Source Water Protection Plan

2024

For the Town of Luray
PWSID 2139330

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)
2002	VDH	Source Water Assessment Record
2008	Olver, Inc.	Wellhead Protection Plan
2018	Tetra Tech, Inc.	Source Water Protection Plan
2024	Tetra Tech, Inc.	Source Water Protection Plan Update

1. Statement of Adoption

Town of Luray 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 of Luray is the governmental entity that provides public water service within the Town in Page 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 of the Town of Luray. The Town, in this Plan, refers to the Town of Luray water system. 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
- 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.

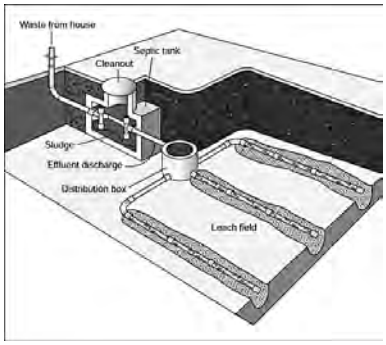
To avoid costly remediation, it is vital to reduce or prevent chemical and microbiological contamination of source waters. There are many normal day-to-day activities that could have the unintended consequence of compromising the community's drinking water supply. Some of the activities include:

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

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

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
- Dissolution of naturally occurring substances in the soil or rock



Septic Tank Schematic

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).
- 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. Town of Luray Local Advisory Committee (LAC)

Name	Organization	Title
Joey Haddock	Town of Luray	Water Plant Superintendent
Tyler Horn	Town of Luray	Water Treatment Operator
Bryan Chrisman	Town of Luray	Assistant Town Manager

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 of Luray 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 of Luray water supply.

Table 2. Summary of Recommended Implementation Activities

Action Number	Recommended Action	Planned or Actual Completion Date
1	Seek grant funding for Hite Spring back-up pump for increased resiliency to mechanical failures.	Yearly during source water grant cycle until funded
2	Update the Town of Luray Comprehensive Plan to include source water protection. PowerPoint drafted for presentation to Town council and Comprehensive plan drafting stakeholders.	Planned update: 2024
3	Promote education of the residents within the Source Water Protection Area (SWPA). The Town has distributed source water brochures to customers via the Town website, Town office, chamber of commerce, and town kiosks. Brochures were mailed to all residents in their water bill in 2019 The brochures describe the importance of source water protection with a list of general do's and dont's. See Appendix C for the brochure or visit the Town website: https://www.townofluray.com/services-2/water-sewer. The Town intends to reprint and redistribute the brochure in 2024.	Completed: 12/2019 Planned progress: 12/2024
4	Grant support to complete water and sewer projects in Appendix B for the 2019 Luray Comprehensive Plan.	Planned progress: 2024
5	Studies to determine the Luray system recharge areas and time of travel may be especially beneficial to the system. It is recommended that, once completed, the Town of Luray use the results of these investigations to update Zone 1 and Zone 2 critical areas.	Grant application 2024-2026
	Provide a draft source water protection ordinance to Town officials.	Submitted to Town 2023
	Provide information about source water protection on the waterworks website at https://www.townofluray.com/services-2/water-sewer by creating a link to the SWPP and subsequent updates.	Completed: 12/2019 Planned progress: 2/2024
	Review the designated SWPA zone and appropriate response procedures with the local police chief. Such actions should include those recommended in the Emergency Response Plan (updated in 2023) in Appendix F	Completed: April 2019 Ongoing as needed
	Provide the Town of Luray utility operators and the town council members source water protection information and maps.	Completed: 2019 Ongoing as needed

	Seek grant funding for security systems at the Hite Spring site.	Completed: July 2019
	Coordinate with the local police chief and Page County officials to identify strategies for containing and cleaning up spills on roads and rail roads. Currently, the Police Chief is the emergency manager and on the Page County Emergency Response Board for emergency response.	Completed in County Emergency Action Plan Last Updated 2020
	Developed a septic system ordinance requiring that all septic systems shall be maintained in good working order and pumped out once every five years.	Completed: June 2018
	Create a scoring matrix to assign value to contaminates. Evaluate and rank the potential risk (from highest to lowest) of each of the Potential Sources of Contamination. Factors to consider are: • proximity to the source, • type of contaminates, and • likelihood of release of contamination.	Completed: August 2018
	Encourage abandonment of all unused private wells within the SWPA by including well protection and abandonment tips in the SWPP educational brochure. A survey was provided to homeowners offering assistance to abandon unused wells. There was no public interest. The Town worked with Page County Health Department to investigated suspected unused wells and discovered all were in use.	Completed: 2019 - 2020
	Report open dump locations to Page County staff to ensure planning for any grants applied for through VADEQs Litter Prevention Program.	Completed: Page County has applied for the state litter grant for the past 12 years. Ongoing as needed
	Consider fencing vital wellhead areas to prevent graffiti, trash, and vandalism.	Completed: 2009

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.

The Town of Luray relies on the Hite Spring and Well #6 to supply water to residents. Hudson Spring has been offline since 2009 but is maintained in the event of an emergency during which it may serve as an alternate source. Maintenance to Hudson Spring includes monthly pump testing and monitoring for nitrate, nitrite, and BacT. The two active springs have been designated as highly susceptible to contamination by the VDH because they are “located in an area that promotes migration of contaminant from certain land use activities of concern” [1].

In the Town of Luray system, both Well #6 and the Hudson Spring are considered ground water under direct influence of surface water (GUDI), This designation is most commonly assigned to sources in areas of karst topography.[2] Waterworks supplied by surface water or ground water under direct influence of surface water have separate monitoring requirements from groundwater only sources in the Waterworks Regulations. These requirements are specific to the number of customers and treatment type. They include specifications on sampling location, frequency, and type. Some of the required samples concern the water characteristics quoted in the GUDI definition below.

According to VDH Waterworks Regulations 12 VAC 5-590-430 a GUDI is:

“any water beneath the surface of the ground with significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens such as Giardia lamblia, or Cryptosporidium. It also means significant and relatively rapid shifts in water characteristics

[1] http://www.townofluray.com/assets/water-qualityreport-2016.pdf
[2] http://www.vdh.virginia.gov/drinking-water/drinking-water-data/

such as turbidity, temperature, conductivity, or pH that closely correlate to climatological or surface water conditions[3]."

5.2. Geological Characterization

The Town of Luray water sources are 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 a USGS Geological Map excerpt.

The Town of Luray exists within the Elkton aquifer and the underlying carbonate bedrock is chemically weathered by water infiltration creating a karst environment. This is the only unconsolidated sediment aquifer west of the Atlantic Coastal Plain province in the Appalachian region. While karst topography is typically characterized by thin soil cover, the Luray bedrock is covered by thick alluvial fan deposits, alluvium, and some debris fan deposits along the western foot of the Blue Ridge Province. These alluvial fans contain manganese, iron ore, and abundant ground water resources (Southworth, page 40). The presence of karst sinkholes in the general vicinity indicate water resources may be highly susceptible to land use contamination.

Luray is situated in an area where the Blue Ridge Province and Great Valley and Page Sections of the Valley and Ridge Province intermingle. Dashed contact lines in the USGS geologic map in Appendix A-3 indicate locations where these geologic units meet but are concealed beneath the alluvial deposits, so their precise location is uncertain.

The alluvial fan deposits, labeled Nf in the geologic map in Appendix A-3, that occur in the majority of Luray land areas consist of unconsolidated sand, pebbles, cobbles and quartzite or sandstone boulders. Alluvial fan thickness is highly variable but has been measured in drill hole and mining data up to 150 meters thick. The deposits are derived primarily from Harpers and Antietam Formations (Southworth, page 62). The active Hite Spring and Well #6 are location in this geologic formation.

Debris fan deposits, Nd, consist of local rocks in a matrix of unstratified clay, silt, sand and pebbles. These deposits from fans and sheets on the low slopes and valleys. They may form terraces 36 meters higher than adjacent debris fans and range in thickness up to 30 meters (Southworth, page 62).

The Harpers formation, Cch, forms in a thin band along Luray's southwestern border between the alluvial fan deposits, Nf, and a thicker alluvium, Qa, formation. It consists of interbedded layers of quartzite, metasandstone, and metasiltstone as well as greenish or bluish-gray quarts-chlorite-sericite phyllite (Southworth, page 65). The alluvium contains unconsolidated silt, sand, cobbles, and boulders with a thickness up to 12 meters (Southworth, page 62). The currently

[3] https://law.lis.virginia.gov/admincode/title12/agency5/chapter590/section10/

inactive Hudson spring is in or directly adjacent to these formations. There are also two small sinkholes less than 50 square meters in diameter near this source.

There are small sections of Beekmantown Group, Ob, and Stonehenge Limestone, Os, Formations present in Luray. The former is characterized by light-grey dolostone containing chert nodules where the weathered surface displays “butcher block” cross hatched joints. The latter is characterized by a dark grey fossiliferous limestone with black chert modules. It contains some dolostone beds and silty limestone (Southworth, page 64). According to the Page County Comprehensive Plan Volume II, Beekmantown is one of two geologic formations in the county that can be considered important sources of groundwater (Comprehensive Plan Vol. II, page 63). This geologic formation contains the Luray and Skyline Caverns, commercial caves (Southworth, page 47).

Appendix A-4 displays the bedrock geology from USGS in the most recent data download available paired with data provided by VDH from a 2014 USGS source. There are three formations within the Zone 2 SWPA, Ob, [e, and O[co. All three are a mixture of limestone and dolostone. Ob is from the Ordovician Period, [e is from the Cambrian Period, and O[co is on the cusp of both. Hatching symbology on the map indicates the entire Zone 1 and Zone 2 SWPA contain carbonate rock at or near the land surface. While this likely extends beyond these zones, as indicated by the geologic formations, the data provided by VDH is restricted to the SWPA. Karst depressions on the map are from a separate USGS data download that represent sinkholes in soluble rocks as of 2020.

Appendix A-5 shows hydrologic soil groupings that indicate runoff and water infiltration potential. All soil group descriptions are contained in the appendix. The Hite Spring well site is located the border of two soil types, soils with a hydrologic group rating C/D and an A rating. Group A soils have a high infiltration rate and low runoff potential. The dual group C/D indicates that drained areas are in group C with a slow infiltration rate and undrained areas are in group D with a very slow infiltration rate and very high runoff potential. Well 6 is located in soils with a hydrologic group rating B and have a moderate infiltration rate.

The Town of Luray is not 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 A-6 and A-7. The Town of Luray water system consists of one active groundwater well, Well #6 given the state assigned identifier WL003; one active spring source, the Hite Spring; one inactive spring source, the Hudson Spring, and one site for potential future development, the Yeager Site. The two active sources are within one mile of each other.

Both primary Zone 1 protection areas for these sources are composed of pasture and hay in addition to developed area of mixed intensity. A railroad transects both Zone 1 areas and East Main Street (U.S. Highway 211 Business) occurs within the Hite Spring Zone 1 area directly adjacent to the railroad. Their surrounding Zone 2 protection areas are predominantly the developed areas representing the Town. The offline source is maintained for emergency backup purposes and has similar land uses in both protection zones as the active sources. A major road, U.S. Highway 340 Business , transects Zone 1 of the backup source.

5.4. Future Land Use

Future land use intentions are derived from the Page County Comprehensive Plan[4] and the Luray Town Plan[5]. While Luray is a slow-growth community, the Town is sensitive to future growth needs. Focus is directed on encouraging residential growth in a manner that will protect the surrounding agricultural resources and prevent congested traffic patterns. The main goals include:

- Maintain a land use pattern that adequately accommodates future residential, commercial and industrial growth.
- Encourage new developments in, or near, the Town to have “Town-like” attributes in terms of land use patterns and design.
- Provide a “clear edge” between the Town (urban), and County (rural) areas.
- Ensure that residential developments are connected to public water and sewer.

In addition to minor transportation improvements, Luray future land use includes developing the Hawksbill Greenway and the Ralph H. Dean recreational areas, extending the road adjacent to the Greenway to connect the elementary and middle schools, and establishing landscaping along this route to increase the aesthetic value of the developments. Maps indicating future land use and project designs are presented in Appendix B.

[4] https://www.pagecounty.virginia.gov/DocumentCenter/View/78
[5] http://www.townofluray.com/assets/townplan-reduced.pdf

6. Potential Sources of Contamination (PSC)

VDH develops an inventory of PSCs 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 maps of PSCs within the SWPA are presented in Appendix E. These PSCs include publicly available information from DEQ, VDH, EPA, and other sources. A windshield survey was conducted on November 9, 2023. PSC discovered during that survey that were not already represented by existing GIS data are included in Appendix E as well.

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. Town of Luray 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:

- Railroad and Highways
- Closed Storage Tank Releases
- Pesticides, Fertilizers and Agricultural Land Uses
- Concentrated Residential or Municipal Areas
- Public and Private Wastewater
- Private Wells
- Industrial Facilities
- Impaired Streams

Closed storage tank releases are the most numerous PSCs in the Luray protection areas. There are 14 facilities inside Zone 2 for the Luray water sources. Threats associated with above-ground 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 or be swept into the river during a flooding event. The PSC categorized as Closed Storage Tank Releases are those for which DEQ opened and closed an investigation. The DEQ Pollution Response Program interactive mapper provides more information on specific sites from May 29, 2019 and after at https://geohub-vadeq.hub.arcgis.com/pages/pollution-response-datasets.

The Resource Conservation and Recovery Act (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. There are 9 RCRA sites in Luray SWPAs. The majority of RCRA sites in Luray SWPAs concern medical 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. In depth information on each RCRA site is available here: https://www.epa.gov/enviro/rcrainfo-search-user-guide. Users can search by handler ID, facility name, or zip code.

The source assessment found record of 2 underground injection wells in the source water protection areas, one of which is used by the town to pump water from Well 6 into the underground raw water system. In general, depending upon the depth, injection wells within the SWPA can potentially contaminate the groundwater source. The record for the underground injection well in the SWPA was provided by the US Environmental Protection Agency (USEPA) Underground Injection Control Program.

Railroad tracks run very closely to the public water supply within Zone 1 at both active source sites. The possibility of collisions and leaks are high. An accident on the main line, or leaks from standing train cars may result in contamination of water resources, especially where there are several sections of sidetrack along the main line.

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 to occur. If a hazardous materials spill were to occur, the substance spilled could infiltrate into the ground or runoff into surface water and potentially contaminate the water supply.

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. Increased nutrient load from these sources in surface water, especially affecting the Hite Spring, may result in algal growth, including an associated cyanobacteria commonly referred to as “blue-green algae”. Algal and bacterial presence may result in taste and odor issues. If stressed, cyanobacteria may also release cyanotoxins, chemicals that if consumed could severely impact human health. There are extensive agricultural areas in Zone 1 and 2 SWPAs for the Town of Luray system. Feed stores and home improvement stores that sell fertilizer and pesticides can be sources of contamination if these chemicals are not stored properly.

Luray water sources are located close to developed areas and industrial sites within town limits. Municipal areas have a concentration of homes, businesses, schools, industrial sites, and other facilities that may collectively introduce contaminants into water at a concentration to cause concern. Storm water runoff, care of public grounds, maintenance of city and county vehicles at garages, and residents’ activities in and outside their homes can con-tribute to contamination of the water source: fertilizers, pesticides, oils, paints, cleaning agents, etc. The Blue Mountain Animal Clinic may pose contamination concerns due to the presence of Regulated Medical Waste (RMW).

There are public waste water systems located in and near the SWPA. Accidental releases may allow untreated wastewater to contaminate the water resource. Failing private septic systems can leach into surrounding soils and potentially contaminate the source water especially given the known presence of soils with poor perk performance in the region which permits contaminants to travel greater distances.

Other potential conduits include offline wells and contaminated streams that may feed ground water resources. Dry Run is within the Zone 1 protection area for both active sources and is impaired by stress to benthic macroinvertebrates. Hawks Bill Creek is adjacent to the offline Hudson Spring and the potential future Yeager Site. Hawks Bill Creek is impaired by *E. coli*. East Hawks Bill Creek also has the potential to impact the Hudson Spring source and is impaired by stress to benthic macroinvertebrates as well as *E. coli*[6]. Appendix A-8 contains a floodplains and impaired streams map.

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.

[6] Virginia Department of Health Potential Sources of Contamination Inventory

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 of Luray. 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:

- Fencing is installed around all public water sources and security system components were installed at Hite Spring.
- Source water protection brochures were mailed to all customers in 2019. The brochures were updated in 2024.
- Regular monthly meetings with Town officials and local emergency management.
- Source Water Protection Area maps were provided to the police chief and town council members.
- A recent Emergency Response Plan was developed tailored for source water protection.
- The Virginia Department of Health provided a Wellhead Protection Plan, with assistance from Olver, Inc., in June 2008 for the Town of Luray
- The Town of Luray created a Source Water Protection Plan in 2018, updated in 2024, with assistance from Tetra Tech, Inc.
- Annual Water Quality Report published on the Town website at http://www.townofluray.com/water---waste-water.html
- Yearly high school student water quality project participation, sampling, and results report documents are published on the Town website at http://www.townofluray.com/student-water-project.html.

7.2. Source Water Protection Emergency Response Plan

The Town of Luray has an Emergency Response Plan updated in 2023. The Emergency Response Plan, included in Appendix F, provides contact information and defines basic emergency response procedures to aid the waterworks in responding to a source water contamination event.

7.3. Public Education and Outreach

In order 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.

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.

For several years, the Town of Luray has partnered with Luray High School Honors students in Earth Science Agriculture and Ecology class. Students learn about water quality by utilizing testing equipment, collecting water samples in local streams, and charting test results based on water quality standards. Students learn, based on the test results, the appropriate uses for the sampled water and possible contributors to contamination. These results are provided in a report to the Town and published on the Town website at: http://www.townofluray.com/student-water-project.html. Luray operators have reached out to offer guidance and education

The Town of Luray publishes an Annual Water Quality Report on the Town website at http://www.townofluray.com/water---waste-water.html and mails this report to water customers yearly.

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:

Emerging Contaminants in Small or Disadvantaged Communities grant program – Environmental Protection Agency

Funding type: grant

Description: Administered under § 300j-19a of the Safe Drinking Water Act, focuses on projects that address perfluoroalkyl and polyfluoroalkyl substances (PFAS) and/or any contaminant listed in EPA's Contaminant Candidate Lists. In Virginia, this funding is funneled through the existing (DWSRF) program.

Link: https://www.vdh.virginia.gov/drinking-water/emerging-contaminants-in-small-or-disadvantaged-communities-ecsdc-grant-program/

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: https://www.deq.virginia.gov/land-waste/litter-prevention/grant-programs

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 (DWSRF) and Water Supply Assistance Grant (WSAG) – Virginia Department of Health – Office of Drinking Water

Funding type: DWSRF mix of loan, grant, and refinancing opportunities; WSAG grants

Description: This program includes the Financial and Construction Assistance Programs (FCAP) and Capacity Development Program (CapDev). There are multiple funding opportunities within these programs including:

- Water Supply Assistance Grant
- Drinking Water Funding Program – construction assistance; planning & design
- Lead Elimination Assistance Program (LEAP)
- Flouridation Grant
- Planning and Design Funding

These programs provide planning funding, which could be used to analyze solutions to source water measures or evaluate potential new sources. These programs also provide 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: https://www.vdh.virginia.gov/drinking-water/fcap/drinking-water-funding-program/

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: https://www.deq.virginia.gov/our-programs/water/water-quality/nonpoint-source-management/funding-grant-and-project-resources

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 stormwater runoff control best management practices.

Link: https://www.deq.virginia.gov/our-programs/water/clean-water-financing-and-assistance/virginia-clean-water-revolving-loan-fund-vcwrlf/wastewater

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.

Link: https://www.deq.virginia.gov/our-programs/water/clean-water-financing-and-assistance/virginia-clean-water-revolving-loan-fund-vcwrlf

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: https://www.deq.virginia.gov/our-programs/water/clean-water-financing-and-assistance/stormwater-local-assistance-fund-slaf

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: https://www.dcr.virginia.gov/land-conservation/vlcf

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: https://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: https://dof.virginia.gov/financial-assistance-programs/

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/urbanwaterspartners/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: https://www.usendowment.org/what-we-do/legacy-programs/healthy-watersheds-consortium/

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/financial/rcpp/

7.5. References

Comprehensive Plan Volume I: Vision, Page County. April 21, 2020. Retrieved November 2023 from: http://pagecounty.virginia.gov/219/Planning-Documents

Comprehensive Plan Volume II: Community Character, Page County. April 21, 2020. Retrieved November 2023 from: http://pagecounty.virginia.gov/219/Planning-Documents

Southworth, Scott, Aleinikoff, J.N., Bailey, C.M., Burton, W.C., Crider, E.A., Hackley, P.C., Smoot, J.P., and Tollo, R.P., 2009, Geologic map of the Shenandoah National Park region Virginia: U.S. Geological Survey Open-File Report 2009–1153, 96 p., 1 plate, scale 1:100,000. Accessed 2018 from: https://pubs.usgs.gov/of/2009/1153/

Town of Luray Comprehensive Plan, 2019. Retrieved November 2023 from: https://www.townofluray.com/government/comprehensive-plan

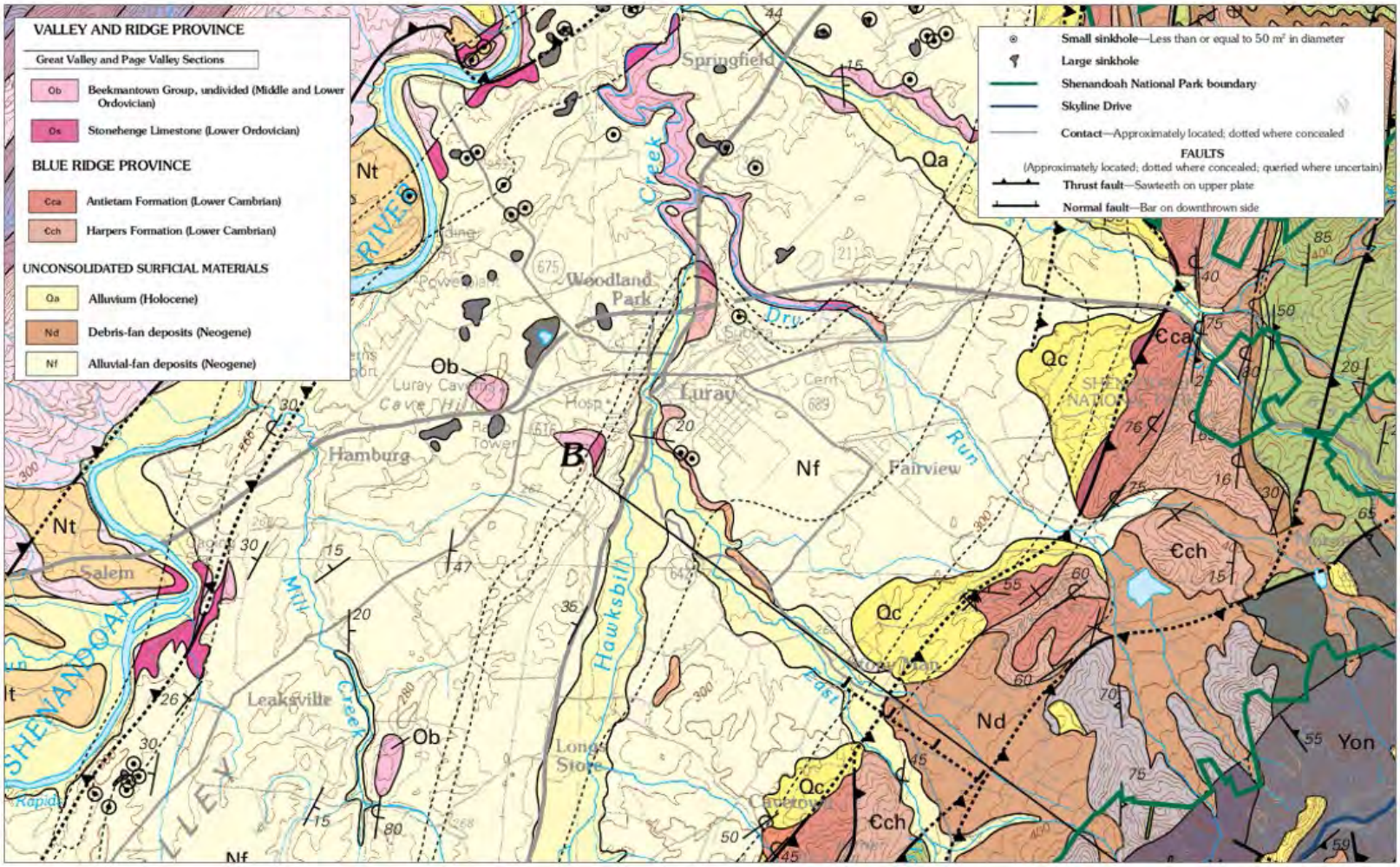
Appendix A-1: Source Water Protection Area Zone 1 Topographical Maps

For security purposes this Appendix is not included in the public version of the plan.

Appendix A-2: Source Water Protection Area Zone 2 Topographical Maps

For security purposes this Appendix is not included in the public version of the plan.

Appendix A-3: USGS Geological Map Excerpt



Excerpt from Southworth, et al. 2009 Geologic Map of the Shenandoah National Park Region, Virginia. USGS Open-File Report 2009-1153.

Appendix A-4: Bedrock Geology

For security purposes this Appendix is not included in the public version of the plan.

Appendix A-5: Hydrologic Soil Group

For security purposes this Appendix is not included in the public version of the plan.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

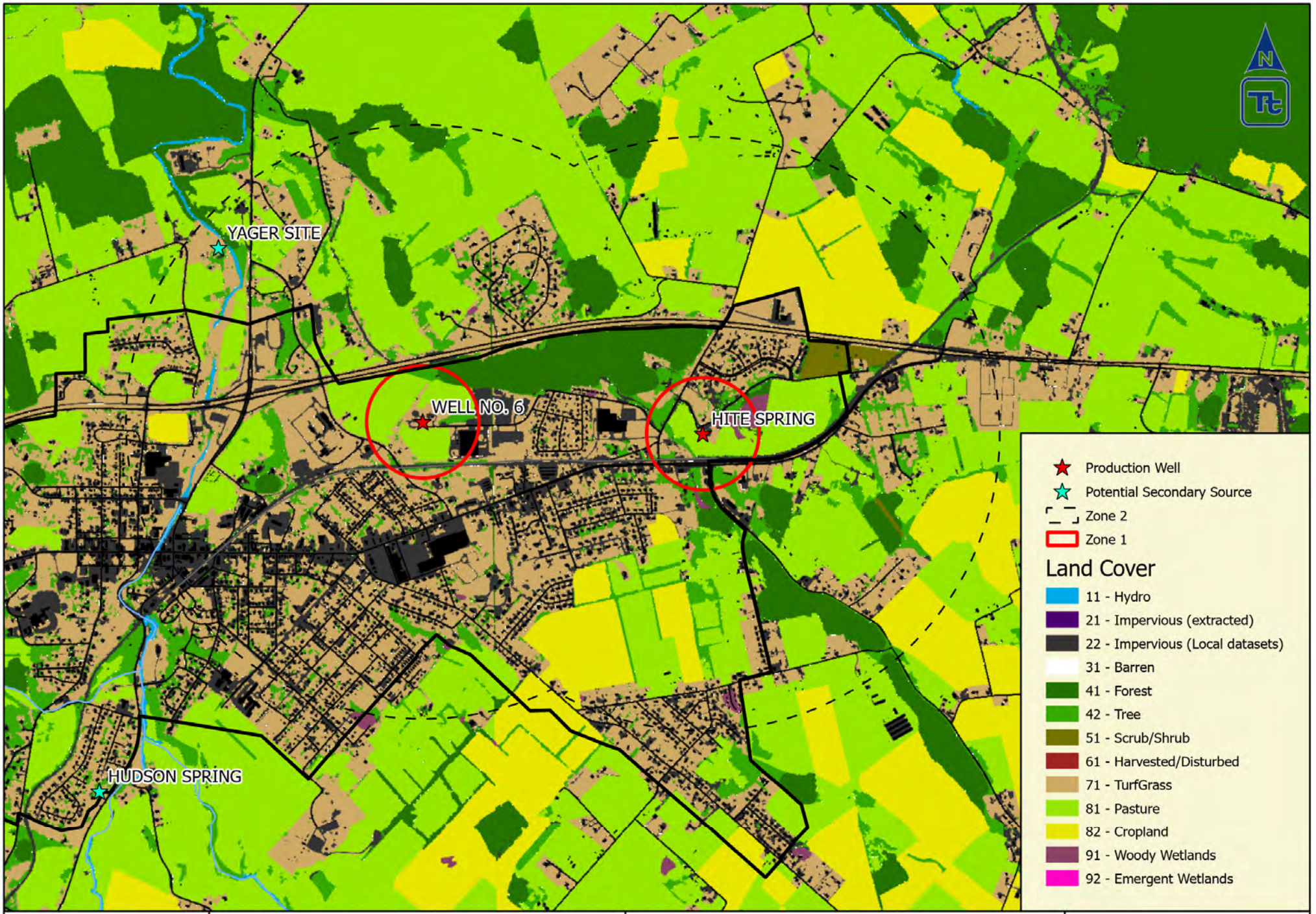
Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Appendix A-6: Land Use Map VGIN

For security purposes this Appendix is not included in the public version of the plan.



Town of Luray
PWSID 2139330
Map produced 11/30/2023

Land Use

Virginia Geographic Information Network (VGIN)

0 1 Miles

TETRA TECH
complex world | CLEAR SOLUTIONS™

Appendix A-7: Land Use Map NLCD 2016

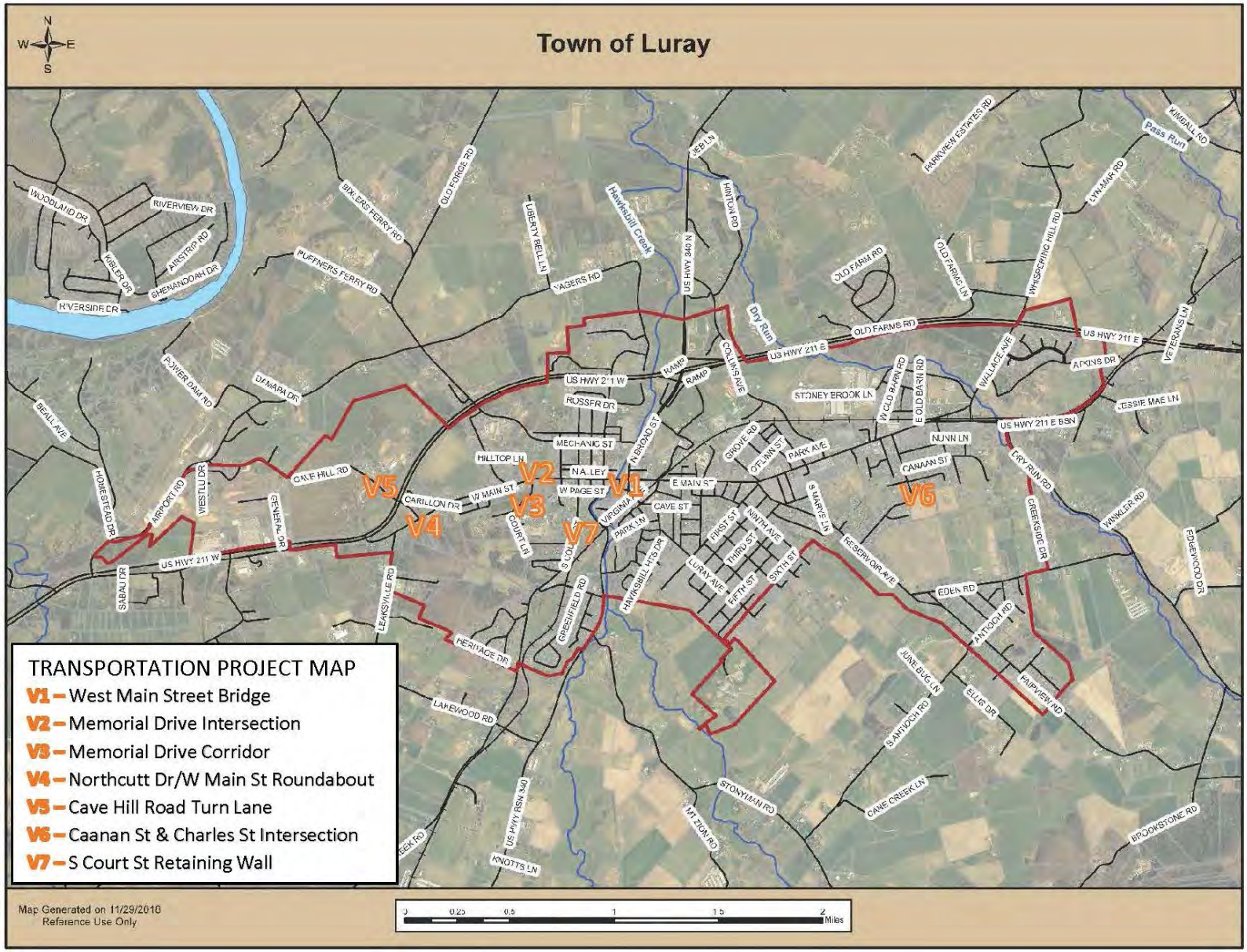
For security purposes this Appendix is not included in the public version of the plan.

Appendix A-8: Floodplains and Impaired Streams Map

For security purposes this Appendix is not included in the public version of the plan.

Appendix B: Source Water Protection Area Future Land Use Maps and Projects

Anticipated road improvements.



Anticipated water and sewer projects from the 2019 Luray Comprehensive Plan.

WATER PROJECTS

Water Storage *– West End*
Provide/Expand 1 Million Gallon Ground Mounted Tank with VFD Pumps

Larger Tanks/Pumps *– West Main Street*
Provide Larger Tank – 1 million Gallon Ground Mounted Tank & 2 sets of VFD Pumps – Cave Hill
& Pressurize West Main Street

Larger Water Main *– East to West*
East – Water Treatment Plant, Rosser Drive
West – Develop Larger Line from 8" to 12",
US HWY 211 from Water Treatment Plant to 340 up Main Street, Northcott Connection

New Water Treatment Plant *– West End*
Construct Treatment Works on West End

New Cover & Mixing Unit *- Reservoir*

Utilize Yager Spring *– Extra Water Source*
Raw Water Bottling Facility

Meter Replacement
Continue Water Meter Replacement Programs

Additional Control Valves
Install Additional Valves to Control Water Loss

Photo by Brooke Newman

Anticipated water and sewer projects from the 2019 Luray Comprehensive Plan - continued

Mapping/Maintenance of Fire Hydrants, *Locator Maps*

Additional Water Storage Tanks *– Enhance Valve & Pressure System*

Airport Road
Springview
Charles Street
Forest Hills
Woodland Park
Bixlers Ferry/Mechanic Street

Photo by Brooke Newman

Upsize West Main Water Line *– Tower to Luray Landing*
From West Tank Past High School on 211, McDonald's to PND

Water Line Loop at Tannery
Complete 4" Connector Line Approximately 200'

Water Line Loop at Mechanic Street/340
Complete 4' Connector Line, Provides Water Pressure, Pressurizes Hydrants

SEWER PROJECTS

Upgrades to Waste Water Treatment Plant *– Pumps, Influent*

Septage Receiving
Provide Technology Based Septage Receiver with Flow Meters & 24-hour Access
Pump Improvements, Provide Efficiency for Waste Water Treatment Plant

Anticipated water and sewer projects from the 2019 Luray Comprehensive Plan - continued

East Luray Sewer Project

Upsize Sewer Collection Mains
Eliminate Bottlenecks
Create Larger Pump Station
Eliminate 3 Existing Pump Stations
Gravity Sewer to Stoneybrook Industrial Park

Upgrade Sewer Main *– Park and Ride to WWTP*
Eliminate Bottleneck of 18" – 24" Line
Eliminate 75% Inflow & Infiltration in Section
Enhance Capacity

Inflow & Infiltration *– Dry Run, Hawksbill Mains*
Inflow & Infiltration Testing, Locate Problems,
Complete Repairs to Prevent Inflow
Replace Old/Undersized Lines
Sewer Manhole Maintenance & Sealing
Addition of Cleanouts at Property Lines

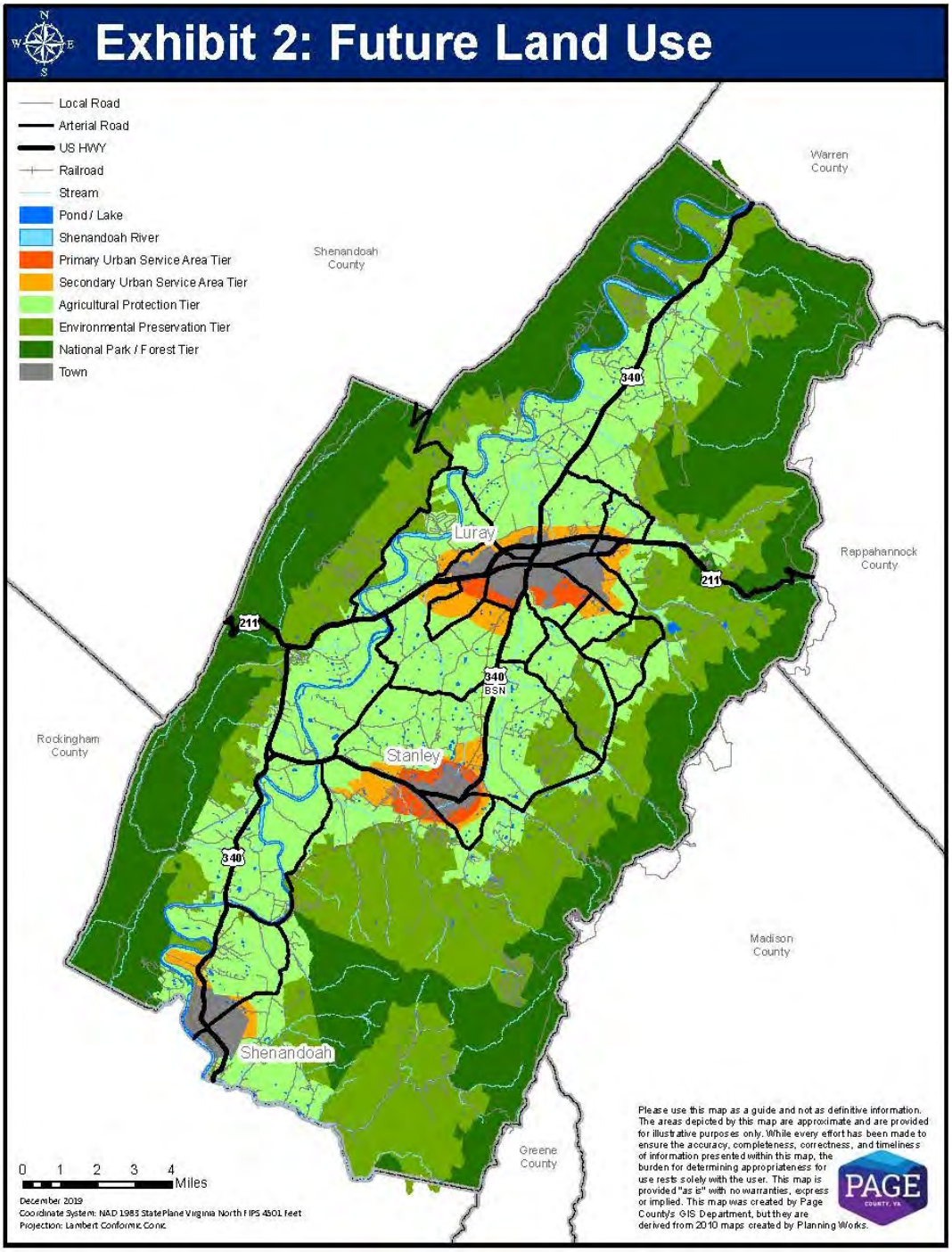
Photo by Page County GIS Aerials

Upgrade Sewer Main *- Mechanic Street to Waste Water Treatment Plant*

Upgrade Sewer Main *- Reservoir/Fairview to Main at Hawksbill Creek, South Court Street, Mill Creek Road to Hawksbill Creek*

New Sewer Force Main *- Airport Road/Yager's Spring Road to Main Line North of Yager's Spring*

Anticipated future land use around Luray as reflected in the 2020 Comprehensive Plan Vision Volume 1.



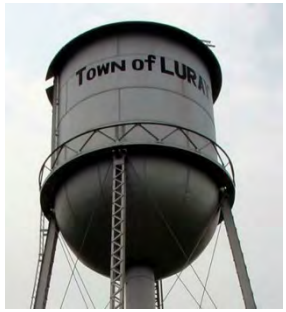
Appendix C: Luray Source Water Protection Residential Brochure

Why protect the source water when we can treat it before drinking?

Not all drinking water is treated. Source water protection is especially important for rural residents or those relying solely on private well water without access to industrial treatment and expensive testing used by public suppliers. Additionally, treatment of public water is less costly when the source water is clean, and those savings directly impact user rates.

We all play a part in protecting the health of our water resources. Contaminants may come from various sources including:

- Storm water runoff
- Wastewater treatment discharges
- Agricultural and farming activities
- Mining and industrial activities
- Leaking chemical storage tanks



For additional information about your drinking water, please contact us at:

Town of Luray

(540) 743-1974 • http://www.townofluray.com/

P.O. Box 629
45 East Main Street
Luray, VA 22835

For more information on the Town's source water protection plan please visit our website: http://townofluray.com/assets/luray_swpp_draft_08_02_2018_public-_version.pdf

Town of Luray | PWSID # 2139330

Source Water Protection

The responsibility for clean water belongs to everyone!

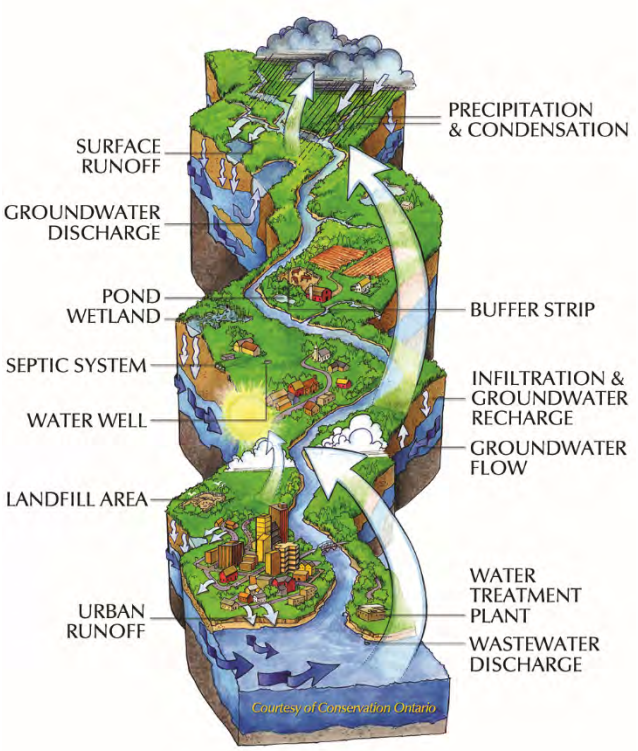
Prepared in cooperation with:

VDH Virginia Department of Health
Protecting You and Your Environment
www.vdh.virginia.gov

Office of Drinking Water

Watersheds:

Where does my drinking water come from?



What is source water?

Everyone lives in a watershed. As water travels over or through the ground, it collects minerals and contaminants which may affect the purity of water resources. Source water comes from streams, rivers, lakes, or groundwater aquifers and supplies drinking water to public utilities and private wells.

Source Water Protection

What is source water protection?

Activities and land uses conducted in the watershed potentially impact the source water. Protecting source water from contamination reduces risk to public health and may decrease treatment costs. The Virginia Department of Health has established source water protection areas (SWPAs) for public water sources, indicated in the map below. Responsible land use within these areas is critical.

What is risk identification?

It is important to identify threats to water resources and their likelihood to impact source water. The Town of Luray has developed a Source Water Protection Plan documenting specific risks in the SWPAs and developing management strategies based on potential threats.

How can you protect source water?

Your public drinking water comes from Hite Spring, Hudson Spring, and a drilled well.

To protect and ensure the sustainability of your drinking water, follow these simple suggestions:

- Keep animals, livestock and their waste, out of local streams or away from wells.
- Plant buffer strips where appropriate.
- Never pour motor oil, hazardous chemicals, or prescription medicines onto the ground, storm sewer, or other drains.
- Minimize the use of fertilizers, pesticides, and herbicides on your lawn and farm.
- Do not dump trash or waste near sink holes, well heads, springs, or streams.
- Do not store or spray chemicals or house livestock near well heads.
- Participate in cleanup activities in your neighborhood or join a local watershed organization.
- Learn about your drinking water supply and conserve water at home.

Appendix D: VDH ODW Field Office Construction Verification

PWSID	System Name	Source	Meets Construction Requirements?
2139330	Town of Luray	Well # 6	Y

Data source: 5/11/2018 Email from Jess Tisinger, PE, VDH ODW LFO

Appendix E: Potential Sources of Contamination Inventory

For security purposes this Appendix is not included in the public version of the plan.

Appendix F: Source Water Protection Emergency Response Plan

For security purposes this Appendix is not included in the public version of the plan.

The Town of Luray has an Emergency Response Plan updated in 2023.

Appendix G: Potential Conduits of Contamination Inventory

The Town of Luray and Page County have no formal record available documenting potential conduits of contamination. Town officials indicate there are very few private wells within Town limits.

Appendix H: VDH ODW Source Water Assessment Report 2024

For security purposes this Appendix is not included in the public version of the plan.