Source Water Protection Plan

2019

For the Town of Bowling Green
PWSID 6033550

Prepared by:

TETRA TECH

Funded by:

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment
www.vdh.virginia.gov

Office of Drinking Water
Safe Drinking Water for a Healthy Virginia

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Record of Review

The Source Water Protection Plan should be reviewed and revised at least every 3 years.

Date of Review	Name of Reviewer	Description of Updates (if any)
2018	VDH	Individual System Source Water Assessment Report (SWAR)
2019	Tetra Tech	Major Plan Update

1. Statement of Adoption

The Town of Bowling Green, hereafter referred to as the Town, adopted this Source Water Protection Plan and has a copy of the plan on file with the Virginia Department of Health Office of Drinking Water (VDH-ODW). The Town is the governmental entity that provides public water service within Caroline County. The service and assistance of the waterworks' representatives in preparation of the plan is acknowledged and greatly appreciated.

[VDH-ODW recommends inserting a copy of the page from Town Council/Board of Supervisors meeting minutes recording the adoption of the Source Water Protection Plan.]

2. Introduction

2.1. Protection of Groundwater Sources

Protection of sources which supply public drinking water is of vital importance to the residents serviced by the Town.

The water supply represents a valuable resource and investment which, if it were to become polluted, could negatively impact public health and would be expensive to restore or replace. Reducing or preventing chemical and microbiological contamination of water sources can ideally allow public water systems to avoid costly treatments and minimize future monitoring requirements. When drinking water is contaminated, costs include the following:

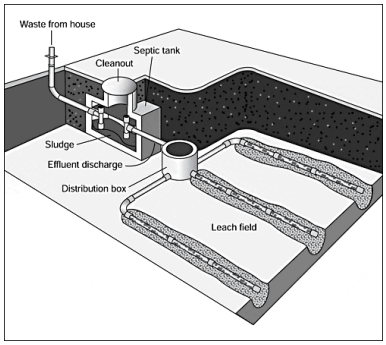
- Providing emergency replacement water;
- Paying for treatment and/or remediation expenses;
- Finding and developing new supplies;
- Paying for consulting services and staff time;
- Litigating against responsible parties;
- Conducting public information campaigns when incidents occur;
- Failing to meet the regulations of the Safe Drinking Water Act;
- Reducing property value or tax revenue;
- Adding health-related costs from exposure to contaminated water;
- Economic impacts, such as interruptions to businesses and loss of development opportunities; and
- Losing community acceptance of treated drinking water.

Source Water Protection is a voluntary program in Virginia. Proposed source water protection strategies are not mandated by state or federal regulations. Proposed commitments and schedules by waterworks' representatives are subject to change.

To avoid costly remediation, it is vital to reduce or prevent chemical and microbiological contamination of source waters. There are many normal day-to-day activities that could have the unintended consequence of compromising the community's drinking water supply. Some of the activities include:

- Improper use and disposal of household chemicals and fuels;
- Lawn treatments (excess fertilizers, and pesticides);
- Leaking oil and heating fuel tanks; and
- Improper management of septic systems.

To maintain quality drinking water, it is important to reduce and/or eliminate hazardous activities.



Septic Tank Schematic

Groundwater can be contaminated by several different pathways:

- Infiltration from the surface;
- Leachate from onsite wastewater (septic) systems;
- Introduction of contaminants from the surface through improperly constructed or defective wells;
- Direct contamination through sink holes or other geologic features; or
- Dissolution of naturally-occurring substances in the soil or rock.

Contaminant movement is affected by the properties of the aquifer as well as the overlying soils. Preventing contamination is paramount in keeping groundwater supplies safe.

2.2. Plan Purpose

The purpose of the Source Water Protection Plan (SWPP) is to protect groundwater, which serves as a source of public water supply, from the threat of contamination as a result of accidents or unwise practices from nearby residential, industrial, commercial, agricultural, waste management, or transportation activities.

2.3. Plan Goals

The goals of the SWPP are:

- To promote public health, economic development, and community infrastructure by maintaining an adequate drinking water supply for all residents of the community;
- To create an awareness of the communities' drinking water source(s); and
- To provide for a comprehensive action plan in case of an emergency affecting the water source.

3. Local Advisory Committee (LAC)

The purpose of the LAC is to evaluate the site-specific risks to the source water, develop site-specific recommended actions to mitigate the risks, and to ensure that the recommended actions are implemented. Community involvement is a critical element to developing a successful SWPP. The LAC involves the community in this process by incorporating community members and local officials into its membership, and by holding meetings with local stakeholders.

The LAC membership typically consists of waterworks employees, town or local government officials, county or regional government representatives, board members, and/or water customers. Extensive knowledge of source water protection or the water system components is not a prerequisite to being a committee member.

Table 1. Bowling Green Local Advisory Committee (LAC)

Name	Organization	Title
Billy Deavers	Town of Bowling Green	Director of Public Works
Shawn Fortune	Town of Bowling Green	Supervisor of Public Works
Reese Peck	Town of Bowling Green	Town Manager
David Lipscomb	Town of Bowling Green	Police Chief

The LAC contributes information to aid the development of the SWPP, reviews draft SWPPs, and ensures the implementation of recommended actions. The recommended actions that the LAC proposes are presented to the local officials and the waterworks for implementation.

The LAC holds meetings to solicit information from other local stakeholders, such as emergency response personnel, local health professionals, land or business owners, and other concerned citizens.

After reviewing the available information, characterizing the water source and the Source Water Protection Area, the LAC develops recommended actions to best protect the Town's water source(s). The recommended actions developed by the LAC are listed in the following section.

4. Recommended Actions

The following source water protection measures are recommended to prevent potential contamination of the Town's water supply.

Table 2. Summary of Recommended Implementation Activities

Action Number	Recommended Action	Planned Completion Date	Actual Completion Date
1	Provide information about source water protection on www.townofbowlinggreen.com, including the Annual Water Quality Report.		CCR yearly provided on the website.
2	Annually review with pertinent emergency response personnel at Caroline County Emergency Services of the designated SWPA zones and appropriate response procedures. Provide an emergency information sheet that shows the SWPAs, roads, and emergency contact information. Conduct an annual meeting/training/review with emergency response personnel to highlight the significance of the SWPAs and review appropriate response procedures for incidents in the SWPAs.		
3	Work with County officials and the citizens committee to update the Bowling Green – Milford Section of the Caroline County Comprehensive Plan (Appendix A) to include goals and policies to facilitate source water protection.	Update in 2030	
4	Seek grant funding to rectify wellhouse chlorine issues.		
5	Seek grant funding and consider fencing and installing security cameras in vital wellhead areas to prevent graffiti, trash, and vandalism. The wells identified for security improvements include: • Well 01A (Security Cameras) • Well 4 (Security Cameras and Fencing) • Well 5 (Security Cameras) Fencing recommended during VDH inspection.		
6	Seek grant funding to formally abandon or re-drill Well 4 as required by the groundwater permit, and formally abandon Well 6	2025	
7	Seek grant funding to pave access road to Well 4 due to accessibility issues for vehicles during inclement weather.		
8	Seek grant funding to identify groundwater recharge areas.		
	Develop or revise a septic system ordinance requiring that all septic systems shall be maintained in good working order and pumped out once every five years.		Completed prior to July 2017
	Evaluate and rank the potential risk (from highest to lowest) of each of the Potential Sources of Contamination. Factors to consider are:		Completed in 2019 SWPP

5. Source Water Assessment & Protection Areas

5.1. Delineation of Source Water Assessment & Protection Areas

VDH delineates two different Source Water Assessment Area zones for each waterworks source. These zones are defined for groundwater sources as follows:

- Zone 1 is a 1,000-foot fixed radius around the well and is a priority zone for managing potential sources of contamination; and
- Zone 2 is a one-mile (5,280-feet) fixed radius outside of Zone 1.

The circular Zone 1 and Zone 2 delineations described above assume that the source is withdrawing from a confined aquifer comprised of uniform unconsolidated material. For groundwater sources which do not withdraw from a confined aquifer, the VDH recommends further study to delineate Zone 1 and Zone 2 assessment areas specific to each source. The Zone 1 assessment area should be defined as the area most at risk of source water contamination and the Zone 2 assessment area should be defined as the entire recharge area.

For the purposes of this plan, the Source Water Protection Area (SWPA) is defined as the area encompassing the Zone 1 and Zone 2 Source Water Assessment Areas. A map of the SWPA for each source is provided in Appendix A.

Table 3. Summary of Public Well Details

System	Well Count	Connections	Population
Town of Bowling Green	3	900	1,500

As indicated in Table 3, the Town relies on 3 wells to supply raw water to 900 connections for approximately 1,500 people. All wells have been designated with low susceptibility to contamination by the VDH because they are "properly constructed groundwater source[s] located in an area that tends to inhibit contaminant migration [and] is protected with an appropriate aquitard[1]". Appendix D summarizes the construction verification for each of the wells. The Town's wells do have Potential Sources of Contamination (PSC) in within the SWPA.

Table 4. Wells Addressed in this Plan

Well Name	Contamination Susceptibility
WL01A	Low
WL004	Low
WL005	Low

[1] VDH Source Water Assessment Report December 3, 2018. See Appendix I

5.2. Geological Characterization

The Town system and wells are located in an unconsolidated aquifer. Unconsolidated aquifers are principally composed of sand and gravel and are typically found in river valleys and in the Virginia Coastal Plain physiographic province. These aquifers yield water via the pore spaces between the individual grains, which tend to be large for coarse-grained well-sorted aquifer material. Appendix A-3 contains geological maps.

The Town is located in a Groundwater Management Area. Groundwater Management Areas are declared by Virginia Administrative Code 9VAC25-600-20 and managed by the Virginia Department of Environmental Quality. Wells in these areas are required to meet additional construction standards beyond the Virginia Waterworks Regulations. Withdrawals of 300,000 gallons per month or more in these areas require a groundwater withdrawal permit.

5.3. Land Use

Existing land use maps for the SWPAs are presented in Appendix B-1. The Town's water system consists of three public wells. SWPA Zone 1 for WL01A is predominantly developed land. WL004 Zone 1 SWPA contains mostly developed open space with some forest. WL005 Zone 1 SWPA is predominantly forest with some mixed developed uses and cropland. Zone 2 SWPAs overlap significantly. There is a wide variety of land uses but Zone 2 SWPA land use consists primarily of forest and developed land uses. The Bowling Green Bypass, labeled State Route 301, transects Zone 2 SWPA for all three wells and Zone 1 SWPA for WL01A. Major roads may be used to transport unknown potential contaminants.

5.4. Future Land Use

Future land uses are identified in the Bowling Green - Milford Community Plan[2] and the Bowling Green Comprehensive Plan[3]. Future Land Use maps are presented in Appendix B-2.

The 2008 Bowling Green, Virginia Comprehensive Plan identified abandoned wells, leaking drain fields, and failing septic systems as potential groundwater contamination sources. Future population projections indicate a potential increase of 300 people by 2030. The current system capacity, 365,000 gallons per day, is sufficient to meet projected demand.

[2] https://co.caroline.va.us/DocumentCenter/View/399/Appendix-A---Bowling-Green-Milford-Plan-PDF

[3] https://www.townofbowlinggreen.com/sites/default/files/fileattachments/public_works/page/2731/bg_comp_plan_adopted_080708_1.pdf

6. Potential Sources of Contamination (PSC)

VDH develops an inventory of PSC within the SWPA through its Source Water Assessment Program. This inventory contains information regarding the ownership of the PSC, the types of contaminants produced by the PSC, as well as the distance of the PSC to the water source. This inventory is summarized in Appendix E. The location map of PSC within the SWPA are also presented in Appendix E. These PSC include publicly available information from DEQ, VDH, EPA, and other sources. DEQ hosts an online VEGIS mapping inventory at: https://apps.deq.virginia.gov/mapper_ext/.

The risk of each PSC varies depending on proximity to the well and potential pathways to reach groundwater. The highest priority area for protection includes the activities within Zone 1 of the SWPA. The Town should use the inventory of PSCs in Zone 1 in evaluating the risk posed by each PSC and the need for protection measures.

The PSCs generally can be categorized as:

- Closed Storage Tank Releases
- Pesticides, Fertilizers and Agricultural Land Uses
- Concentrated Residential or Municipal Areas
- Public and Private Waste Water
- Private Wells
- Industrial Facilities
- Illegal Dump Sites
- Impaired Streams

The 2008 Bowling Green, Virginia Comprehensive Plan identified abandoned wells, leaking drain fields, and failing septic systems as potential groundwater contamination sources. Though 85 septic systems are in located in Town, owners are required to pump-out or to have an inspection every 5 years. New residential structures must connect to an available public sewer line. There are private individual septic systems and public waste water systems located in and near the SWPA. Accidental releases may allow untreated waste water to contaminate the water resource. Failing private septic systems can leach waste into surrounding soils and potentially contaminate the source water. The Comprehensive Plan also identified and inventoried all underground gas tanks. Fifteen tanks existed on 6 individual tax parcels. Many of these sites are not within SWPAs.

Six Closed Storage Tank Releases exist in the Town of Bowling Green SWPAs. Threats associated with storage tanks may be from historic or active facilities. If these tanks remain at historic sites, they may contain residual chemicals/oils that could contaminate the source if they were to leak. For active facilities, storage tanks potentially contain materials that if released would pose a risk to public health. The PSC categorized as Closed Storage Tank Releases are those for which DEQ opened and closed an investigation. These sites may pose no threat to the water resource or leaking may have occurred. For more information on specific sites, DEQ provides a database in CSV format called i_register.txt. This database may be downloaded from

the following site:
https://www.deq.virginia.gov/Programs/LandProtectionRevitalization/PetroleumProgram/FilesForms/DataandRecords.aspx. The same information is provided on the VEGIS mapping site.

There are 2 facilities inside Zone 2 for Town of Bowling Green SWPAs subject to the Resource Conservation and Recovery Act (RCRA). RCRA is the public law that creates the framework for the proper management of hazardous and non-hazardous solid waste as well as underground storage tanks. The RCRA sites in Town of Bowling Green SWPAs concern gas or automotive industries. Some sites may require a Hazardous Waste Management Permit, meaning they are engaged in the treatment, use, or disposal of hazardous waste. Such facilities can be a source of a wide variety of contaminants depending on the historical use of the site.

Underground Storage Tanks (USTs), particularly those at historic sites, may leak and contaminate groundwater sources. In addition to gas stations, many businesses in the community were observed to have vehicle maintenance facilities, including auto sales lots and industrial facilities with company-owned vehicle fleets. The USTs are included as RCRA sites.

The source assessment found record of 2 underground injection wells in the SWPA of Town of Bowling Green system wells. Depending upon the depth, injection wells within the SWPA can potentially contaminate the groundwater source. Locational information for the underground injection wells in the SWPA were provided by the US Environmental Protection Agency (USEPA) Underground Injection Control Program.

Major highways run through the Zone 1 and Zone 2 SWPAs. Major routes may carry heavy truck traffic through the region. A release from a vehicle accident may result in a hazardous materials spill. If a hazardous materials spill were to occur, the substance spilled could infiltrate into the ground and potentially contaminate the water supply. Lubricants, antifreeze, and other automotive fluids, in addition to gasoline and diesel, can cause contamination of groundwater sources if not cleaned up and disposed of properly.

Pesticides and fertilizers used for farm operations can migrate into the water supply. Areas used for disposal of animal waste or burying dead livestock can also cause contamination of the source water. Feed stores and home improvement stores that sell fertilizer and pesticides can be sources of contamination if these chemicals are not stored properly.

Some wells are located close to developed areas within town limits. Municipal and industrial areas have a concentration of homes, businesses, schools, and other facilities that may collectively introduce contaminants into water at a concentration to cause concern. There are 15 industrial sites, and 2 known tire piles in the SWPAs. Stormwater runoff, care of public grounds, maintenance of city and county vehicles at garages, and residents' activities in and outside their homes can contribute to contamination of the water source including use and storage of fertilizers, pesticides, oils, paints, cleaning agents, etc. Other potential conduits include offline wells and contaminated streams that may feed ground water resources.

Identification of existing contamination sources may address immediate concerns about protection of the local water supply. To ensure that the supply remains uncontaminated,

continual review of land use activities and identification of potential sources of contamination is necessary.

7. Source Water Protection Plan

The SWPP describes the actions necessary to minimize the risk to the quality of the source water utilized by the Town. The goal of the plan is to reduce or eliminate potential threats to drinking water supplies within the SWPA either through existing regulatory or statutory controls, or by using non-regulatory (and often voluntary) measures centered around an involved public.

7.1. Existing Measures and Activities

Current measures in place for protecting the quality of water within the SWPA are:

- The Virginia Department of Health provided and updated a Source Water Assessment Report (SWAR) in December 2018 for each of the Town's wells, provided in Appendix I.
- Article IV, Chapter 98, Section 18 of the Caroline County Code of Ordinances specifies that subdivisions will not be approved without appropriate sanitary sewers or septic tanks. Article III requires permits and inspections for all private sewage disposal and requires permits for installation or repair of septic systems.
- The Town provides adequate treatment to ensure water quality for customers and provides yearly Water Quality Reports.
- The Town Code Section 3-159 Performance Standards regulates agricultural activity in the Town and additionally restricts activity in Chesapeake Bay Preservation Areas to protect water resources. Section 5 restricts use of the sanitary sewer network and prohibits use of the treatment works as a discharge for pollutants.

7.2. Source Water Protection Emergency Response Plan

An Example Emergency Response Plan was created in 2004 by Whitman, Requardt & Associates pertaining to most emergencies potentially encountered by the Town of Bowling Green system. In addition to this resource, the "Emergency Response Planning Template for Public Drinking Water Systems" produced for the Rural Community Assistance Partnership National Network and the Rural Community Assistance Corporation (2005) was used to develop an Emergency Response Plan specifically concerning source water protection. The Emergency Response Plan provides contact information and defines basic emergency response procedures to aid the waterworks in responding to a source water contamination event. The Source Water Protection Emergency Response Plan is located in Appendix F.

7.3. Public Education and Outreach

For citizens to appreciate the benefits of source water protection, they must first understand what the problems are in providing safe drinking water, and how they can become involved in the process. Public education is the greatest promoter of voluntary action and public support for a community's wellhead source water protection program. The Town provides customers yearly Water Quality Reports via individual mail.

Activities and opportunities should be sought that will increase public awareness that source water protection is a local issue and that each citizen plays a part. A public education brochure template is available in Appendix C. Some other examples of public education and outreach include providing information about source water protection on the waterworks website and in the Annual Water Quality Report and installing signs along roads in high visibility locations near the designated boundary of the SWPA that state “Entering Town of Bowling Green Source Water Protection Area”.

7.4. Implementation and Funding

The initial step in implementation should be to discuss responsible parties and timelines to implement the strategies. Community members can determine the best process for completing activities within the projected time periods. Feasible source management strategies are addressed in the Recommended Actions Section of this Plan.

Numerous funding opportunities are available to aid communities in the implementation of source water protection initiatives. The following is a summary funding sources currently available to support source water protection in Virginia:

Litter Prevention and Recycling Grant Programs – Virginia Department of Environmental Quality

Funding type: grant

Description: This program coordinates annual competitive and non-competitive Litter Prevention and Recycling Grant Programs to support localities’ recycling and litter prevention activities. Contact program staff at 804-698-4029 to determine what resources may be available to encourage cleanup and reporting of dump sites.

Link:http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/RecyclingandLitterPreventionPrograms/LitterPreventionandRecyclingGrantPrograms.aspx

Wellhead Protection Implementation Projects Grants – Virginia Department of Health – Office of Drinking Water

Funding type: grant

Description: This program supports the implementation of wellhead protection projects including well abandonment, educational outreach, wellhead fencing, advancing ordinances, emergency response planning, hazardous waste collection, and protection area delineation. This program requires that the waterworks have a protection strategy in-place (i.e. Source Water Protection Plan) and an active source water protection committee.

Link: http://www.vdh.virginia.gov/drinking-water/source-water-programs/source-water-protection-assistance-funding-opportunities/

Drinking Water State Revolving Fund – Virginia Department of Health – Office of Drinking Water

Funding type: low interest loan with possible principal forgiveness

Description: This program provides planning funding, which could be used to analyze solutions to source water measures or evaluate potential new sources. This program also provides low interest loans with possible principal forgiveness for waterworks construction projects including new wells and intake modifications, and low interest loans for waterworks to acquire land or conservation easements and to establish local voluntary incentive-based source water protection measures. Funding is prioritized for small, financially stressed, community waterworks.

Link: http://www.vdh.virginia.gov/drinking-water/financial-construction-assistance-programs/

Nonpoint Source Management Implementation Grant Program – Virginia Department of Environmental Quality

Funding type: grant

Description: This program provides grants for watershed projects, demonstration and educational programs and nonpoint source pollution control program development.

Link:http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/NonpointSourcePollutionManagement.aspx

Virginia Wastewater Revolving Loan Fund – Virginia Department of Environmental Quality

Funding type: low interest loan

Description: This program provides low interest loans for acquisition of title or other rights to real property to protect or improve water quality, and for storm water runoff control best management practices.

Link:http://www.deq.virginia.gov/Programs/Water/CleanWaterFinancingAssistance/VCWRLFTableofContents.aspx

Virginia Clean Water Revolving Loan Fund – Virginia Department of Environmental Quality

Funding type: low interest loan

Description: This program primarily funds wastewater treatment projects, but also funds agricultural best management practices and non-point Source Pollution Abatement. This program can provide low interest loans to waterworks or localities to provide loans or other incentives to facilitate the implementation of agricultural best management practices.

Links:

Land conservation - http://www.deq.virginia.gov/Programs/Water/CleanWaterFinancingAssistance/LandConservation.aspx

Stormwater - http://www.deq.virginia.gov/Programs/Water/CleanWaterFinancingAssistance/StormwaterFundingPrograms/StormwaterLoans.aspx

Stormwater Local Assistance Fund – Virginia Department of Environmental Quality

Funding type: cost-share

Description: This fund provides matching grants for stormwater projects including new stormwater best management practices, stormwater best management practice retrofits, stream restoration, low impact development projects, buffer restorations, pond retrofits, and wetlands restoration.

Link:http://www.deq.virginia.gov/Programs/Water/CleanWaterFinancingAssistance/StormwaterFundingPrograms/StormwaterLocalAssistanceFund(SLAF).aspx

Virginia Land Conservation Foundation – Virginia Department of Conservation and Recreation

Funding type: grant

Description: Grants are awarded to help fund the purchase of permanent conservation easements, open spaces and parklands, lands of historic or cultural significance, farmlands and forests, and natural areas. This program may allow public waterworks to permanently protect land in the SWPA at little cost to the waterworks.

Link: http://www.dcr.virginia.gov/virginia-land-conservation-foundation/

The Land and Water Conservation Fund State and Local Assistance Program – Virginia Department of Conservation and Recreation

Funding type: cost-share

Description: This program supports the acquisition and/or development of public outdoor recreation areas. This may aid utilities in purchasing land in the SWPA when the source water protection goals do not conflict with the recreational use of the land. It should be noted that all LWCF assisted areas must be maintained and opened, in perpetuity, as public outdoor recreation areas.

Link: http://www.dcr.virginia.gov/recreational-planning/grants

Other Virginia Department of Forestry funding programs –

VDF administers a number of programs aimed at promoting healthy forests and wildlife habitat that may help waterworks to limit erosion on land that they control within the SWPA. Additionally, VDF administers programs aimed at supporting agricultural best management practices. Waterworks can use these programs to promote Best Management Practices within their SWPA.

Link: http://www.dof.virginia.gov/costshare/index.htm

Urban Waters Small Grants Program – US Environmental Protection Agency

Funding type: grant

Description: This program provides small grants to restore their urban waters in ways that also benefit community and economic revitalization. In general, projects should address local water quality issues related to urban runoff pollution, provide additional community benefits, actively engage underserved communities; and foster partnership

Link: https://www.epa.gov/urbanwaters/urban-waters-small-grants

Healthy Watersheds Consortium Grant – U.S. Endowment for Forestry & Communities, Inc.

Funding type: grant

Description: This program provides grants to accelerate strategic protection of healthy, freshwater ecosystems and their watersheds. The primary focus for applicants should be protection and stewardship of the landscape that comprises the watershed, rather than restoration of degraded habitats or projects with a strictly water quality improvement outcome.

Link: http://www.usendowment.org/healthywatersheds.html

Regional Conservation Partnership Program – U.S. Department of Agriculture

Funding type: cost share

Description: This program provides funding to locally driven, public-private partnerships that improve the nation's water quality, combat drought, enhance soil health, support wildlife habitat and protect agricultural viability. The program connects partners with producers and private landowners to design and implement voluntary conservation solutions that benefit natural resources, agriculture, and the economy. Applicants must match or exceed the federal award with private or local funds.

Link: https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/farmbill/rcpp/

Appendix A-1: Source Water Protection Area Zone 1 Topological Map

This appendix is omitted from public versions of the document for security purposes.

Appendix A-2: Source Water Protection Area Zone 2 Topological Map

This appendix is omitted from public versions of the document for security purposes.

Appendix A-3: Source Water Protection Area Geological Maps

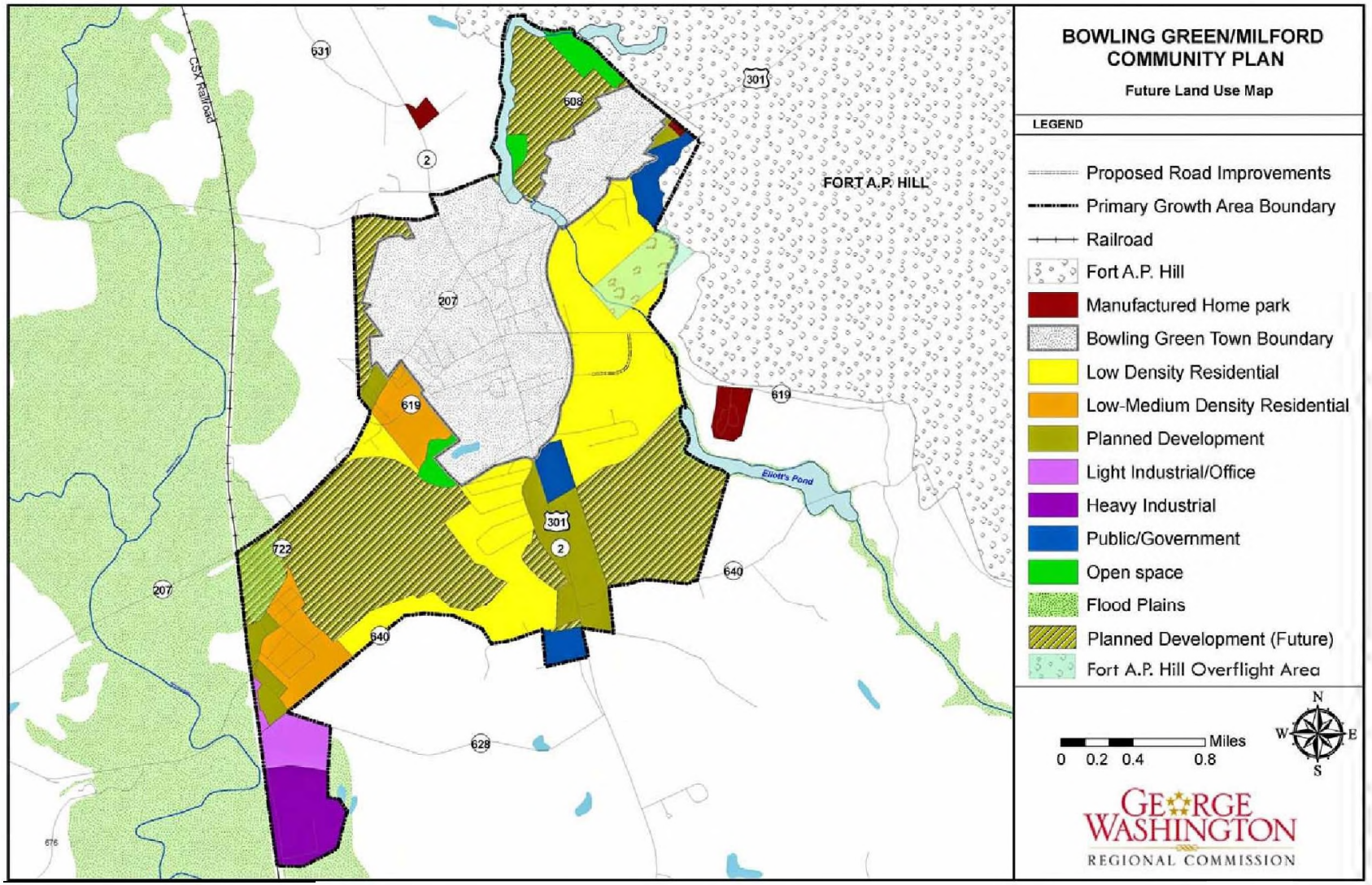
This appendix is omitted from public versions of the document for security purposes.

Appendix B-1: Source Water Protection Area Land Use Maps

This appendix is omitted from public versions of the document for security purposes.

Appendix B-2: Source Water Protection Area Future Land Use Map

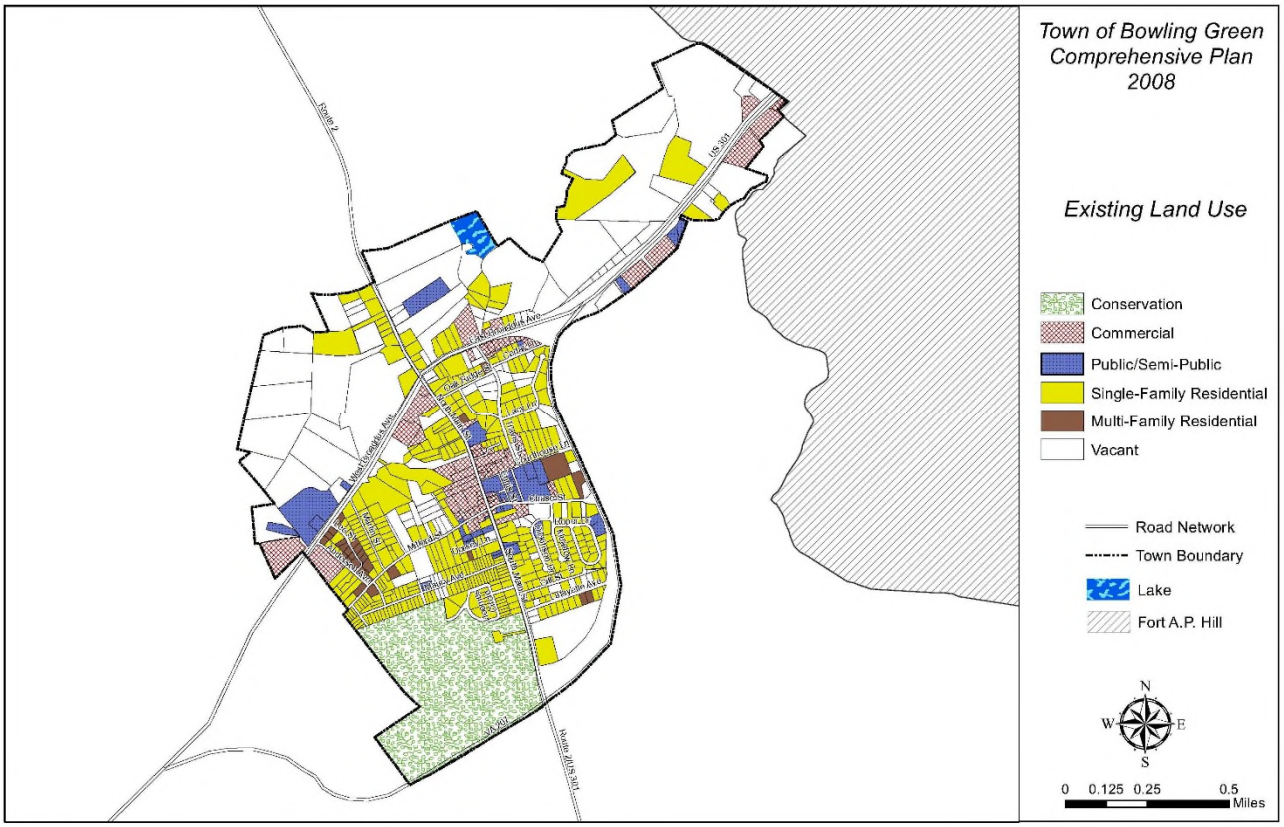
Future Land Use map included in the 2006 Bowling Green – Milford Community Plan[4]

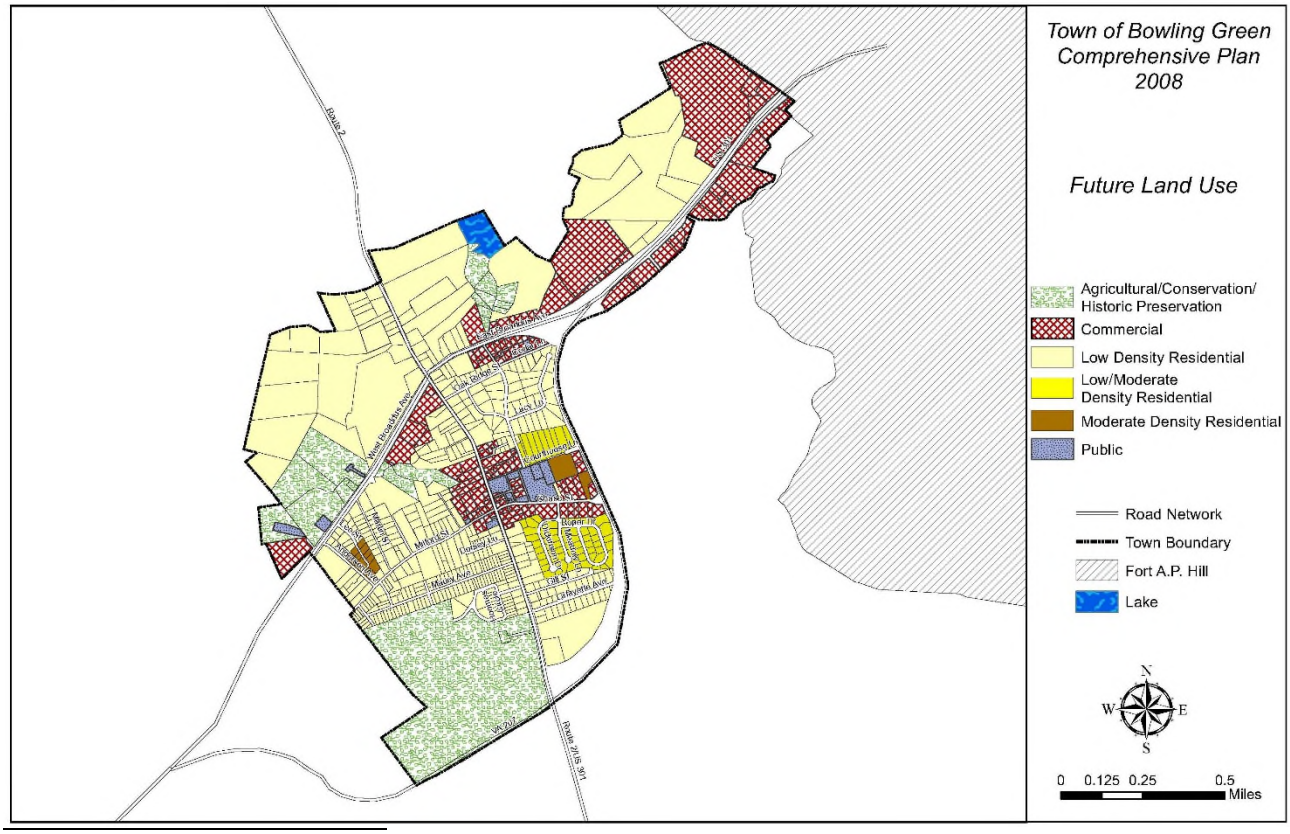


Map A.1

[4] https://co.caroline.va.us/DocumentCenter/View/399/Appendix-A---Bowling-Green-Milford-Plan-PDF

Current and Future Land Use maps included in the 2008 Town of Bowling Green Comprehensive Plan[5]





[5] https://www.townofbowlinggreen.com/documents

Appendix C: Residential Brochure

How To Protect Your Drinking Water

for residents of the
[PWS Name] Source Water Protection Area

[Insert photo of Town Seal/Company Logo here]

For questions regarding the [PWS Name] Source Water Protection Plan, please contact:

Name, Title
Phone: 555-555-5555
Fax: 555-555-5555
E-mail: someone@example.com

How Can I Protect My Water?

- **Never pour used motor oil or other hazardous waste materials onto the ground or in a storm drain. Find a proper disposal location at http://earth911.com.**
- **Don't flush unwanted medications. Find a drug collection location or event (https://www.deadiversion.usdoj.gov/drug_disposal) or place medications in a sealed container in the trash.**
- **Minimize the use of fertilizers, pesticides and herbicides on your lawn and farm.**
- **Join your local watershed organization.**
- **Learn about your drinking water supply and conserve water in your home.**
- **Pump your septic system every 3-5 years.**
- **Keep animals, including livestock and their waste, out of local streams.**

Source: http://www.ColumbiaMontourSWP.org

Where Does My Drinking Water Come From?

Your drinking water comes from [surface water name and/or groundwater]. [include brief description of sources/system].

Why Should I Be Concerned?

The public water supply is a valuable resource that, if contaminated, would negatively impact public health and put a financial burden on the community to restore or replace. As the map below shows, your property is located within our source water protection area. As such, things you do on your property can adversely affect our water source!

Insert photo of Zone I here

Appendix D: VDH ODW Field Office Construction Verification

District Engineer Douglas Meyer, from the Virginia Department of Health Office of Drinking Water East Central support office, provided email correspondence verification whether wells were constructed in accordance with the *Waterworks Regulations* based on engineering description sheets or well driller logs on file. The table below indicates whether each well meets these requirements.

PWSID	System Name	Source	Meets Construction Requirements?
6033550	Bowling Green	WL01A	Y
		WL004	Y
		WL005	Y

Appendix E: Potential Sources of Contamination Inventory

This appendix is omitted from public versions of the document for security purposes.

Appendix F: Source Water Protection Emergency Response Plan

This appendix is omitted from public versions of the document for security purposes.

Appendix G: Potential Conduits of Contamination Inventory

This appendix is omitted from public versions of the document for security purposes.

Private well location GIS data does not exist, though there are some residents who rely on private wells. These wells, if not properly maintained, allow PSCs to infiltrate the aquifer. The potential threat of wells to the water source may extend beyond the Zone 1 and 2 SWPAs.

Appendix H: Virginia Source Water Assessment Program Land Use Risk to Source Water

Virginia Source Water Assessment Program Land Use Risk to Source Water

Table 1
LAND USE ACTIVITY INVENTORY
(Community and Nontransient Noncommunity Waterworks)

CLASSIFICATION	CONTAMINANT	SURFACE WATER RISK	GROUND WATER RISK	NAICS CODE
Residential/Commercial				
Fuel Storage Systems [ground water only]	V	X	medium	814110
On-site sewage system [ground water only]	M, N	X	medium	814110
Agriculture				
Chemical/fuel storage areas	V, S, N	low	medium	111, 112
Crop and fodder production	S, N	low	medium	111
Specialty crop production/nursery (e.g. horticulture, citrus, nuts, fruits)	S, N	low	medium	112
Livestock/poultry				112
Pasture (grazing)	M, N	medium	low	112
Intensive animal feeding operations				112
Confined animal feeding operations (permitted)	M, N	high	high	112
Confined animal feeding operations (non-permitted)	M, N	high	high	112
Aquaculture	M, N	low	medium	11251
Animal burial areas	M, N	low	medium	112
Manure holding or spreading	M, N	medium	medium	112
Other				
Industrial/Commercial [Dry and Discharging]				
Above ground storage tank (> 660 gallons) excluding potable water and petroleum	V, S, N	medium	medium	
Animal Slaughtering or Processing	M, N	low	medium	311
Asphalt Plants	V, S, N	low	medium	32412
Car Wash	V	low	low	811192
Cemetery [ground water only]	M, N, S	X	low	812220
Coal Gasification Facility	V	low	medium	324199
Dry Cleaning Establishment	V	low	medium	812320
Electrical and Electronic Product Manufacturing	I, V	low	medium	335310, 334410
Electroplating/Metal Finishing	I, V	low	medium	332813
Fertilizer/Manufacturer/Distributor/Storage	A, S	medium	medium	325, 422
Fire Training Facilities	V	low	medium	922160
Food Processing	M, N	low	low	311
Funeral Home/Mortuary	N, V	low	low	812210
Furniture/Boat Refinish (Boat Yards)	V, S, N	medium	medium	811420, 336612
Gasoline Station/Service Center	V, S, N	low	medium	447100
Golf Course	B, S	low	medium	713910
Hazardous Waste Recovery Facility	V, S, R, M	high	high	562211
Hazardous Waste Transfer, Storage or Disposal	V, S, R, M	high	high	562
Hospital	V, S, R, M	low	medium	622110
Laboratories	V, S, R, M	low	medium	541380, 621510
Machine Shops	V	low	medium	332710
Marina [Surface Only]	M, V, S	medium	X	713930
Military Base	V, S, R, M	high	high	928110
Oil & Gas Production (Refining)/Storage/Pipelines	V	medium	medium	324110, 422710, 486910
Paint Shop	V	low	medium	811121
Pesticide/Herbicide Manufacturer/Distributor/Storage	S	medium	medium	325320, 422690,422910,
Photo Processor/Printer	I	low	medium	812290
Pipeline / Powerline Right of Way	S	low	low	486910, 221120
Plastic Manufacturer	V, S	low	medium	326100, 325211
Power Generation Station	S	medium	low	221110
Scrap and Junk Yards	V, I	low	medium	421930
Solid Waste Collection/Transfer Site	V, S, M, I	low	low	562111
Superfund Site	V, S, R, M, I	high	high	562211
Underground Injection Well [groundwater only]	V, S, R, M, I	X	high	562
Underground Storage Tanks [excluding potable water][groundwater only]	V	X	medium	
Underground Storage Tanks [leaking][regulated][groundwater]	V	X	high	
Wood Preservative Manufacturer/Wood Preserver	S	low	medium	321114
Other				
Wastewater Facilities				
Combined Sewer Overflow/Discharge	M, N, V, S	high	low	22132
Septage Lagoon	M, N	medium	medium	22132

Table 1
LAND USE ACTIVITY INVENTORY Continued
(Community and Nontransient Noncommunity Waterworks)

CLASSIFICATION	CONTAMINANT	SURFACE WATER RISK	GROUND WATER RISK	NAICS CODE
Sewer Lines (Surface-crossing and adjacent lines only) [surface water only]	M, N	High	X	22132
Storm Sewer Discharges and Stormwater infiltration ponds	V, N, S	Medium	low	22132
Untreated Piped Discharge [straight pipe]	M, N	High	low	22132
Wastewater Pump Station	M, N, V	High	low	22132
Wastewater Treatment Facility [point source discharge]	M, N, V	Medium	low	22132
Wastewater Treatment Nondischarging lagoon/mass drainfield	M, N, V	Low	medium	22132
Land Disposal				
Biosolids	M, N, I	low	low	111, 112
Industrial Sludge	M, N, I, S, V	low	low	562
Landfill (Lined)	M, N, V, S	low	medium	562212
Landfill (Unlined)	M, N, V, S	low	high	562212
Open Dump	M, N, V, S	low	High	5622
Septage	M, N	medium	Medium	111, 112, 562
Tire Pile	V	high	High	5622
Wastewater	M, N	medium	Medium	22132
Other				
Resource Extraction				
Coal	V	low	Low	21211
Oil + Gas	V	medium	Medium	211
Sand, Gravel, Limestone	V	low	Low	2123
Other				
Transportation				
Airport	V	low	Medium	422720
Parking Lots	V	low	Low	814
Primary Roadways	V, S, N, M, R	medium	Low	48
Railroad Tracks and Yards	V, S, N, M, R	medium	Low	482110
Salt Storage Sites	I	low	Low	48
Truck Terminals	V, S, N, M, R	medium	Medium	484
Special Cases (specifically identified as a significant source of contaminants)				
Barge and Vessel Traffic for surface sources		high	X	483211
Caves/Sinkholes for surface sources			X	

"x" – does not mean no risk

M = microbiological
N = nitrate/nitrite
V = volatile organic chemicals
S = synthetic organic chemicals
I = inorganic chemicals
R = radiological contaminants

(NOT all inclusive)

Table 2
LAND USE ACTIVITY INVENTORY
(Transient Noncommunity Waterworks)

CLASSIFICATION	CONTAMINANT	SURFACE WATER RISK	GROUND WATER RISK	NAICS CODE	
Residential					
On-site sewage system [ground water only]	M, N	X	medium	814110	
Agriculture					
Chemical/fuel storage areas	V, S, N	low	medium	111, 112	
Crop and fodder production	S, N	low	medium	111	
Specialty crop production/nursery (e.g. horticulture, citrus, nuts, fruits)	S, N	low	medium	111	
Livestock/poultry				112	
Pasture (grazing)	M, N	medium	low	112	
Intensive animal feeding operations				112	
Confined animal feeding operations (permitted)	M, N	high	high	112	
Confined animal feeding operations (unpermitted)	M, N	high	high	112	
Aquaculture	M, N	low	medium	11251	
Animal burial areas	M, N	low	medium	112	
Manure holding or spreading	M, N	medium	medium	112	
Other					
Industrial/Commercial [Dry and Discharging]					
Above ground storage tank (> 660 gallons) excluding potable water and petroleum	V, S, N	medium	medium		
Animal Slaughtering or Processing	O, N	low	medium	311	
Fertilizer/Manufacturer/Distributor/Storage	C, S	medium	medium	325310	
Hospital	V, S, R, M	low	medium	622110	
Laboratories	V, S, R, M	low	medium	541380,	621510
Marina [Surface Only]	M, V, S	medium	X	713930	
Solid Waste Collection/Transfer Site	V, S, M, I	low	low	562111	
Underground Injection Well [groundwater only]	V, S, R, M, I	X	high	562	
Other					
Wastewater Facilities					
Combined Sewer Overflow/Discharge	M, N, V, S	high	low	22132	
Septage Lagoon	M, N	medium	medium	22132	
Sewer Lines (Surface-crossing and adjacent lines only) [surface water only]	M, N	high	X	22132	
Storm Sewer Discharges and Stormwater infiltration ponds	V, N, S	medium	low	22132	
Untreated Piped Discharge [straight pipe]	M, N	High	low	22132	
Wastewater Pump Station	M, N, V	High	low	22132	
Wastewater Treatment Facility [point source discharge]	M, N, V	Medium	low	22132	
Wastewater Treatment Nondischarging lagoon/mass drainfield	M, N, V	Low	medium	22132	
Land Disposal					
Biosolids	M, N, I	Low	low	111, 112	
Industrial Sludge	M, N, I, S, V	Low	low	562	
Landfill (Lined)	M, N, V, S	Low	medium	562212	
Landfill (Unlined)	M, N, V, S	Low	high	562212	
Open Dump	M, N, V, S	Low	high	5622	
Septage	M, N	Medium	medium	111, 112	562
Wastewater	M, N	Medium	medium	22132	
Other					
Special Cases (specifically identified as a significant source of contaminants)					
Barge and Vessel Traffic for surface sources		High	X	483211	
Caves/Sinkholes for surface sources			X		

"x" – does not mean no risk

M = microbiological
N = nitrate/nitrite
V = volatile organic chemicals
S = synthetic organic chemicals
I = inorganic chemicals
R = radiological contaminants

(NOT all inclusive)

Appendix I: Virginia Department of Health Source Water Protection Report (SWAR)

This appendix is omitted from public versions of the document for security purposes.