upon request. Typically, samples are collected either for the information of the homeowner or as a result of a contract requirement at the time of a real estate transfer.

When voluntary compliance with regulations cannot be obtained by the local health department sanitarian, criminal action can be brought by the Commonwealth's attorney. Civil actions, including injunctions, mandamus, or suit may be initiated by a representative of the Attorney General's Office. In addition, the State Health Commissioner can issue orders to cease or correct an action.



### 3.2.3 Public Water Supply Wells

The Commonwealth of Virginia first enacted the Waterworks Regulations in 1974. While the primary purpose of these regulations is public health protection, groundwater protection is also considered by ensuring that all wells used for public consumption are properly constructed. Improperly developed wells can be an avenue for contamination of groundwater.

#### Agency Responsibilities

The Virginia Department of Health, Division of Water Supply Engineering has responsibility for public health protection in the construction of public water supply wells. The Waterworks Regulations create a Waterworks Advisory Committee which advises the Commissioner on the Regulations. When there may exist some question as to the availability of groundwater for a new well, the owner or Department of Health may request that technical assistance be given by a geologist from the Virginia Water Control Board.

#### Permitting Procedure and Standards

The Waterworks Regulations consist of three major areas: procedures, drinking water standards, and design standards. Permitting of a groundwater source of supply for a public well incorporates requirements from all three areas. Construction or modification of a waterworks is illegal unless a construction permit has been issued.

Construction permits are issued by the State Health Commissioner, but all requests for a construction permit are directed initially to the appropriate Regional Office, Office of Water Programs.

The permitting process does not address groundwater protection, per se. It is through the application of sound engineering principles and practices that the Division of Water Supply Engineers ensures the protection of groundwater sources during their development.

The steps to follow for the applicant for a construction permit for a public water supply well include:

1. Submission of a letter of application by the waterworks owner requesting permission to establish, construct, expand, modify and/or operate a waterworks or water supply.
2. A preliminary engineering conference is held with the District Engineer in the area where the proposed well is to be located. At this conference, the owner's consulting engineer will generally set forth the water supply needs and

proposed solutions including recommendations and conclusions.

3. A well site inspection is required when a new groundwater source will serve as the source of supply.
4. Plans, specifications, and design criteria are submitted along with any other data requested by the Division.
5. Once construction has been completed in accordance with the approved plans, an operation permit is issued by the Commissioner.

#### On-going Review and Compliance

The Department of Health makes periodic sanitary surveys of all facilities to ensure their continued proper operation and maintenance. This includes the visible integrity of the well and its appurtenances. Waterworks owners are required to monitor their drinking water quality on a periodic basis.

Any owner of a public water supply system who violates the provision of the Public Water Supplies Act may be assessed, by a court of competent jurisdiction, a civil penalty of not more than \$5,000 per day for each day of such violation. All penalties shall be recovered in a civil action brought by the Attorney General in the name of the Commonwealth.

#### 3.4 Appendix

##### Applicable Statutes and Regulations

Sewage Handling and Disposal Regulations: The authority for VDH to regulate on-site sewage disposal systems is found in Virginia Code Subsection 32.1-163 et seq (1950).

Virginia Waterworks Regulations: The Public Water Supplies Law, Virginia Code Subsection 32.1-167 et seq. establishes authority for the VDH to enact the Waterworks Regulations.

Sewerage Regulations: The joint regulatory program for sewerage systems and treatment works is based upon the Water Control Law, Virginia Code Subsection 62.1-44.19. and the State Health Law, Virginia Code Subsection 32.1-164.