March 22, 2024

Mr. Matt Spuck
Town Manager
Town of Onancock
15 North Street
Onancock, VA 23417

Re: Draft Source Water Protection Plan for Town of Onancock (VA3001620); CHA Project No. 077507

Dear Mr. Spuck:

I would like to thank you for the information that has been provided thus far to contribute to the Source Water Protection Plan for the Town of Onancock. We have compiled all the existing information provided to us by you and the Virginia Department of Health into a draft Source Water Protection Plan.

You should review the draft source water protection plan and appendices and we can discuss any revisions needed to the plan. The following is a brief list of items that are needed to finalize the plan:

- Titles and contact information for the Local Advisory Committee members.
- Information for the Emergency Response Plan (Appendix C) including population served, and key contacts. The information that is needed is highlighted in Appendix C.
- Emergency phone number or other contact information for reporting spills or similar emergencies. Information will be included in the brochure (Appendix D) and the letter to emergency responders (Appendix E).

The draft plan includes a general description of source water protection and the waterworks' infrastructure. The plan also describes the potential sources of contamination within the source water protection areas. The source water protection measures that are included in the plan have the main goal of informing management, local residents, and neighbors about the vulnerability of the public drinking water source and describing actions they can take to prevent contamination. The draft brochure is designed as public education tool to distribute to residents within the source water protection area as you feel necessary.

As always, please do not hesitate to contact me at (540) 552-5548 and aruble@chasolutions.com or Raylani Reis at (540) 552-5574 and rreis@chasolutions.com if you have any questions.

Sincerely,

Ashley Ruble

Ashley Ruble, CHMM
Project Manager

SOURCE WATER PROTECTION PLAN

Town of Onancock
15 North Street
Onancock, Virginia 23417

CHA Project Number: 077507.000

March 2024

Prepared for:

Town of Onancock
15 North Street
Onancock, Virginia 23417

Prepared by:
CHA Consulting, Inc.
1341 Research Center Drive
Suite 2100 Blacksburg, Virginia 24060
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RECORD OF REVIEW

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

Date of Review	Name of Reviewer	Description of Updates (if any)

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Appendix E Example Correspondence

STATEMENT OF ADOPTION

The Town of Onancock waterworks has adopted this Source Water Protection Plan (SWPP) and has a copy of the plan on file with the Virginia Department of Health (VDH). The service and assistance of the waterworks' representatives in the preparation of the plan are acknowledged and greatly appreciated.

Matt Spuck	Town Manager, Town of Onancock
Brett Mariner	
George Hall	
Priscilla Hart	

By signing below, we acknowledge the above statements to be true, and that we are authorized by the Town of Onancock to make such representation.

_____ _____

Name, Title Date

ACKNOWLEDGMENTS

The SWPP for the Town of Onancock meets all the Commonwealth of Virginia's Source Water Protection Program requirements. These requirements include delineating the Source Water Protection Area (SWPA), identifying potential sources of contamination (PSC) within the protection area and creating an inventory of these sources, and conducting a susceptibility analysis to determine the risk of contamination to the water source. The SWPP builds on the Source Water Assessment Report and develops a plan for protecting surface water from contamination.

A Local Advisory Committee (LAC) was formed to develop and implement this SWPP for the Town of Onancock. LAC members include:

Matt Spuck	Town Manager, Town of Onancock
Brett Mariner	
George Hall	
Priscilla Hall	

EXECUTIVE SUMMARY

Maintaining high-quality drinking water supplies is the primary goal of source water protection efforts under the Safe Drinking Water Act. Protecting source water can benefit the environment, the waterworks' owners, and the public. The environment benefits from cleaner water with fewer pollutants, the owner benefits from reduced costs in treating the water and the public benefits from safer drinking water and a cleaner environment.

The source water protection planning process includes the following elements:

- Identifying the aquifer source of the public groundwater supply;
- Assessing potential conduits and potential sources of contamination (PSC) within those areas and evaluating their risk of contaminating the public groundwater source; and
- Implementing a protection strategy to manage these risks and prevent drinking water contamination.

Since the Town of Onancock's source is groundwater, key potential conduits to the groundwater supply include privately owned wells and impaired waterbodies.

The following are recommended actions to help ensure the availability and quality of the Town of Onancock water supply in the future:

- Develop a general brochure describing Source Water Protection for the water system and promote the general education of the community on Source Water Protection.
- Mail the water system brochure to each residence within the SWPA.
- Attach source water protection articles to water bills or community newsletters.
- Annual meeting between the LAC members to discuss source water protection.
- Post signs along major roadways near the SWPA to indicate these areas are in a drinking water protection area and where spills can be reported.
- Annually review with pertinent emergency response personnel of the designated SWPAs and appropriate response procedures.
- Review and update the SWPP as needed (at least every three years).
- Encourage local school districts to incorporate source water protection information into their curriculum. Conduct classroom visits or class trips to the water treatment plant to encourage education about drinking water.
- Coordinate with local solid waste unit and Accomack County as needed to hold an annual household hazardous waste cleanup event for residents.
- Upgrade security fencing and signage at the groundwater wells including protection from vehicular accidents.
- Coordinate with the Accomack-North Hampton Regional Planning District to keep informed on salt water intrusion studies.
- Stay informed on the utilization of the Middle Yorktown-Eastover Aquifer and introduce conservation efforts as needed.

1.0 INTRODUCTION

1.1 Protection of Groundwater Sources

Protection of sources that supply public drinking water is of vital importance to the residents of the Town of Onancock. 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 allow public water systems to avoid costly treatments and minimize future monitoring requirements. When drinking water is contaminated, costs can include:

- 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; and
- Loss of production for individuals and businesses that rely on a clean water supply and loss of economic development opportunities.

Additionally, other consequences are associated with contaminated water supplies, including:

- Community fear of the potential harm to their families.
- Community objection to the use of treated drinking water.

The Virginia Source Water Protection Program is a voluntary program administered by the Virginia Department of Health – Office of Drinking Water (VDH-ODW) to assist communities with developing and implementing source water protection strategies. 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. Contaminant movement is affected by the properties of the contaminants, as well as the properties of the overlying soils and the aquifer. The Town of Onancock's source water is generally protected from localized surface contamination due to the presence of natural geologic barriers present in the subsurface and the depths of the wells. However, the potential exists for contaminant migration into the aquifer by several different pathways:

- Infiltration from the aquifer recharge areas;
- Migration of contamination from overlying aquifers;

- Diversion of contaminations into the aquifer through over-pumping; and
- Introduction of contaminants from the surface through improperly constructed or defective wells.

Many normal day-to-day activities could have the unintended consequence of compromising the community's drinking water supply if pathways exist for the contaminants to migrate into the aquifer. 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.

Other potential sources of contamination could include the following natural or human-induced activities:

- Saltwater intrusion;
- Dissolution of naturally-occurring substances in the soil or rock;
- Industrial, commercial, or public point sources; and
- Non-point sources.

Preventing contamination is paramount in keeping groundwater supplies safe. To maintain quality drinking water, it is important to reduce and/or eliminate hazardous activities.

1.2 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.

1.3 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 a comprehensive action plan in case of an emergency affecting the water source.

1.4 Description of the Water System

The Town of Onancock (PWSID #3001620) consists of three drilled wells, one 300,000-gallon elevated storage tank, chlorination and fluoridation facilities, and a distribution system. The water is primarily used for residential and commercial use. Table 1 summarizes the depth of each of the wells.

Table #1. Town of Onancock Wells

Well Name	Depth (feet)
Well 7	220
Well 8	220
Well 9	220

The Town of Onancock waterwork has an estimated water demand of 288,000 gallons per day (gpd), a total source capacity of 604,800 gpd, and a storage capacity of 377,600 gpd. The waterwork is permitted for 8,079,200 gallons per month and 80,615,000 gallons per year. The waterworks is limited to a design capacity of 377,600 gallons per day due to limited storage capacity.

2.0 LOCAL ADVISORY COMMITTEE (LAC)

The purpose of the Local Advisory Committee (LAC) is to evaluate the site-specific risks to the groundwater sources, develop site-specific recommended actions to mitigate the risks and ensure that the recommended actions are implemented. Community involvement is a critical element in developing a successful Source Water Protection Plan (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 committee member prerequisite.

The Town of Onancock LAC consists of:

Table #2. Town of Onancock Local Advisory Committee

Name	Organization	Title
Matt Spuck	Town of Onancock	Town Manager
Brett Mariner		
George Hall		
Priscilla Hall		

The LAC contributes information to aid in the development of the SWPP, reviews draft SWPPs, and ensures the implementation of recommended actions.

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 Onancock's water source. The recommended actions developed by the LAC are listed in Section 5.4.

3.0 SOURCE WATER ASSESSMENT & PROTECTION AREAS

3.1 Delineation of Source Water Protection Areas

As part of the Source Water Assessment Program (SWAP), VDH delineates two different zones for each waterworks source. These zones are defined for groundwater sources as follows:

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

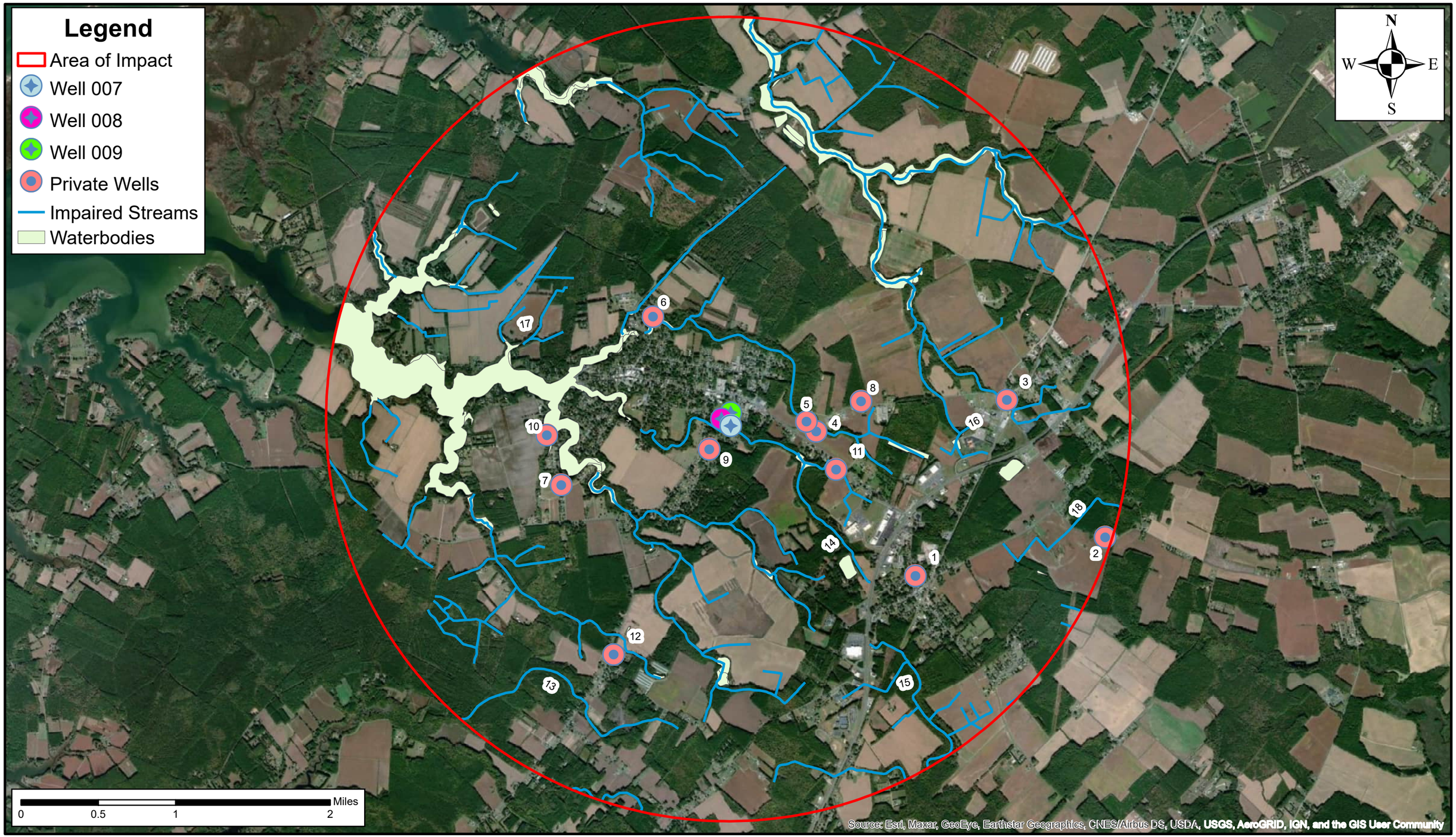
The circular Zone 1 and Zone 2 delineations described above assume that the source is withdrawing from a confined aquifer comprised of uniform unconsolidated material where specific information on the aquifer is unknown. However, the groundwater withdrawal permit for the Town of Onancock from the Virginia Department of Environmental Quality (DEQ) were reviewed, and the permit noted that the three wells withdrawal from a confined aquifer known as the Middle Yorktown-Eastover Aquifer. The permit delineated the area of impact (AOI) as a 2.6-mile radius from the pumping center of the three wells.

For this plan, the Source Water Protection Area (SWPA) is defined as the area encompassing the AOI for Wells 7, 8, and 9. The AOI for the Town of Onancock wells is a 2.6-mile radius from the pumping center. Figure 1 shows the potential conduits identified within the AOI. Potential conduits are features such as private wells, impaired streams, etc. that have the potential to serve as a conduit for contamination to reach the confined aquifer. Due to the nature of the confined aquifer in the AOI, the potential sources of contamination in the surficial aquifer in the SWAP are less likely to impact the groundwater sources from aquifers beneath the confining unit. Therefore, the potential conduits were included as the primary concerns for the Town of Onancock. Section 4.0 provides additional detail on the priority threats to the Town of Onancock's water system.

Appendix A includes an inventory of potential conduits shown on Figure 1 as well as an inventory of potential sources of contamination from the SWAP described above.

3.2 Topography and Relief

Figure 2 shows the topography and elevation contours for the Town of Onancock SWPA as well as the impaired streams within the AOI. Impaired streams within the AOI are described in Section 3.5.



Source: Potential Conduit Data from VDH

Job No:
077507
NOV 2023

FIGURE 1

POTENTIAL CONDUITS MAP

TOWN OF ONANCOCK SOURCE WATER PROTECTION PLAN

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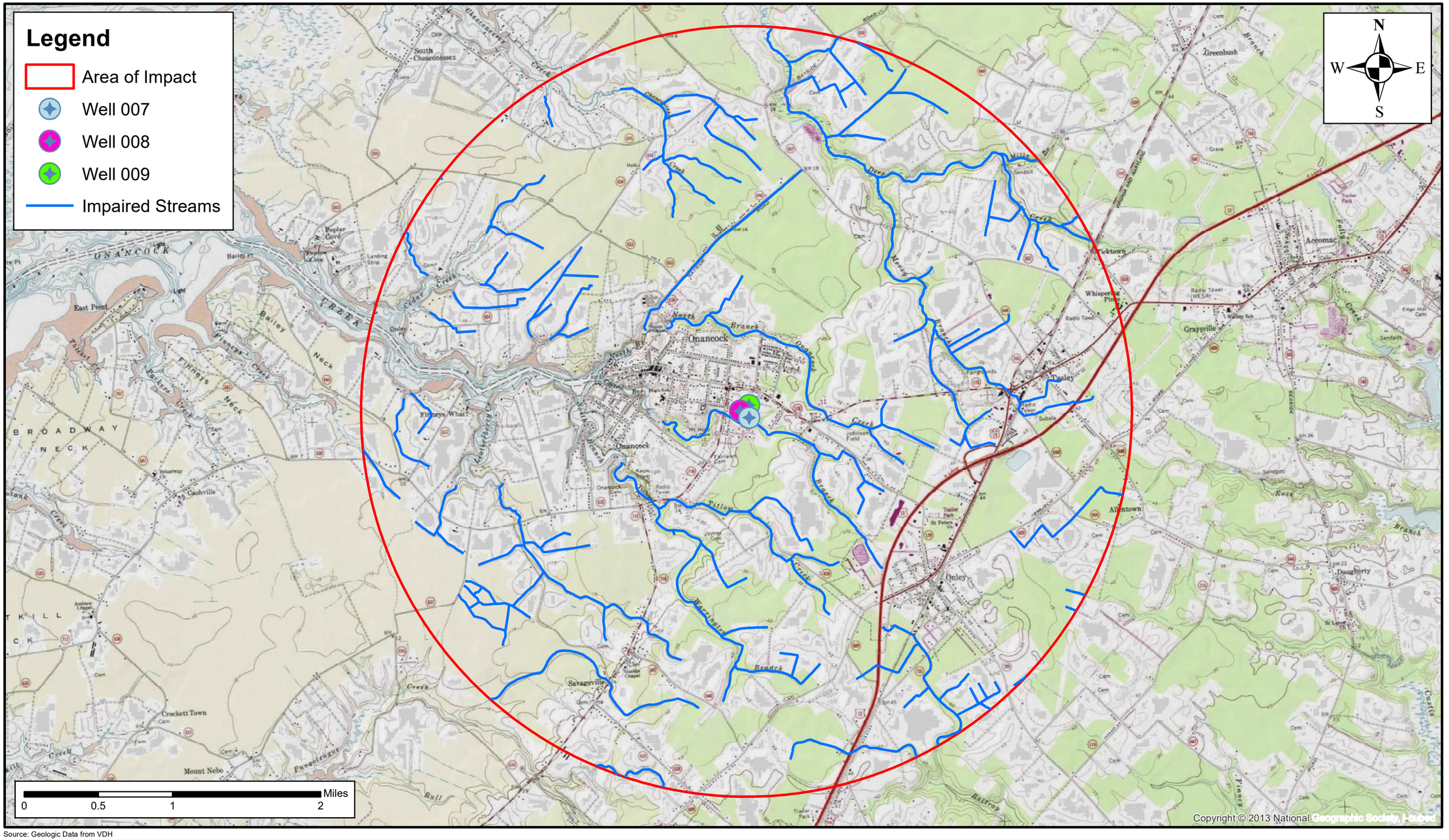
Suite 2100
Blacksburg, VA 24060
www.chasolutions.com



Source: Geologic Data from VDH

Job No:
077507
NOV 2023

FIGURE 2

TOPOGRAPHIC AND IMPAIRED STREAMS MAP

TOWN OF ONANCOCK SOURCE WATER PROTECTION PLAN

1341 Research Center Dr.
Suite 2100
Blacksburg, VA 24060
www.chasolutions.com

3.3 Geological Characterization

Figure 3 is a Geologic Map of the SWPA and shows the major surficial geologic formations within the SWPA. The water system is located within the Coastal Plain Province of Virginia. Table 3 describes the major geologic formations within the SWPA in detail.

Table #3. Geologic Formations within the Town of Onancock SWPA

Formation Name	Description
Omar Formation – Accomack Member (Qoa;0)	Light-to-dark-gray, light-yellowish-gray, brownish-gray, and yellowish-orange sand, gravel, silt, clay, and peat of south west-trending central upland (altitude 38-50 feet) in Accomack County. Upper part of unit is bounded on east and west by ocean- and bay-facing scarps; lower part present in subsurface of adjacent lowland areas where it is overlain unconformably by Upper Pleistocene and Holocene deposits. In northern part of county, unit is a barrier-back barrier sequence of clean, cross-bedded, gravelly sand (above) and peat, clayey silt, and muddy sand (below); mollusks include Crassostrea, Mercenaria, and Noetia. At base of unit, pebbly to bouldery, medium- to very-coarse-grained sand and thick, compact clay-silts constitute the fluvial-estuarine fill of a paleochannel of the Susquehanna River system. Accomack Member and underlying channel fill are as much as 200 feet, or more, in thickness. Quaternary.
Kent Island Formation (Qk;0)	Pale-gray to yellowish-gray, medium to coarse sand and sandy gravel grading upward into poorly to well sorted, fine to medium sand, in part clayey and silty. Unit is a surficial deposit of broad, bayward-sloping lowland (altitude ranges from sea level to about 20 feet) bordering east side of Chesapeake Bay. Thickness ranges from a feather-edge at scarp along eastern edge of lowland to about 40 feet in downdip areas.

Source: Virginia Division of Mineral Resources, 1993

3.4 Soils

Soil characteristics play an important role in determining groundwater infiltration rates and groundwater quality, and in affecting the chemical quality of groundwater resources. Figure 4 contains a soil map for the SWPA which shows the major hydrologic groups in the SWPA. This includes:

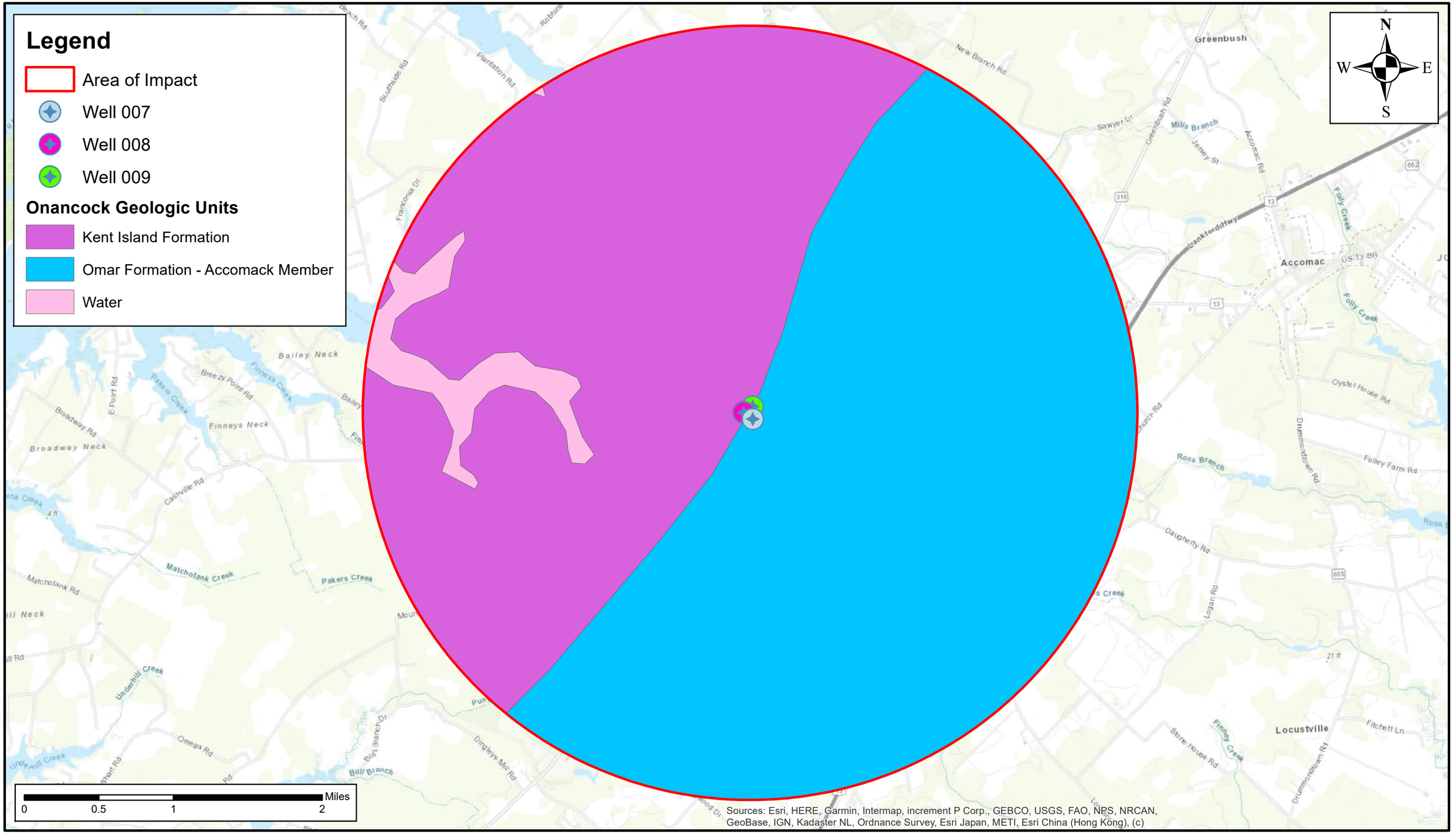
- Class A - High infiltration rates. Soils are deep well drained to excessively drained sands and gravels.
- Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.
- Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.
- Class D - Very slow infiltration rates. Soils are clayey, have a high-water table, or are shallow to an impervious layer.

There are four major soil series located within the Town of Onancock SWPA, generally consisting of sandy loams. The soils were mostly identified to be very deep, and as such, retain water and

contaminants for a greater duration than shallower soils. However, the major soil types in the SWPA are permeable and therefore, will transmit water and contaminants more readily than a soil with a lower permeability. Table 4 lists the major soil series in the SWPA and indicates the basic characteristics of each soil type. Appendix B contains the United States Department of Agriculture Soil Survey for the SWPA.

Table #4. Soils of Town of Onancock SWPA

Major Soil Series	Slope	Depth to Bedrock	Drainage	Permeability	Hydrologic Soil Group	% Organic Matter	% Clay
Dragston fine sandy loam	0 to 2 %	>80 inches	Somewhat poorly drained	Moderately rapid	A/D	0.29	8.0
Munden sandy loam	0 to 2 %	>80 inches	Moderately well drained	Moderate to Moderately rapid	B	0.56	10.0
Nimmo sandy loam	0 to 2 %	>80 inches	Poorly drained	Moderate to Moderately rapid	B/D	0.52	9.0
Bojac sandy loam	0 to 2 %	>80 inches	Well drained	Moderately rapid	A	0.29	10.0



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c)

Source: Geologic Data from VDH

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FIGURE 3

GEOLOGIC MAP

TOWN OF ONANCOCK SOURCE WATER PROTECTION PLAN

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Blacksburg, VA 24060
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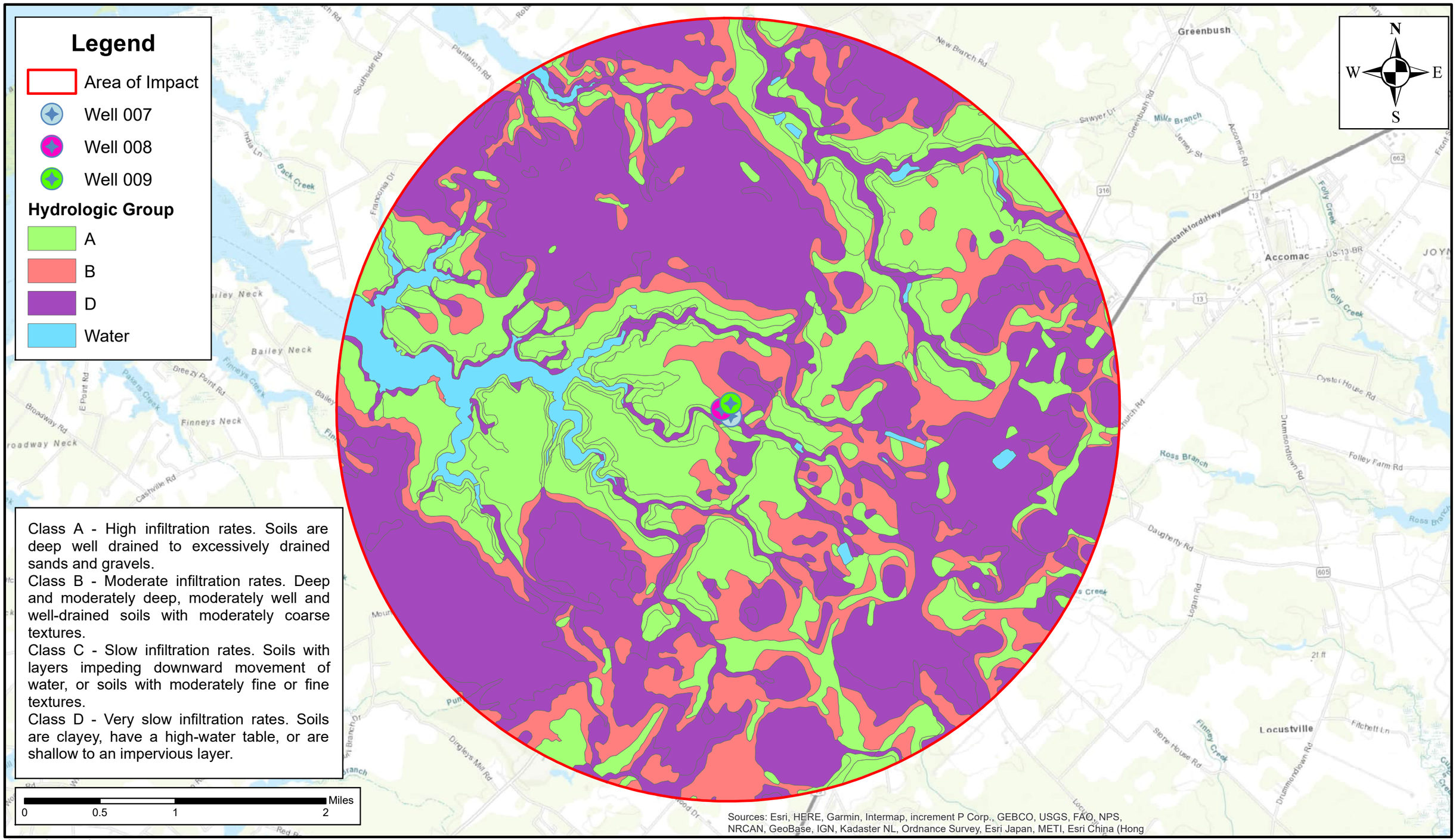


Source: Soil Data from VDH

Job No: 077507 **NOV 2023**	FIGURE 4	**SOIL MAP** **TOWN OF ONANCOCK SOURCE WATER PROTECTION PLAN**	CHA 1341 Research Center Dr. Suite 2100 Blacksburg, VA 24060 www.chasolutions.com

3.5 Water Resources

3.5.1 Surface Water Resources

While the Town of Onancock drinking water source comes from three groundwater wells as described in Table 1, the waterbodies surrounding the SWPA contribute to how contamination and pollutants are transported within the SWPA. Table 5 summarizes the water quality impairments for water bodies located in the SWPA. The waterbodies described in Table 5 are shown in Figure 2 Topographic and Impaired Streams Map. As shown in Table 5, there are several impaired streams and waterbodies whose impairment cause has limited or no data. The Town of Onancock should investigate funding sources to apply for in order to assess these impairments and accurately determine their potential impact on the Town's drinking water wells.

Table #5. Town of Onancock SWPA Impairments

Name	Location Description	Impairment Cause
Pungoteague Creek	Tributary that branches off near Dingleys Mill Road and crosses Savageville Road	Unknown/Not Assessed
Joynes Branch	Eastern riverine tributary to the Central Branch of Onancock Creek	DO, PH, and E. coli bacteria
Tributaries of Rattrap Creek	Tributaries of Rattrap Creek east of Route 13	Unknown/Not Assessed
Tributaries of Merry Branch	Tributaries of Merry Branch near intersection of Fairgrounds Road and Tasley Road	Unknown/Not Assessed
Various tributaries north and south of Onancock Tangier Fry	Various tributaries north and south of Onancock Tangier Fry including Back Creek, Chesconnessex Creek, Cedar Creek, Leatherberry Creek, Finneys Creek, Parkers Creek, Titlow Creek, South Branch Onancock Creek, Warrington Branch, and North Branch Onancock Creek	Unknown/Not Assessed
Ross Branch	Tributary to Folly Creek. Riverine section of Ross Branch, segment begins at headwaters extending downstream to start of tidal waters. Located south of Accomack.	Benthic Population
Chesapeake Bay	Entire Chesapeake Bay Watershed	Total Suspended Solids, Total Nitrogen, Total Phosphorus
Onancock Creek	Central Branch	Enterococcus

3.5.2 Saltwater Intrusion

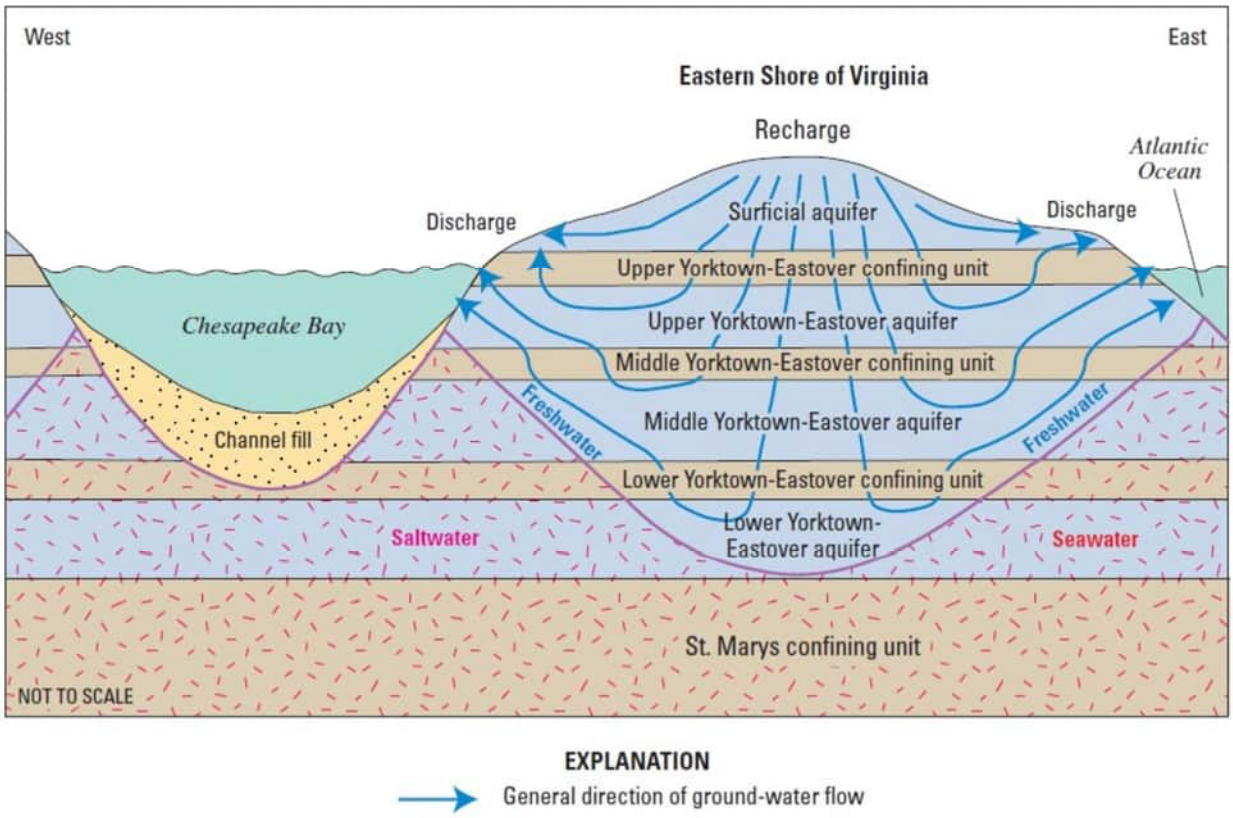
According to the EPA, sea level rise in combination with increased groundwater pumping can increase saltwater intrusion in groundwater aquifers. This can result in increased treatment costs related to desalinization and in severe cases render groundwater wells unusable. Over utilization of the Middle Yorktown-Eastover aquifer has the potential for increasing saltwater intrusion and

contaminating the Town of Onancock's drinking water wells. The Town of Onancock should stay informed on the utilization of the Middle Yorktown-Eastover aquifer and implement conservation efforts as needed. Additionally, the Town of Onancock should stay up to date on current saltwater intrusion research such as coordinating with the Accomack-North Hampton Regional Planning District who are actively researching and implementing aquifer replenishment efforts.

3.5.3 Groundwater Resources

As described in Section 3.1, the Town of Onancock's three groundwater wells withdraw from the confined Middle Yorktown-Eastover aquifer. According to the Town of Chincoteague Water Supply Plan there are four main aquifers within Accomack county suitable for drinking water use and are, in order of increasing depth, Columbia aquifer, and the upper, middle, and lower Yorktown-Eastover aquifers. These freshwater aquifers are divided by confining units comprised of very fine sand, silt, and clay. Because the Yorktown-Eastover aquifers are confined, their groundwater availability is characterized by low recharge rate, high storage, and low susceptibility to contamination. Figure 6 shows a vertical cross section of the aquifers and confining units for the Eastern Show of Virginia.

Figure 5 – Vertical Cross Section of the Eastern Shore of Virginia



Source: USGS Virginia Eastern Shore Groundwater Resources 2021.

3.6 Land Use

3.6.1 Present Land Use

Based on the "National Land Cover Dataset", the land uses of the SWPA are shown in Table 5. As shown in the table, the land uses of the SWPA are predominately cultivated crops and woody wetlands. Figure 6 shows the existing land uses for the SWPA, based on information obtained from the United States Department of Agriculture National Land Cover Dataset. The three wells are located within a residential and commercial area surrounded by residential homes and commercial businesses. There are two gas stations located at the intersections of Market Street and Hill Street and Market Street and Hartman Avenue.

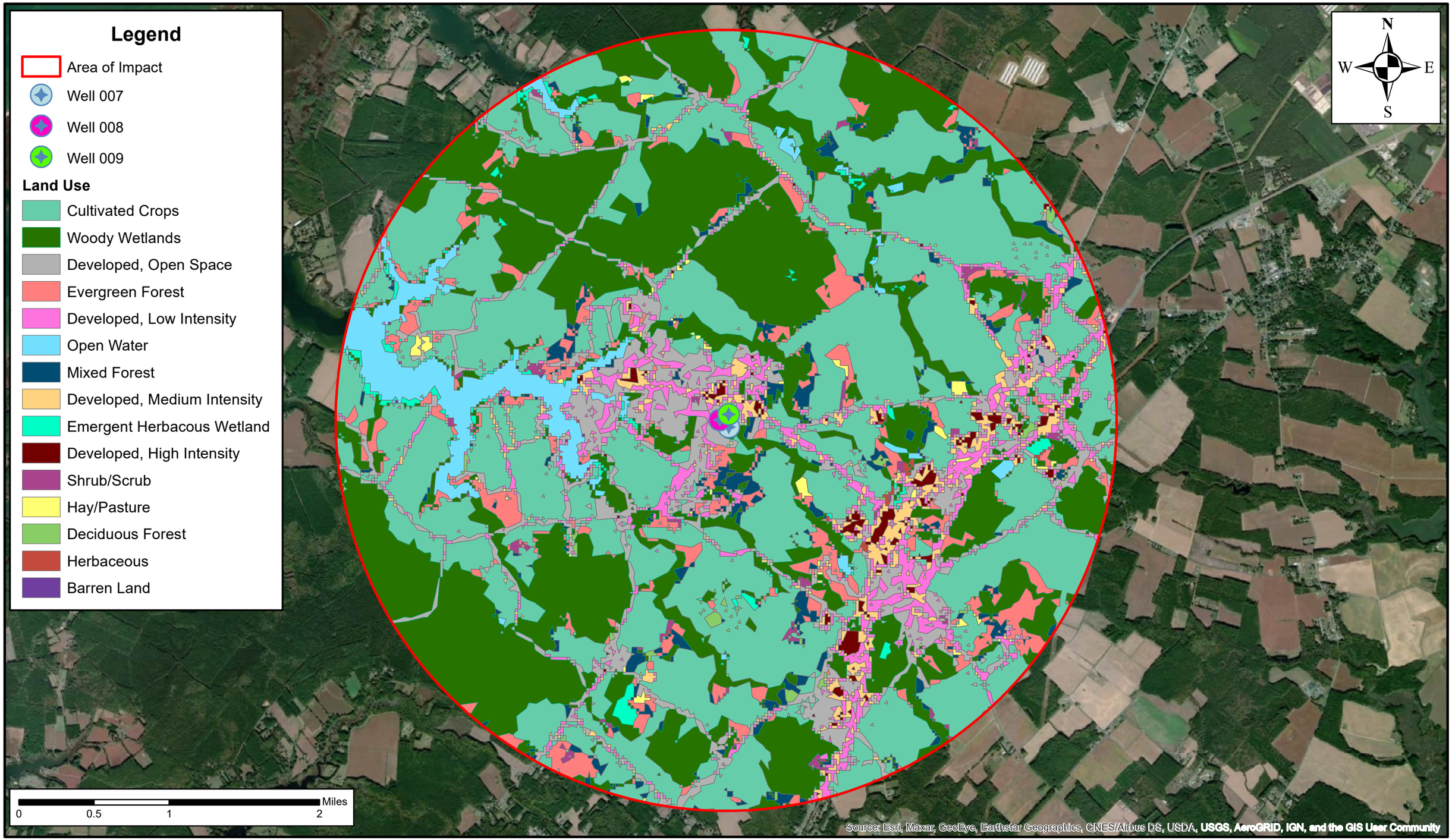
Table #6. Town of Onancock Land Use Data in the SWPA

Land Use Category	Percent Land Cover	Land Use Considerations for Source Water Protection
Open Water	3.5	N/A
Developed, Open Space	8.3	Rapid run-off and no infiltration into soils
Developed, Low Intensity	3.7	
Developed, Medium Intensity	1.8	
Developed, High Intensity	0.6	
Baren Land	0	
Deciduous Forest	0.2	Potential for increased run-off during timbering operations
Evergreen Forest	5.1	
Mixed Forest	2.1	
Shrub/Scrub	0.4	Variable soil infiltration
Herbaceous	0.1	
Hay/Pasture	0.4	Pesticide misuse, fertilizer misuse, animal waste in surface water
Cultivated Crops	42.0	
Woody Wetland	31.2	Can act as natural filters removing pollutants from water and have the potential to retain sediment runoff.
Emergent Herbaceous Wetlands	0.6	
TOTAL	100%	

3.6.2 Future Land Use

The Town of Onancock's Comprehensive Plan was adopted by the Town Council in September 2021. According to the Town of Onancock's Comprehensive Plan, the population has declined 28% since 2000. Due to the lack of population growth expected, developed land use is not expected to significantly increase. The Plan also notes that there are no known underground storage tanks, septic systems or abandoned wells on any of the properties surrounding and immediately adjacent to the Town's groundwater wells. Figure 6 shows the future land use map

from the Accomack County Comprehensive Plan (2018) since the Town of Onancock's Comprehensive Plan did not include future land use mapping.



Source: USDA National Land Cover Dataset by State

Job No: 077507 **NOV 2023**	FIGURE 5	**LAND USE MAP**	1341 Research Center Dr. Suite 2100 Blacksburg, VA 24060 www.chasolutions.com
		TOWN OF ONANCOCK SOURCE WATER PROTECTION PLAN	

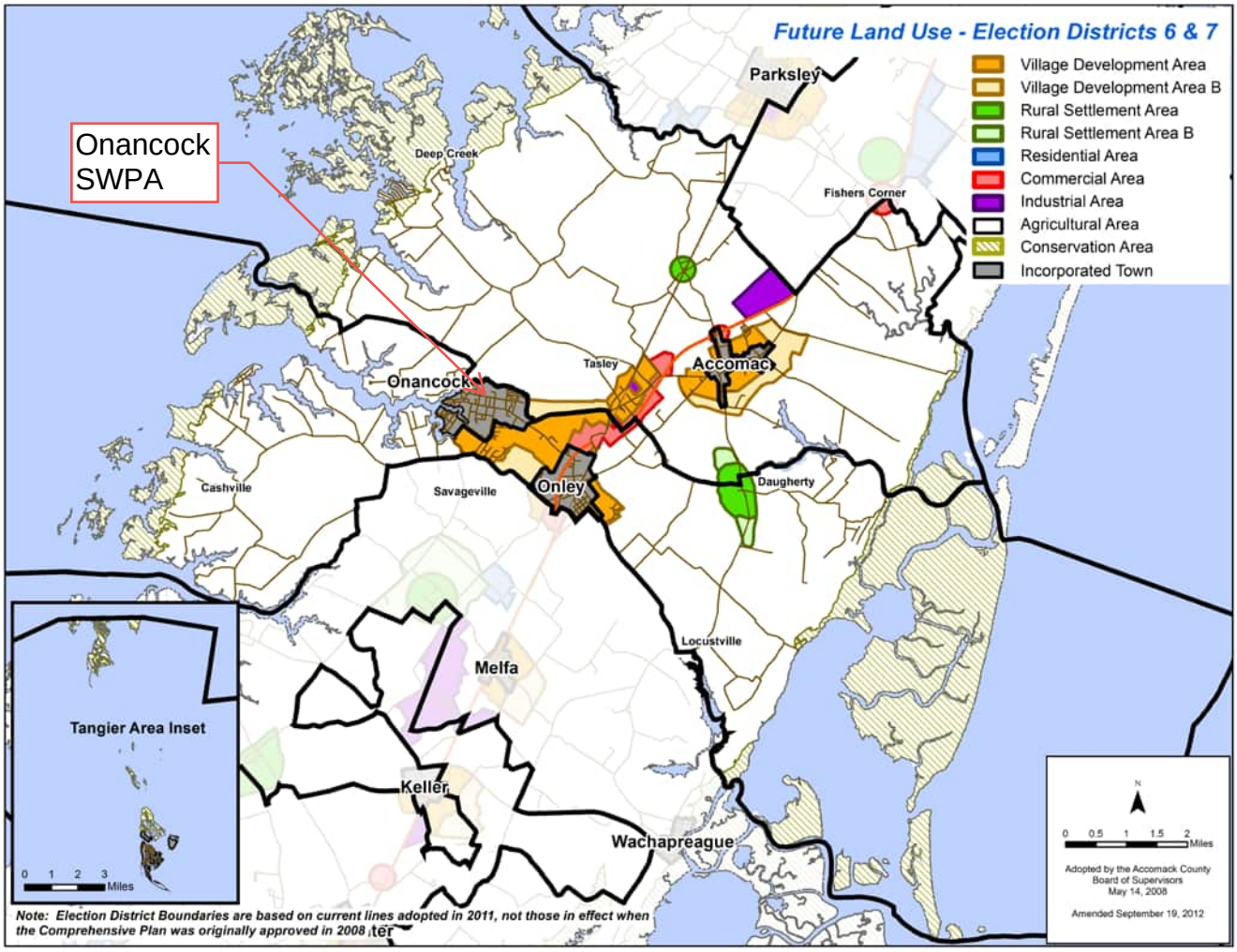


Figure 6 - Future Land Use Map

Source: Accomack County Comprehensive Plan Amended October 2018

4.0 POTENTIAL SOURCES OF CONTAMINATION

4.1 Identifying Existing Potential Sources of Contamination

As discussed in Section 2.1 of this Source Water Protection Plan (SWPP), potential contamination of the SWPA could occur via conduits into the confined aquifer. Based on the high usage of the aquifer as a water source in the area, the greatest potential pathway would occur through the introduction of contaminants from the surface through improperly constructed or defective wells within the SWPA. The private wells that have been identified within the Town of Onancock AOI are shown in Figure 1 and included in the potential conduit inventory.

The risk of contamination varies depending on the type of contaminant and its potential for reaching the groundwater. The highest priority area for protection includes the activities within the groundwater wells within the AOI. The Town of Onancock should use the potential conduits to evaluate the risk posed to the groundwater resources, and the need for protection measures.

VDH develops an inventory of PSC within the designated Zone 1 and Zone 2 SWPAs as described in Section 3.0 through its SWAP. Since the aquifer that the three groundwater wells withdrawal from is a confined aquifer with an identified AOI, the original inventory developed by the SWAP is not shown on Figure 1 and is only included in Appendix A for informational purposes. The potential conduits shown on Figure 1 and included in Appendix A are the biggest threat to the groundwater quality. The potential conduit inventory is summarized in Table 6.

The identification of existing contamination sources will help to address immediate concerns about the protection of the local water supply. A summary listing of various sources of contamination that are commonly considered is included in Appendix A.

Table #6. Town of Onancock Summary of Potential Conduits

Facility Type	Area of Impact
Private Wells	12
Impaired Streams	6
TOTAL	18

The potential conduits of most concern are the 12 privately owned wells located within the AOI.

4.2 Identifying New Potential Sources of Contamination

To ensure that the supply remains uncontaminated, continual review of land use activities and identification of potential sources of contamination and potential conduits is necessary. The Town of Onancock should be aware of the SWPA and AOI when making any decisions regarding land use and future development to ensure sources of contamination and potential conduits do not impact the Town's groundwater supply. Coordination with Accomack County and nearby municipalities may be needed depending on the scale and location of any proposed future development.

5.0 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 Onancock. 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.

5.1 Existing Measures and Activities

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

- Virginia DEQ and VDH requirements for proper construction of new wells and abandonment of inactive or defective wells;
- Monthly and annual water testing;
- Routine maintenance of the water system;
- Security fencing around all wells;
- Town of Onancock Code of Ordinances (Chapter 14 – Environment) which specifies unlawful property maintenance conditions including the accumulation of trash and garbage that may have the potential to impact stormwater quality.
- Town of Onancock Code of Ordinances (Chapter 34 – Utilities, Article IV – Water Conservation) which specifies the measures to be followed in the event a drought or similar inadequate public water supply.
- Accomack County code (Chapter 38, Article III – Erosion and Sediment Control) serves to prevent the degradation of properties, stream channels, waters, and other natural resources of the County of Accomack by establishing requirements for the control of soil erosion, sediment deposition, and nonagricultural runoff and by establishing procedures whereby these requirements shall be administered and enforced.

5.2 Source Water Protection Emergency Response Plan

The Town of Onancock does not currently have an emergency response plan. The “Emergency Response Planning Template for Public Drinking Water Systems” produced for the Rural Community Assistance Partnership (RCAP) National Network and the Rural Community Assistance Corporation (2005) was used to develop a draft Emergency Response Plan. The Emergency Response Plan provides contact information and defines emergency response procedures to aid the waterworks in responding to a source water contamination event. A copy of emergency response materials is included as Appendix C.

5.3 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.

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 D. An example of public education and outreach could include providing

information about source water protection on your waterworks website and Annual Water Quality Report.

5.4 Recommended Actions

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

5.4.1 Public Education

Table #7. Action Plan for Public Education

Action Number	Recommended Action	Planned Completion Date	Actual Completion Date
1	Distribute brochures designed specifically for the waterworks that address the following concerns: (1) a general overview of the importance of source water protection; (2) the local nature of groundwater recharge – what you do matters; (3) concerns with local geology; and (4) a list of general dos and don'ts. Example education materials are located in Appendix D.	1 year	
2	Mail a Source Water Protection brochure to each customer and/or residence in the SWPA as part of the annual consumer confidence report. An example brochure is located in Appendix D.	1 year	
3	Distribute brochures or information on the safe management of pesticides and fertilizers in your home (such as "Better Backyard" available from the Chesapeake Bay program at: http://www.chesapeakebay.net/content/publications/cbp_12259.pdf (This information should be provided to neighboring agriculture land owners where fertilizer is applied.)	1 year	
4	Provide information about source water protection on the Town of Onancock Website and/or Facebook page.	1 year	
5	Provide information about source water protection on the Waterworks Annual Water Quality Report.	1 year	
6	Install signs along roads in high visibility locations near the designated boundary of the SWPA that state "Entering a Source Water Protection Area". (Note that signs on road right-of-way will require approval from VDOT.)	Within 2 years	
7	Encourage local school districts to incorporate source water protection information into their curriculum. Conduct class room visits or class trips to water treatment plant to encourage education about drinking water.	2 year	

5.4.2 Planning and Policy

Table 8 – Action Plan for Planning and Policy

Action Number	Recommended Action	Planned Completion Date	Actual Completion Date
1	Annually review with pertinent emergency response personnel that serve the Town of Onancock community the designated SWPA and appropriate response procedures. Provide an emergency information sheet that shows the SWPA, roads, and emergency contact information. Example notifications to emergency response personnel are provided in Appendix E.	Annually	
2	Review and update the Source Water Protection Plan as needed, but at least once every three to five years.	3 years	
2a	Identify and update the list of potential source contaminants and potential conduits.		
2b	Review educational programs.		
2c	Assess progress on achieving the SWPP goals.		
3	Evaluate and rank the potential risk (from highest to lowest) of each of the potential sources of contamination and potential conduits. Factors to consider are: • Proximity to the source, • Type of contaminates, and • Likelihood of release of contamination.	3 years	
4	Designate a Source Water Protection Overlay District that would: • specify minimum restriction for SWPAs (i.e. provide a generic SWP Overlay), and/or • allow the designation of a specific Overlay District proposed by the locality Concerns that could be addressed include: • restriction of certain types of businesses and activities, • guidelines on approval and abandonment of private wells.	TBD	
5	Hold an annual meeting between the members of the LAC to discuss source water protection information and activities in the community.	Annually	
6	Identify local organizations, volunteer groups, or interested residents that support source water protection efforts in the source water protection area and consider inviting these groups or individuals to join the LAC.	2 years	
7	Coordinate with local solid waste unit and Accomack County as needed to hold an annual household hazardous waste cleanup event for residents.	1 year	
8	Coordinate any planned source water protection measures with Accomack County.	1 year	

Action Number	Recommended Action	Planned Completion Date	Actual Completion Date
9	Upgrade security fencing and signage at the groundwater wells including protection from vehicular accidents	2 years	
10	Coordinate with the Accomack-North Hampton Regional Planning District to keep informed on salt water intrusion studies	Annually	
11	Stay informed on the utilization of the Middle Yorktown-Eastover Aquifer and introduce conservation efforts as needed	Annually	

5.5 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.

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

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: https://www.vdh.virginia.gov/drinking-water/dwsrf/

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/clean-water-financing-and-assistance/nonpoint-source-funding

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

Funding type: low interest loan

Description: The VCWRLF provides low-interest loans to local governments for the planning, design, and construction of wastewater and stormwater treatment facilities and the implementation of nonpoint source pollution control. Over the years the scope of activities under the VCWRLF has been expanded and additional programs have been established to

address agriculture, land conservation, brownfield remediation, and other non-point source water quality issues.
Links:
Land conservation - https://www.deq.virginia.gov/our-programs/water/clean-water-financing-and-assistance/virginia-clean-water-revolving-loan-fund-vcwrlf
Stormwater - https://www.deq.virginia.gov/our-programs/water/clean-water-financing-and-assistance/virginia-clean-water-revolving-loan-fund-vcwrlf/stormwater
Wastewater - https://www.deq.virginia.gov/our-programs/water/clean-water-financing-and-assistance/virginia-clean-water-revolving-loan-fund-vcwrlf/wastewater

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/lwcf

Other Virginia Department of Forestry funding programs
VDF administers a number of programs aimed at promoting healthy forests and wildlife habitats 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/water-quality-protection/community-assistance-water-quality-protection/financial-assistance-programs-protecting-water-quality-in-communities/

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-state#virginia

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/

6.0 REFERENCES

1. Accomack County Comprehensive Plan Amended October 2018. 2018.
2. Accomack County Regional Water Supply Plan. Prepared by Malcom Pirnie, Inc. and the Accomack-Northampton PDC. February 28, 2011.
3. Climate Adaption and Saltwater Intrusion. January 2024. USEPA. https://www.epa.gov/arc-x/climate-adaptation-and-saltwater-intrusion
4. Geologic Map of Virginia 1993. Virginia Division of Mineral Resources. 1993.
5. Town of Chincoteague Water Supply Plan. Town of Chincoteague. 2010.
6. Town of Onancock Comprehensive Plan. Adopted September 27, 2021.
7. Unites States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS). "Web Soil Survey"
8. Virginia Department of Health (VDH). 2009. Engineering Description Sheet Town of Onancock.

APPENDIX A

Potential Conduits and Sources of Contamination Inventory

Virginia Department of Health - Office of Drinking Water

Potential Conduits Inventory

County/City	Town of Onancock	Waterwork:	Town of Onancock
PWSID:	VA3001620		
Source ID:	WL007, WL008, WL009	Facility:	Town of Onancock

Map ID	Distance to Source (miles)	Facility Type	Well Type	Permit ID	Permit Type	Physical Address
1	1.53	Private Well	Drinking/Domestic Use	001-WW-41893	Replacement Well Permit	25461 W Main Street
2	2.56	Private Well	Drinking/Domestic Use	001-WW-36732	Replacement Well Permit	22205 Mini Road
3	1.76	Private Well	Drinking/Domestic Use	001-WW-48533	Replacement Well Permit	24415 Tasley Rd
4	0.55	Private Well	Drinking/Domestic Use	001-WW-47971	Replacement Well Permit	20190 Fairgrounds Rd
5	0.49	Private Well	Drinking/Domestic Use	001-WW-48075	Replacement Well Permit	9 Fairgrounds Rd
6	0.84	Private Well	Drinking/Domestic Use	001-WW-48334	Construction Permit	19142 Greenway Circle
7	1.17	Private Well	Drinking/Domestic Use	001-WW-47724	Replacement Well Permit	25014 Nancock Gardens Rd
8	0.86	Private Well	Drinking/Domestic Use	001-WW-48213	Replacement Well Permit	20365 Fairgrounds Road
9	0.22	Private Well	Drinking/Domestic Use	001-WW-48187	Replacement Well Permit	7 Frances Street
10	1.18	Private Well	Drinking/Domestic Use	001-WW-47682	Replacement Well Permit	24329 Locust Grove Rd.
11	0.72	Private Well	Drinking/Domestic Use	001-WW-47824	Replacement Well Permit	20338 Market Street
12	1.65	Private Well	Drinking/Domestic Use	001-WW-48355	Replacement Well Permit	26097 Savageville Road

		Water Name	Location Description	Impairement Cause
13	N/A	Pungoteague Creek	Tributary that branches off near Dingleys Mill Road and crosses Savageville Road	There are no data with which to assess the Aquatic Life, Wildlife, Fish Consumption and Recreation Uses. Class III, Section 2a. Need data with which to assess the Aquatic Life, Wildlife, Fish Consumption and Recreation Uses.
14	N/A	Joynes Branch	Eastern riverine tributary to the Central Branch of Onancock Creek	The Aquatic Life Use is fully supporting based on DO & pH data meeting criteria @ station @ 7-JOY000.59. The Recreation Use is impairment based on the exceedance of the criteria for E.coli bacteria (2 violates / 9 obs.) @ station 7-JOY000.59 sampled in
15	N/A	Tributaries of Rattrap Creek	Tributaries of Rattrap Creek east of Route 13	There are no data with which to assess the Aquatic Life, Wildlife, Fish Consumption and Recreation Uses. Class III, Section 1a.
16	N/A	Tributaries of Merry Branch	Tributaries of Merry Branch near intersection of Fairgrounds Road and Tasley Road	There are no data with which to assess the Aquatic Life, Wildlife, Fish Consumption and Recreation Uses. Class III, Section 2a. Need data with which to assess the Aquatic Life, Wildlife, Fish Consumption and Recreation Uses. Spilt out Lee Mont
17	N/A	Various tributaries north and south	Various tributaries north and south of Onancock Tangier Fry including Back Creek, Chesconnessex Creek, Cedar Creek, Leatherberry Creek,Finneys Creek, Parkers Creek, Titlow Creek,South BranchOnancock Creek,Warrington Branch,& North BranchOnancockCreek	There are no data with which to assess the Aquatic Life, Wildlife, Fish Consumption and Recreation Uses. Class III, Section 2a. Need data with which to assess the Aquatic Life, Wildlife, Fish Consumption and Recreation Uses
18	N/A	Ross Branch	Tributary to Folly Creek. Riverine section of Ross Branch, segment begins at headwaters extending downstream to start of tidal waters. Located south of Accomack.	The Aquatic Life Use is impaired due to impacts to the stream's benthic population. The Wildlife and Recreation Uses are fully supported. There are no data to assess the Fish Consumption Use. Class III, Section 1a. This assessment unit was included

Source: Potential Conduits Data from VDH Database.

Virginia Department of Health - Office of Drinking Water			
Potential Conduits Summary			
County/City:	Town of Onancock	Waterwork:	Town of Onancock
PWSID:	VA3001620		
Source ID:	WL007, WL008, WL009	Facility:	Town of Onancock
Facility Type			AOI
Private Wells			12
Impaired Streams			6
		Total	18
Source: Potential Conduits Data from VDH Database.			

Virginia Department of Health - Office of Drinking Water

Potential Sources of Contamination Inventory

County/City	Town of Onancock	Waterwork:	Town of Onancock
PWSID:	VA3001620		
Source ID:	WL007, WL008, WL009	Facility:	Town of Onancock

Map ID*	Distance to Source (miles)	Contaminant Type	Facility Type	Property Owner/Business Name	Mailing Address/Location
1	0.144895	Inorganics, SOCs, VOCs	Fuel Storage System	Daniel Shea	19 Hill St, Onancock VA 23417
2	0.161585	Inorganics, SOCs, VOCs	Closed Storage Tank Release	BELL ATLANTIC	150 West Market Street Onancock VA 23417
3	0.172685	Inorganics, SOCs, VOCs	Closed Storage Tank Release	Sepedas Service Center	146 Market St Onancock VA 23417
4	0.184021	Site Specific	Industrial Site	I W Bagwell	PO Box 136, Onancock VA 23417
5	0.188587	Inorganics, SOCs, VOCs	Fuel Storage System	Jo Ann Johnson	PO Box 459, Onancock VA 23417
6	0.195517	Inorganics, SOCs, VOCs	Fuel Storage System	Margaret Fitchell	32 Johnson St, Onancock VA 23417
7	0.196233	Site Specific	RCRA	<Null>	<Null>
8	0.196377	Inorganics, Microbial, SOCs	Cemetery	Mount Holly Cemetery	not found
9	0.203885	Inorganics, SOCs, VOCs	Gasoline Station/Service Center	Jo Ann Johnson	PO Box 459, Onancock VA 23417
10	0.20588	Inorganics, SOCs, VOCs	Gasoline Station/Service Center	Jo Ann Johnson	PO Box 459, Onancock VA 23417
11	0.206372	Inorganics, SOCs, VOCs	Closed Storage Tank Release	CROCKETT REALTY	155 Market Street Onancock VA 23417
12	0.20985	Inorganics, SOCs, VOCs	Gasoline Station/Service Center	Jo Ann Johnson	PO Box 459, Onancock VA 23417
13	0.214867	VOCs	Tire Pile	Jo Ann Johnson	PO Box 459, Onancock VA 23417
14	0.220755	Inorganics, SOCs, VOCs	Closed Storage Tank Release	Onancock Corner Mart	114 Market St Onancock VA 23417
15	0.227034	Inorganics, SOCs, VOCs	Fuel Storage System	Leopoldo Bonilla CO First American	1400 Corporate Dr, Irving Tx 75038
16	0.227437	Inorganics, SOCs, VOCs	Closed Storage Tank Release	ED BLAKES BP	175 Market Street Onancock VA 23417
17	0.230611	Inorganics, SOCs, VOCs	Closed Storage Tank Release	Prospect Corp LLC Property	116 Market St Onancock, 23417
18	0.238212	Inorganics, SOCs, VOCs	Fuel Storage System	Shelton & Sharon Askew	4 Hill St, Onancock VA 23417
19	0.244455	Inorganics, Microbial, SOCs, VOCs	Funeral Home/Mortuary	Evelyn Williams Life	PO Box 218, Onancock VA 23417
20	0.251849	Inorganics, SOCs, VOCs	Fuel Storage System	L-Fosten Chandler Jr	Commonwealth Social Services 19 Sturdis St, Onancock VA 23417
21	0.256745	Inorganics, SOCs, VOCs	Fuel Storage System	James Milliner Life	23 Johnson St, Onancock VA 23417
22	0.314273	Inorganics, SOCs, VOCs	Fuel Storage System	Elizabeth Custis	111 Market St, Onancock VA 23417
23	0.331902	Inorganics, SOCs, VOCs	Fuel Storage System	William Parks	10 Justis St, Onancock VA 23417
24	0.350528	Site Specific	RCRA	<Null>	<Null>
25	0.351447	Site Specific	RCRA	<Null>	<Null>
26	0.384401	Inorganics, SOCs, VOCs	Closed Storage Tank Release	BELL ATLANTIC	Kerr & Pine Street Onancock VA 23417
27	0.397096	Inorganics, SOCs, VOCs	Closed Storage Tank Release	JER Rentals LLC Residential Property	58 Kerr St Onancock, 23417
28	0.410653	Inorganics, SOCs, VOCs	Closed Storage Tank Release	Onancock Armory	67 Kerr St Onancock VA 23417
29	0.568193	Inorganics, Microbial, SOCs, VOCs	Solid Waste Collection/Transfer Site	Eastern Shore Rural Health Systems INC	PO Box 1039, Nassawadox VA 23413
30	0.580905	Inorganics, Microbial, SOCs, VOCs	Solid Waste Collection/Transfer Site	Alice Milligan	not found
31	0.611742	Inorganics, SOCs, VOCs	Closed Storage Tank Release	Manter Property	14 Kerr St Onancock VA 23417
32	0.71987	Inorganics, SOCs, VOCs	Fuel Storage System	Vickie Collins Betz	PO Box 1829, Onancock VA 23417
33	0.741244	Inorganics, SOCs, VOCs	Closed Storage Tank Release	LANKFORD / FISHER COUNTRY STORE	Saxis Road Sanford VA 23426
34	0.74795	Inorganics, SOCs, VOCs	Fuel Storage System	Marvin Kelly	29 North St, Onancock VA 23417
35	0.749397	Inorganics, SOCs, VOCs	Fuel Storage System	Sherman Efaw CO Transamerica	2191 Defense Hwy Suite 400, Croften MD 21114
36	0.756943	Inorganics, SOCs, VOCs	Fuel Storage System	Deadrise Enterprises	8 Kerr St, Onancock VA 23417
37	0.760431	Inorganics, SOCs, VOCs	Fuel Storage System	Freddie Pruitt	6 Pine St, Onancock VA 23417
38	0.768681	Inorganics, SOCs, VOCs	Fuel Storage System	CD and Jo Ann Marsh	PO Box 399, Onancock VA 23417
39	0.784379	Inorganics, SOCs, VOCs	Fuel Storage System	Post Office	US Government (Post Office)
40	0.80363	Site Specific	RCRA	<Null>	<Null>
41	0.815399	Inorganics, SOCs, VOCs	Fuel Storage System	IW Bagwell	PO Box 118, Onancock VA 23417
42	0.837423	Inorganics, SOCs, VOCs	Underground Storage Tanks	Robert Bates Taylor Sr	14 Market St, Onancock VA 23417
43	0.837445	Inorganics, SOCs, VOCs	Fuel Storage System	James Randell c/o First America	1400 Corporate Dr, Irving TX 75038
44	0.897834	Inorganics, Microbial, SOCs	Cemetery	Cokesbury Church	not found

45	0.989799	Inorganics, SOCs, VOCs	Closed Storage Tank Release	Nordstrom Oil Company	King St Onancock VA 23417
46	0.959528	Inorganics, SOCs, VOCs	Marina	Onancock Public Dock	Onancock Creek
47	0.985365	Inorganics, SOCs, VOCs	Open Storage Tank Release	Bagwell Oil Facility	2 Mount Prospect Avenue Onancock VA 23417
48	0.980898	Inorganics, SOCs, VOCs	Open Storage Tank Release	BAGWELL OIL CO INC	2 Mount Prospect Avenue Onancock VA 23417
49	0.977328	Inorganics, SOCs, VOCs	Open Storage Tank Release	BAGWELL OIL CO INC	2 Mount Prospect Avenue Onancock VA 23417
Source: Potential Sources of Contamination Data from VDH Database. *Note: PSCs are not shown on mapping					

Virginia Department of Health - Office of Drinking Water

Potential Sources of Contamination Inventory

County/City:	Town of Onancock	Waterwork:	Town of Onancock
PWSID:	VA3001620		
Source ID:	WL007, WL008, WL009	Facility:	Town of Onancock

Facility Type	Zone 1 Count	Zone 2 Count	Total
Fuel Storage System	7	11	18
Closed Storage Tank Release	5	7	12
Open Storage Tank Release	0	3	3
Solid Waste Collection/Transfer Site	0	2	2
Industrial Site	1	0	1
RCRA	1	3	4
Cemetery	1	1	2
Tire Pile	1	0	1
Gasoline Station/Service Center	3	0	3
Underground Storage Tanks	0	1	1
Marina	0	1	1
Funeral Home/Mortuary	1	0	1
Total	20	29	49

Source: Potential Sources of Contamination Data from VDH Database.

Land Use	Typical Contaminants[1,2,3]	Contaminant Types
COMMERCIAL / INDUSTRIAL		
Auction lots	Livestock sewage wastes; nitrates; phosphates; coliform and noncoliform bacteria; giardia, viruses; total dissolved solids	Inorganics
Automotive Body shops/repair shops	Waste oils; solvents; acids; paints; automotive wastes[4]; miscellaneous cutting oils	Inorganics, SOCs, VOCs
Car washes	Soaps; detergents, waxes; miscellaneous chemicals	
Gas stations	oils; solvents; gasoline, diesel, miscellaneous wastes, lead	
Boat Services/repair/refinishing	Diesel fuels; oil; septage from boat waste disposal area; wood preservative and treatment chemicals; paints; waxes; varnishes; automotive wastes[4]	Inorganics, SOCs, VOCs
Cement / concrete plants	Diesel fuels; solvents; oils; miscellaneous wastes	Inorganics, SOCs, VOCs
Dry cleaners	Solvents (perchloroethylene, petroleum solvents, Freon); spotting chemicals (trichloroethane, methyl chloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate)	VOCs
Electrical/electronic manufacturing	Cyanides; metal sludges; caustic (chromic acid); solvents; oils; alkalis; acids; paints and paint sludges; calcium fluoride sludges; methylene chloride; perchloroethylene; trichloroethane; acetone; methanol; toluene; PCBs	Inorganics, SOCs, VOCs
Food processing / Animal Slaughtering	Nitrates; salts; phosphorus; miscellaneous food wastes; chlorine; ammonia; ethylene glycol	Inorganics, Microbial, VOCs, SOCs
Funeral homes and Mortuaries	External corporeal wash water, internal body fluids, as well as residual arterial embalming chemicals (formaldehyde, phenol, and methanol	Inorganics, Microbial, SOCs, VOCs
Furniture repair/manufacturing	Paints; solvents; degreasing and solvent recovery sludges; lacquers; sealants	Inorganics, SOCs, VOCs
Hardware/lumber/parts stores	Hazardous chemical products in inventories; heating oil and fork lift fuel from storage tanks; wood-staining and treating products such as creosote; paints; thinners; lacquers; varnishes	Inorganics, SOCs, VOCs
Home manufacturing	Solvents; paints; glues and other adhesives; waste insulation; lacquers; tars; sealants; epoxy wastes; miscellaneous chemical wastes	Inorganics, SOCs, VOCs
Hospitals/Research laboratories	X-ray developers and fixers[8]; infectious wastes; radiological biological wastes, disinfectants; asbestos; beryllium; solvents; infectious materials; drugs; disinfectants; (quaternary ammonia, hexachlorophene, peroxides, chlorhexidine, bleach); and miscellaneous chemical wastes.	Inorganics, Microbial, RADs, SOCs, VOCs
Junk/scrap/salvage yards	Automotive wastes[4]; PCB contaminated wastes; any wastes from businesses[6] and households[7]; oils; lead	Inorganics, SOCs, VOCs
Machine shops	Solvents; metals; miscellaneous organics; sludges; oily metal shavings; lubricant and cutting oils; degreasers (tetrachloroethylene); metal marking fluids; mold-release agents	Inorganics, SOCs, VOCs
Medical/vet offices	X-ray developers and fixers[8]; infectious wastes; radiological wastes; biological wastes; disinfectants; asbestos; beryllium; dental acids; variable miscellaneous chemicals	Inorganics, Microbial, RADs, SOCs, VOCs
Metal plating/finishing/ fabricating	Sodium and hydrogen cyanide; metallic salts; hydrochloric acid; sulfuric acid; chromic acid; boric acid; paint wastes; heavy metals; plating wastes; oils; solvents	Inorganics, SOCs, VOCs
Military installations	Wide variety of hazardous and nonhazardous wastes depending on the nature of the facility and operation[9]; diesel fuels; jet fuels; solvents; paints; waste oils; heavy metals; radioactive wastes	Inorganics, RADs, SOCs, VOCs

Office buildings/complexes	Building wastes[6]; lawn and garden maintenance chemicals[5]; gasoline; motor oil	Inorganics, SOCs, VOCs
Parking lots/malls	Hydrocarbons; heavy metals; building wastes[6]	Inorganics, SOCs, VOCs
Pharmaceutical	TSS, oil & grease, fecal coliform, volatile organic compounds, nonconventional pollutants.	Microbial, SOCs, VOCs
Photo processing, print shop	Ethanol, isopropanol, ethylene glycol, xylene, toluene, cyclohexanone, petroleum products, volatile organic compounds, lead, chromium, silver, cadmium, and barium,	Inorganics, SOCs, VOCs
Textiles	Scouring alkali waste, oils, surfactants, lubricants, dye, bleaching (hydrogen peroxide, sodium hypochlorite, sodium chlorite, sulfur dioxide), caustic soda, salts	Inorganics, SOCs
Wood preserving/treating	Wood preservatives; creosote, pentachlorophenol, arsenic, dioxin.	Dioxin, Inorganics, SOCs
Wood/pulp/paper processing and mills	Metals; acids; minerals; sulfides; other hazardous and nonhazardous chemicals[9]; organic sludges; sodium hydroxide; chlorine; hypochlorite; chlorine dioxide; hydrogen peroxide; treated wood residue (copper quinolate, mercury, sodium azide); tanner gas; paint sludges; solvents; creosote; coating and gluing wastes, dioxin.	Dioxin, Inorganics, SOCs
Chemical Processing / Storage		
Above/Below ground storage tanks	Heating oil; diesel fuel; gasoline; other chemicals	Inorganics, SOCs, VOCs
Chemical/petroleum processing/storage	Hazardous chemicals; solvents; hydrocarbons; heavy metals; asphalt	Inorganics, SOCs, VOCs
Coal Gasification Facility	Gas loss, leaching of residual products found in ash residue in the spent gasification cavity (calcium, sodium, sulfate, bicarbonate, metals), condensed liquids (BTEX, phenolic compounds, Polycyclic aromatic hydrocarbons (PAHs) and heterocyclic compounds.	Inorganics, SOCs, VOCs
Pesticide / Herbicide / Fertilizer Manufacture / Distribution / Storage	Wide variety of hazardous and nonhazardous wastes depending on the nature of the facility.	Inorganics, SOCs, VOCs
Plastics/synthetics producers	Solvents; oils; miscellaneous organic and inorganics (phenols, resins); paint wastes; cyanides; acids; alkalis; wastewater treatment sludges; cellulose esters; surfactant; glycols; phenols; formaldehyde; peroxides; etc.	Inorganics, SOCs, VOCs
Disposal		
Solid Waste Collection / Transfer Site	Wide variety of contaminants depending on the historical use. Anthropogenic waste (toxic metals, hydrocarbons, chlorinated hydrocarbons, surfactant-derived compounds, phthalates, pharmaceutical chemicals. Biological waste (ammonia, dissolved organic carbon, aliphatic compounds, phenols, derivates of abietic acid)	Inorganics, Microbial, SOCs, VOCs
Hazardous Waste Recovery Facility / Waste Transfer / Storage / Disposal and Superfund Sites	Wide variety of contaminants depending on historical use.	Inorganics, Microbial, RADs, SOCs, VOCs
Resource Extraction		
Shale Gas extraction / Coalbed methane extractions / Tight sands hydraulic fracturing	Total dissolved solids, fracturing fluid additives: acids, biocides, gel agents, clay stabilizers, corrosion inhibitors, pH adjusting agents, scale inhibitors, surfactants; metals, naturally occurring radioactive materials.	Inorganics, RADs, SOCs, VOCs
Mines/gravel pits	Mine spills or tailings that often contain metals; acids; highly corrosive mineralized waters; metal sulfides; metals; acids; minerals sulfides; other hazardous and nonhazardous chemicals[9]	Inorganics, RADs, VOCs
NON-INDUSTRIAL		
Golf courses	Fertilizers [12]; herbicides[11]; pesticides for controlling mosquitoes, ticks, ants, gypsy moths, and other pests [5]	Inorganics, SOCs, VOCs
Transportation		

Airports (maintenance/fueling areas)	Jet fuels; deicers; diesel fuel; chlorinated solvents; automotive wastes;[4] heating oil; building wastes[6]	VOCs
Barge and Vessel Traffic	Fuel, miscellaneous wastes; oil; variable transported materials	Inorganics, Microbial, RADs, SOCs, VOCs
Boat ramps and marinas	Gasoline, diesel, miscellaneous wastes, lead, waste oil; solvents; gasoline and diesel fuel from vehicles and storage tanks; fuel oil; other automotive wastes[4]; deicing products; variable transported materials	Inorganics, SOCs, VOCs
Fleet / trucking / bus terminals	Waste oil; solvents; gasoline and diesel fuel from vehicles and storage tanks; fuel oil; other automotive wastes[4]	Inorganics, SOCs, VOCs
Primary Roadways / Truck Terminals	Gasoline, diesel, miscellaneous wastes, lead, waste oil; solvents; gasoline and diesel fuel from vehicles and storage tanks; fuel oil; other automotive wastes[4]; deicing products; variable transported materials	Inorganics, Microbial, RADs, SOCs, VOCs
Railroad tracks / yards / maintenance / fueling areas	Diesel fuel; herbicides for rights-of-way [11]; creosote from preserving wood ties; solvents; paints; waste oils	Inorganics, Microbial, RADs, SOCs, VOCs
Agriculture		
Crop and Fodder Production/ Specialty Crop Production/Nursery	Pesticides, herbicides, fertilizers, nitrates.	Inorganics, SOCs, VOCs
Pasture (Grazing)/Confined Animal Feeding Operations/Aquaculture	Nutrients: nitrogen, ammonia, and phosphorus; organic matter; pathogens; parasites, bacteria, and viruses; solid matter; pesticides and hormones; antibiotics, metals	Inorganics, Microbial
Land Disposal		
Cemetery	Microbiological contaminants including *Staphylococcus spp.*, *Bacillus spp., Enterobacteriaceae spp.*, fecal streptococci, *Clostridium spp.*, *Helicobacter pylori*, enteroviruses, rotavirus, calicivirus; arsenic, mercury, formaldehyde, copper, lead, zinc.	Inorganics, Microbial, SOCs
Injection wells/drywells/sumps	Stormwater runoff; spilled liquids; used oils; antifreeze; gasoline; solvents; other petroleum products; pesticides[11]; and a wide variety	Inorganics, Microbial, RADs, SOCs, VOCs
Landfills/dumps (active and closed)	Leachate; organic and inorganic chemical contaminants; waste from households[7] and businesses[6]; nitrates; oils; metals; solvents; sludge	Inorganics, Microbial, SOCs, VOCs
Septic systems	Nitrates; septage; Cryptosporidium; Giardia; coliform[10] and noncoliform bacteria; viruses; drain cleaners; solvents; heavy metals; synthetic detergents; cooking and motor oils; bleach; pesticides;[5,13] paints; paint thinner; swimming pool chemicals;[14] septic tank/cesspool cleaner chemicals[15]; elevated levels of chloride, sulfate, calcium, magnesium, potassium, and phosphate; other household hazardous wastes[7]	Inorganics, Microbial
Utilities		
Urban stormwater management infrastructure	TSS, pesticides and fertilizers, animal waste, metals, oil and grease/hydrocarbons, bacteria and viruses, nitrogen and phosphorus ,	Inorganics, Microbial, SOCs, VOCs
Utility stations/maintenance areas	PCBs from transformers and capacitors; oils; solvents; sludges; acid solution; metal plating solutions (chromium, nickel, cadmium); herbicides from utility rights-of-way	Dioxin, SOCs
Wastewater treatment facilities	Municipal wastewater; sludge[16]; treatment chemicals[17]; nitrates; heavy metals; coliform[10] and noncoliform bacteria; nonhazardous wastes[16]	Inorganics, Microbial, SOCs, VOCs

NOTES
[1] This table lists the most common wastes, but not all potential wastes. For example, it is not possible to list all potential contaminants contained in stormwater runoff or from military installations.

[2] In general, water contamination stems from the misuse and improper disposal of liquid and solid wastes; the illegal dumping or abandonment of household, commercial, or industrial chemicals; the accidental spilling of chemicals from trucks, railways, aircraft, handling facilities, and storage tanks; or the improper siting, design, construction, operation, or maintenance of agricultural, residential, municipal, commercial, and industrial

drinking water wells and liquid and solid waste disposal facilities. Contaminants also can stem from atmospheric pollutants, such as airborne sulfur and nitrogen compounds, which are created by smoke, flue dust, aerosols, and automobile emissions, fall as acid rain, and percolate through the soil. When the contaminants list in this table are used and managed properly, environmental contamination is not likely to occur.

[3] Contaminants can reach water bodies from activities occurring on the land surface, such as industrial waste storage; from sources below the land surface but above the water table, such as septic systems; from structures beneath the water table, such as wells; or from contaminated recharge water.

[4]Automobile wastes can include gasoline; antifreeze; automatic transmission fluid; battery acid; engine and radiator flushes; engine and metal degreasers; hydraulic (brake) fluid; and motor oils.

[5] Common pesticides used for lawn and garden maintenance (i.e., weed killers, and mite, grub, and aphid controls) include such chemicals as 2,4-D; chlorpyrifos; diazinon; benomyl; captan; dicofol; and methoxychlor.

[6] Common wastes from public and commercial buildings include automotive wastes; and residues from cleaning products that may contain chemicals such a xylenols, glycol esters, isopropanol, 1,1,1-trichloroethane, sulfonates, chlorinated phenols, and cresols.

[7] Household hazardous wastes are common household products which contain a wide variety of toxic or hazardous.

[8] X-ray developers and fixers may contain reclaimable silver, glutaraldehyde, hydroquinone, potassium bromide, sodium sulfite, sodium carbonate, thiosulfates, and potassium alum.

[9] The Resource Conservation and Recovery Act (RCRA) defines a hazardous waste as a solid waste that may cause an increase in mortality or serious illness or pose a substantial threat to human health and the environment when improperly treated, stored, transported, disposed of, or otherwise managed. A waste is hazardous if it exhibits characteristics of ignitability, corrosivity, reactivity, and/or toxicity. Not covered by RCRA regulations are domestic sewage; irrigation waters or industrial discharges allowed by the Clean Water Act; certain nuclear and mining wastes; household wastes; agricultural wastes (excluding some pesticides); and small quantity hazardous wastes (i.e., less than 220 pounds per month) generated by businesses.

[10] Coliform bacteria can indicate the presence of pathogenic (disease-causing) microorganisms that may be transmitted in human feces. Diseases such as typhoid fever, hepatitis, diarrhea, and dysentery can result from sewage contamination of drinking water supplies.

[11] Pesticides include herbicides, insecticides, rodenticides, fungicides and avicides. EPA has registered approximately 50,000 different pesticide products for use in the United States. Many are highly toxic and quite mobile in the subsurface. An EPA survey found that the most common pesticides found in drinking water wells were DCPA (dacthal) and atrazine, which EPA classifies as moderately toxic (class 3) and slightly toxic (class 4) materials, respectively

[12] The EPA National Pesticides Survey found that the use of fertilizers correlates to nitrate contamination of groundwater supplies.

[13] Common household pesticides for controlling pests such as ants, termites, bees, wasps, flies, cockroaches, silverfish, mites, ticks, fleas, worm, rates, and mice can contain active ingredients include naphthalene, phosphorus, xylene, chloroform, heavy metals, chlorinated hydrocarbons, arsenic, strychnine, kerosene, nitrosamines, and dioxin.

[14] Swimming pool chemicals can contain free and combined chlorine; bromine; iodine; mercury-based, copper-based, and quaternary algaecides; cyanuric acid; calcium or sodium hypochlorite; muriatic acid; sodium carbonate.

[15] Septic tank/cesspool cleaners include synthetic organic chemicals such as 1,1,1 trichloroethane, tetrachloroethylene, carbon tetrachloride, and methylene chloride.

[16] Municipal wastewater treatment sludge can contain organic matter, nitrates; inorganic salts, heavy metals; coliform and noncoliform bacteria; and viruses.

[17] Municipal wastewater treatment chemicals include calcium oxide; alum; activated alum, carbon, and silica; polymers; ion exchange resins; sodium hydroxide; chlorine; ozone; and corrosion inhibitors.

APPENDIX B

Soil Survey Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Accomack County, Virginia

Area of Impact

November 20, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

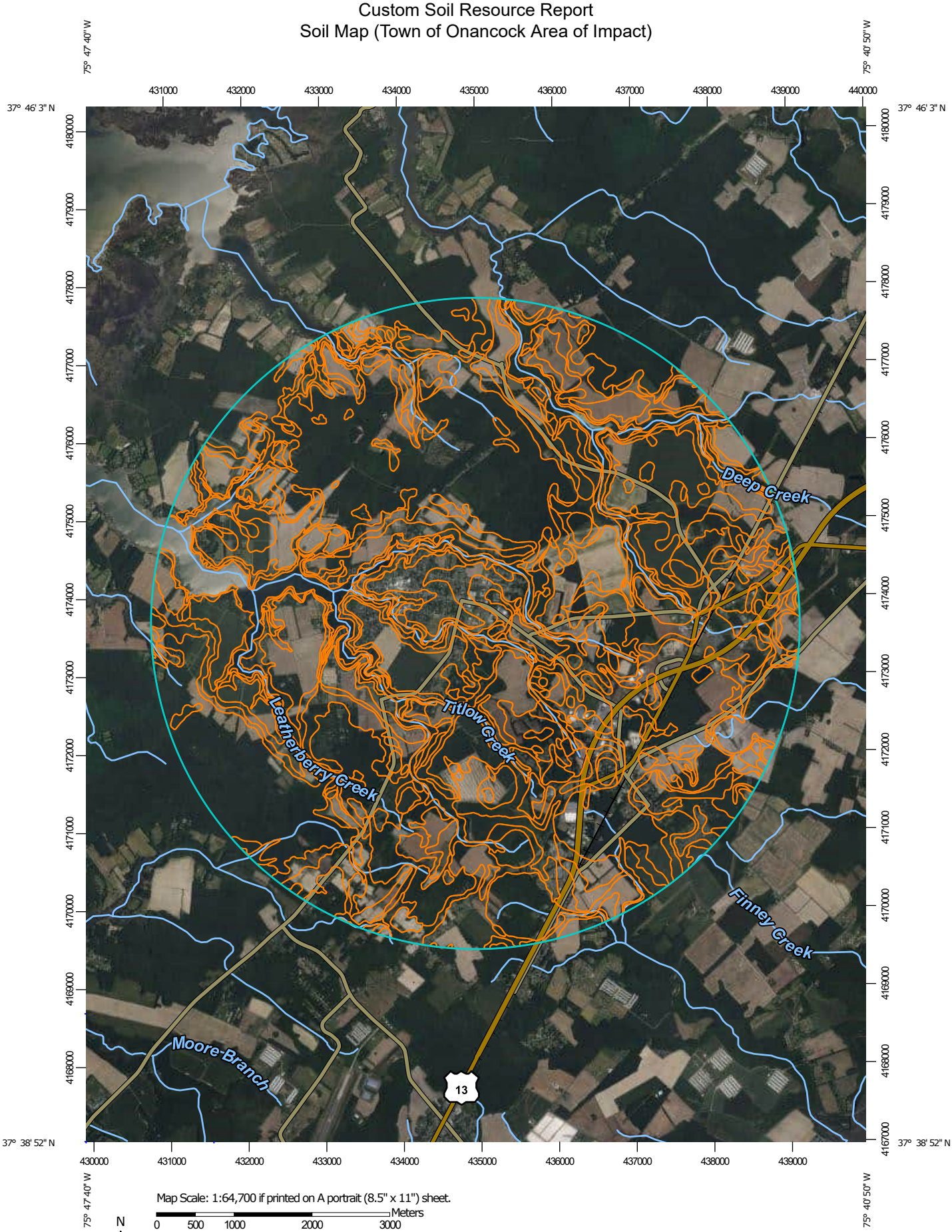
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Town of Onancock Area of Impact)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Accomack County, Virginia
Survey Area Data: Version 19, Aug 25, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 21, 2022—Jul 4, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Town of Onancock Area of Impact)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AmA	Arapahoe-Melfa complex, 0 to 2 percent slopes, frequently flooded	3.3	0.0%
BhB	Bojac loamy sand, 2 to 6 percent slopes	829.8	6.1%
BkA	Bojac sandy loam, 0 to 2 percent slopes	3,081.3	22.7%
DrA	Dragston fine sandy loam, 0 to 2 percent slopes	1,510.3	11.1%
MaA	Magotha fine sandy loam, 0 to 2 percent slopes, frequently flooded	3.5	0.0%
McA	Melfa-Hobucken complex, 0 to 1 percent slopes, frequently flooded	111.1	0.8%
MoB	Molena loamy sand, 0 to 6 percent slopes	26.2	0.2%
MoD	Molena loamy sand, 6 to 35 percent slopes	182.6	1.3%
MuA	Munden sandy loam, 0 to 2 percent slopes	2,340.2	17.2%
NmA	Nimmo sandy loam, 0 to 2 percent slopes	4,447.4	32.7%
PoA	Polawana mucky sandy loam, 0 to 2 percent slopes, frequently flooded	544.3	4.0%
SeA	Seabrook loamy sand, 0 to 2 percent slopes	1.6	0.0%
UpD	Udorthent and Udipsamment soils, 0 to 30 percent slopes	78.4	0.6%
W	Water	429.4	3.2%
Totals for Area of Interest		**13,589.4**	**100.0%**

Map Unit Descriptions (Town of Onancock Area of Impact)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps.

The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Accomack County, Virginia

AmA—Arapahoe-Melfa complex, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 3yvr
Elevation: 0 to 20 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Arapahoe and similar soils: 45 percent
Melfa and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arapahoe

Setting

Landform: Terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine sediments

Typical profile

H1 - 0 to 13 inches: mucky loam
H2 - 13 to 34 inches: loam
H3 - 34 to 85 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D
Ecological site: F153BY060NC - Wet Loamy Flats and Depressions
Hydric soil rating: Yes

Description of Melfa

Setting

Landform: Salt marshes
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Marine sediments

Typical profile

Oe - 0 to 6 inches: mucky peat
H2 - 6 to 13 inches: sandy loam
H3 - 13 to 50 inches: sandy loam
H4 - 50 to 85 inches: coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Maximum salinity: Slightly saline to strongly saline (7.0 to 30.0 mmhos/cm)
Sodium adsorption ratio, maximum: 90.0
Available water supply, 0 to 60 inches: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: A/D
Ecological site: R153BY130NC - Tidal Marsh on Mineral Soil
Hydric soil rating: Yes

BhB—Bojac loamy sand, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 3yvv
Elevation: 10 to 250 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Bojac and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bojac

Setting

Landform: Terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine sediments

Typical profile

H1 - 0 to 7 inches: loamy sand
H2 - 7 to 40 inches: loam
H3 - 40 to 85 inches: sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F153BY030NC - Dry Loamy Rises and Flats
Hydric soil rating: No

BkA—Bojac sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 3yvw
Elevation: 10 to 250 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Bojac and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bojac

Setting

Landform: Terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine sediments

Typical profile

H1 - 0 to 7 inches: sandy loam
H2 - 7 to 40 inches: loam
H3 - 40 to 85 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: A
Ecological site: F153BY030NC - Dry Loamy Rises and Flats
Hydric soil rating: No

DrA—Dragston fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 3yw0
Elevation: 0 to 20 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Dragston and similar soils: 90 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dragston

Setting

Landform: Terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine sediments

Typical profile

H1 - 0 to 6 inches: fine sandy loam
H2 - 6 to 40 inches: loam
H3 - 40 to 85 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 12 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A/D
Ecological site: F153BY040NC - Moist Loamy Rises and Flats
Hydric soil rating: No

Minor Components

Arapahoe

Percent of map unit: 3 percent
Landform: Depressions
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F153BY060NC - Wet Loamy Flats and Depressions
Hydric soil rating: Yes

MaA—Magotha fine sandy loam, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 3yw4
Elevation: 0 to 20 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Magotha and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Magotha

Setting

Landform: Salt marshes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Marine sediments

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 40 inches: fine sandy loam
H3 - 40 to 85 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Maximum salinity: Strongly saline (16.0 to 600.0 mmhos/cm)
Sodium adsorption ratio, maximum: 70.0
Available water supply, 0 to 60 inches: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: B/D
Ecological site: R153BY130NC - Tidal Marsh on Mineral Soil
Hydric soil rating: Yes

McA—Melfa-Hobucken complex, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 3yw5
Elevation: 0 to 10 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Melfa and similar soils: 45 percent
Hobucken and similar soils: 40 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Melfa

Setting

Landform: Tidal flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Marine sediments

Typical profile

Oe - 0 to 6 inches: mucky peat
H2 - 6 to 13 inches: sandy loam
H3 - 13 to 50 inches: sandy loam
H4 - 50 to 85 inches: coarse sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Maximum salinity: Slightly saline to strongly saline (7.0 to 30.0 mmhos/cm)
Sodium adsorption ratio, maximum: 90.0
Available water supply, 0 to 60 inches: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: A/D
Ecological site: R153BY130NC - Tidal Marsh on Mineral Soil
Hydric soil rating: Yes

Description of Hobucken

Setting

Landform: Tidal flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Marine sediments

Typical profile

H1 - 0 to 13 inches: loam
H2 - 13 to 40 inches: loam
H3 - 40 to 85 inches: sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Maximum salinity: Strongly saline (16.0 to 70.0 mmhos/cm)
Sodium adsorption ratio, maximum: 50.0
Available water supply, 0 to 60 inches: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A/D
Ecological site: R153BY130NC - Tidal Marsh on Mineral Soil
Hydric soil rating: Yes

Minor Components

Chincoteague

Percent of map unit: 1 percent
Landform: Salt marshes
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R153BY130NC - Tidal Marsh on Mineral Soil
Hydric soil rating: Yes

MoB—Molena loamy sand, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 3yw6
Elevation: 500 to 1,000 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Molena and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Molena

Setting

Landform: Terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine sediments

Typical profile

H1 - 0 to 8 inches: loamy sand
H2 - 8 to 45 inches: loamy sand
H3 - 45 to 85 inches: sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F153BY030NC - Dry Loamy Rises and Flats
Hydric soil rating: No

MoD—Molena loamy sand, 6 to 35 percent slopes

Map Unit Setting

National map unit symbol: 3yw7
Elevation: 20 to 70 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Molena and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Molena

Setting

Landform: Terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine sediments

Typical profile

H1 - 0 to 8 inches: loamy sand
H2 - 8 to 45 inches: loamy sand
H3 - 45 to 85 inches: sand

Properties and qualities

Slope: 6 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: F153BY030NC - Dry Loamy Rises and Flats
Hydric soil rating: No

MuA—Munden sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 3yw8
Elevation: 0 to 150 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Munden and similar soils: 90 percent
Minor components: 6 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Munden

Setting

Landform: Terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine sediments

Typical profile

H1 - 0 to 8 inches: sandy loam
H2 - 8 to 40 inches: sandy loam
H3 - 40 to 85 inches: loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: F153BY040NC - Moist Loamy Rises and Flats
Hydric soil rating: No

Minor Components

Nimmo

Percent of map unit: 6 percent
Landform: Depressions

Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F153BY060NC - Wet Loamy Flats and Depressions
Hydric soil rating: Yes

NmA—Nimmo sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 3yw9
Elevation: 10 to 100 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Nimmo and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nimmo

Setting

Landform: Terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine sediments

Typical profile

H1 - 0 to 6 inches: sandy loam
H2 - 6 to 32 inches: loam
H3 - 32 to 85 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Ecological site: F153BY060NC - Wet Loamy Flats and Depressions
Hydric soil rating: Yes

Minor Components

Polawana

Percent of map unit: 2 percent
Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F153BY090NC - Flooded Mineral Soil Floodplains and Terraces
Hydric soil rating: Yes

PoA—Polawana mucky sandy loam, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 3ywb
Elevation: 10 to 100 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Polawana and similar soils: 95 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Polawana

Setting

Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Marine sediments

Typical profile

H1 - 0 to 22 inches: mucky sandy loam
H2 - 22 to 85 inches: loamy fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D
Ecological site: F153BY090NC - Flooded Mineral Soil Floodplains and Terraces
Hydric soil rating: Yes

Minor Components

Nimmo

Percent of map unit: 2 percent
Landform: Depressions
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F153BY060NC - Wet Loamy Flats and Depressions
Hydric soil rating: Yes

SeA—Seabrook loamy sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 3ywc
Elevation: 0 to 100 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Seabrook and similar soils: 90 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Seabrook

Setting

Landform: Terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine sediments

Typical profile

H1 - 0 to 10 inches: loamy sand
H2 - 10 to 45 inches: loamy sand
H3 - 45 to 85 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 24 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F153BY020NC - Moist Sands
Hydric soil rating: No

Minor Components

Nimmo

Percent of map unit: 2 percent
Landform: Depressions
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F153BY060NC - Wet Loamy Flats and Depressions
Hydric soil rating: Yes

UpD—Udorthent and Udipsamment soils, 0 to 30 percent slopes

Map Unit Setting

National map unit symbol: 3ywd
Elevation: 0 to 100 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 152 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 45 percent
Udipsamments and similar soils: 35 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Landform: Terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine sediments

Typical profile

H1 - 0 to 10 inches: loam
H2 - 10 to 40 inches: loam

H3 - 40 to 80 inches: loamy sand

Properties and qualities

Slope: 0 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Description of Udipsamments

Setting

Landform: Terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine sediments

Typical profile

H1 - 0 to 10 inches: sand
H2 - 10 to 40 inches: sand
H3 - 40 to 80 inches: sand

Properties and qualities

Slope: 0 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Minor Components

Chincoteague

Percent of map unit: 4 percent
Landform: Salt marshes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

W—Water

Map Unit Setting

National map unit symbol: 3ywf
Frost-free period: 200 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Setting

Down-slope shape: Linear
Across-slope shape: Linear

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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the following National Soil Survey Handbook link: “National Soil Survey Handbook.”

ABC soil

A soil having an A, a B, and a C horizon.

Ablation till

Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

AC soil

A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil

The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil

Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone

A semiconical type of alluvial fan having very steep slopes. It is higher, narrower, and steeper than a fan and is composed of coarser and thicker layers of material deposited by a combination of alluvial episodes and (to a much lesser degree) landslides (debris flow). The coarsest materials tend to be concentrated at the apex of the cone.

Alluvial fan

A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium

Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl

A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM)

The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions

Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon

A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo

The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

Aspect

The direction toward which a slope faces. Also called slope aspect.

Association, soil

A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity)

The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low: 0 to 3
Low: 3 to 6
Moderate: 6 to 9
High: 9 to 12
Very high: More than 12

Backslope

The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp

A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland

A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Bajada

A broad, gently inclined alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically, it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins.

Basal area

The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation

The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology)

A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane

A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology)

from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedding system

A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock

The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography

A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace

A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum

Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout (map symbol)

A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed. The adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Borrow pit (map symbol)

An open excavation from which soil and underlying material have been removed, usually for construction purposes.

Bottom land

An informal term loosely applied to various portions of a flood plain.

Boulders

Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks

A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Breast height

An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management

Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte

An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Cable yarding

A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil

A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche

A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR)

The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy

The leafy crown of trees or shrubs. (See Crown.)

Canyon

A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water

Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena

A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation

An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity

The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps

See Terracettes.

Cement rock

Shaly limestone used in the manufacture of cement.

Channery soil material

Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment

Control of unwanted vegetation through the use of chemicals.

Chiseling

Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque

A steep-walled, semicircular or crescent-shaped, half-bowl-like recess or hollow, commonly situated at the head of a glaciated mountain valley or high on the side of a mountain. It was produced by the erosive activity of a mountain glacier. It commonly contains a small round lake (tarn).

Clay

As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions

See Redoximorphic features.

Clay film

A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clay spot (map symbol)

A spot where the surface texture is silty clay or clay in areas where the surface layer of the soils in the surrounding map unit is sandy loam, loam, silt loam, or coarser.

Claypan

A dense, compact subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. The layer restricts the downward movement of water through the soil. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community

The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil

Sand or loamy sand.

Cobble (or cobblestone)

A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material

Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility)

See Linear extensibility.

Colluvium

Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope

Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil

A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions

See Redoximorphic features.

Conglomerate

A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system

Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage

A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil

Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping

Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section

The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat)

A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology)

A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations)

Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop

A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management

Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system

Growing crops according to a planned system of rotation and management practices.

Cross-slope farming

Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown

The upper part of a tree or shrub, including the living branches and their foliage.

Cryoturbate

A mass of soil or other unconsolidated earthy material moved or disturbed by frost action. It is typically coarser than the underlying material.

Cuesta

An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Culmination of the mean annual increment (CMAI)

The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave

The walls of excavations tend to cave in or slough.

Decreasers

The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing

Postponing grazing or resting grazing land for a prescribed period.

Delta

A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer

A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression, closed (map symbol)

A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and that does not have a natural outlet for surface drainage.

Depth, soil

Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement

A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

Diatomaceous earth

A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope

A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace)

A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming

A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural)

Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface

Runoff, or surface flow of water, from an area.

Drainageway

A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw

A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Drift

A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin

A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Duff

A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune

A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

Earthy fill

See Mine spoil.

Ecological site

An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation

The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation

A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit

Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream

A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation

A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion

The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (accelerated)

Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion (geologic)

Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion pavement

A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface

A land surface shaped by the action of erosion, especially by running water.

Escarpment

A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Escarpment, bedrock (map symbol)

A relatively continuous and steep slope or cliff, produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.

Escarpment, nonbedrock (map symbol)

A relatively continuous and steep slope or cliff, generally produced by erosion but in some places produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.

Esker

A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left

behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Extrusive rock

Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth's surface.

Fallow

Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan remnant

A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

Fertility, soil

The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat)

The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity

The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope

A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil

Sandy clay, silty clay, or clay.

Firebreak

An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom

An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material

Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone

A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain

The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms

A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay

A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step

An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial

Of or pertaining to rivers or streams; produced by stream or river action.

Foothills

A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope

The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb

Any herbaceous plant not a grass or a sedge.

Forest cover

All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type

A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan

A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil

The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai

Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glaciofluvial deposits

Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits

Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil

Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping

Growing crops in strips that grade toward a protected waterway.

Grassed waterway

A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel

Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravel pit (map symbol)

An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel.

Gravelly soil material

Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot (map symbol)

A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area that has less than 15 percent rock fragments.

Green manure crop (agronomy)

A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water

Water filling all the unblocked pores of the material below the water table.

Gully (map symbol)

A small, steep-sided channel caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage whereas a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock

Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim

Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan

A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology)

A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat)

Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops

Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill

A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope

A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil

A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon: An organic layer of fresh and decaying plant residue.

L horizon: A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

A horizon: The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon: The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon: The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon: The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon: Soft, consolidated bedrock beneath the soil.

R layer: Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

M layer: A root-limiting subsoil layer consisting of nearly continuous, horizontally oriented, human-manufactured materials.

W layer: A layer of water within or beneath the soil.

Humus

The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups

Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties include depth to a seasonal high water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock

Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation

The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil

A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers

Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration

The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity

The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate

The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate

The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Very low: Less than 0.2
Low: 0.2 to 0.4
Moderately low: 0.4 to 0.75
Moderate: 0.75 to 1.25
Moderately high: 1.25 to 1.75
High: 1.75 to 2.5
Very high: More than 2.5

Interfluve

A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology)

A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream

A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders

On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions

See Redoximorphic features.

Irrigation

Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin: Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border: Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding: Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation: Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle): Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow: Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler: Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation: Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding: Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame

A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

Karst (topography)

A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll

A small, low, rounded hill rising above adjacent landforms.

Ksat

See Saturated hydraulic conductivity.

Lacustrine deposit

Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain

A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace

A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landfill (map symbol)

An area of accumulated waste products of human habitation, either above or below natural ground level.

Landslide

A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones

Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lava flow (map symbol)

A solidified, commonly lobate body of rock formed through lateral, surface outpouring of molten lava from a vent or fissure.

Leaching

The removal of soluble material from soil or other material by percolating water.

Levee (map symbol)

An embankment that confines or controls water, especially one built along the banks of a river to prevent overflow onto lowlands.

Linear extensibility

Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^{1}/_{3}$- or $^{1}/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit

The moisture content at which the soil passes from a plastic to a liquid state.

Loam

Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess

Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength

The soil is not strong enough to support loads.

Low-residue crops

Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl

An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Marsh or swamp (map symbol)

A water-saturated, very poorly drained area that is intermittently or permanently covered by water. Sedges, cattails, and rushes are the dominant vegetation in marshes, and trees or shrubs are the dominant vegetation in swamps. Not used in map units where the named soils are poorly drained or very poorly drained.

Mass movement

A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses

See Redoximorphic features.

Meander belt

The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar

A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll

One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment

Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil

Very fine sandy loam, loam, silt loam, or silt.

Mesa

A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock

Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth’s crust. Nearly all such rocks are crystalline.

Mine or quarry (map symbol)

An open excavation from which soil and underlying material have been removed and in which bedrock is exposed. Also denotes surface openings to underground mines.

Mine spoil

An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil

Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage

Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area

A kind of map unit that has little or no natural soil and supports little or no vegetation.

Miscellaneous water (map symbol)

Small, constructed bodies of water that are used for industrial, sanitary, or mining applications and that contain water most of the year.

Moderately coarse textured soil

Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil

Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon

A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine

In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil

The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil

Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain

A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can

occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Muck

Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat

See Hemic soil material.

Mudstone

A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation

A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon

A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil

A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules

See Redoximorphic features.

Nose slope (geomorphology)

A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant

Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter

Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low: Less than 0.5 percent
Low: 0.5 to 1.0 percent
Moderately low: 1.0 to 2.0 percent
Moderate: 2.0 to 4.0 percent
High: 4.0 to 8.0 percent
Very high: More than 8.0 percent

Outwash

Stratified and sorted sediments (chiefly sand and gravel) removed or “washed out” from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain

An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace

An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan

A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material

The unconsolidated organic and mineral material in which soil forms.

Peat

Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped

An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment

A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

Pedon

The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation

The movement of water through the soil.

Perennial water (map symbol)

Small, natural or constructed lakes, ponds, or pits that contain water most of the year.

Permafrost

Ground, soil, or rock that remains at or below 0 degrees C for at least 2 years. It is defined on the basis of temperature and is not necessarily frozen.

pH value

A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil

A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping

Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting

Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit

The moisture content at which a soil changes from semisolid to plastic.

Plasticity index

The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology)

A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa

The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite

The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan

A compacted layer formed in the soil directly below the plowed layer.

Ponding

Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded

Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings

See Redoximorphic features.

Potential native plant community

See Climax plant community.

Potential rooting depth (effective rooting depth)

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning

Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil

The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil

A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use

Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and

promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland

Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil

A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid: Less than 3.5
Extremely acid: 3.5 to 4.4
Very strongly acid: 4.5 to 5.0
Strongly acid: 5.1 to 5.5
Moderately acid: 5.6 to 6.0
Slightly acid: 6.1 to 6.5
Neutral: 6.6 to 7.3
Slightly alkaline: 7.4 to 7.8
Moderately alkaline: 7.9 to 8.4
Strongly alkaline: 8.5 to 9.0
Very strongly alkaline: 9.1 and higher

Red beds

Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations

See Redoximorphic features.

Redoximorphic depletions

See Redoximorphic features.

Redoximorphic features

Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*
   B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
   C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
   A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
   B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix

See Redoximorphic features.

Regolith

All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief

The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material)

Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill

A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser

The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut

A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments

Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop (map symbol)

An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit.

Root zone

The part of the soil that can be penetrated by plant roots.

Runoff

The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil

A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline spot (map symbol)

An area where the surface layer has an electrical conductivity of 8 mmhos/cm more than the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has an electrical conductivity of 2 mmhos/cm or less.

Sand

As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone

Sedimentary rock containing dominantly sand-sized particles.

Sandy spot (map symbol)

A spot where the surface layer is loamy fine sand or coarser in areas where the surface layer of the named soils in the surrounding map unit is very fine sandy loam or finer.

Sapric soil material (muck)

The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat)

The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy's Law, a law that describes the rate of water movement through porous media. Commonly abbreviated as "Ksat." Terms describing saturated hydraulic conductivity are:

Very high: 100 or more micrometers per second (14.17 or more inches per hour)

High: 10 to 100 micrometers per second (1.417 to 14.17 inches per hour)

Moderately high: 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour)

Moderately low: 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour)

Low: 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour)

Very low: Less than 0.01 micrometer per second (less than 0.001417 inch per hour).

To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

Saturation

Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification

The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock

A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum

A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil

A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot (map symbol)

An area where, on the average, 75 percent or more of the original surface layer has been lost because of accelerated erosion. Not used in map units in which “severely eroded,” “very severely eroded,” or “gullied” is part of the map unit name.

Shale

Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion

The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short, steep slope (map symbol)

A narrow area of soil having slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.

Shoulder

The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell

The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-coppice dune

A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology)

A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica

A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio

The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt

As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone

An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils

Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole (map symbol)

A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Site index

A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic)

Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slide or slip (map symbol)

A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces.

Slope

The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope alluvium

Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill

The slow filling of ponds, resulting from restricted water transmission in the soil.

Slow water movement

Restricted downward movement of water through the soil. See Saturated hydraulic conductivity.

Sodic (alkali) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodic spot (map symbol)

An area where the surface layer has a sodium adsorption ratio that is at least 10 more than that of the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has a sodium adsorption ratio of 5 or less.

Sodicity

The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity and their respective ratios are:

Slight: Less than 13:1
Moderate: 13-30:1
Strong: More than 30:1

Sodium adsorption ratio (SAR)

A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock

Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil

A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates

Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand: 2.0 to 1.0
Coarse sand: 1.0 to 0.5
Medium sand: 0.5 to 0.25
Fine sand: 0.25 to 0.10
Very fine sand: 0.10 to 0.05
Silt: 0.05 to 0.002
Clay: Less than 0.002

Solum

The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area (map symbol)

A pile of earthy materials, either smoothed or uneven, resulting from human activity.

Stone line

In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones

Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony

Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stony spot (map symbol)

A spot where 0.01 to 0.1 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surrounding soil has no surface stones.

Strath terrace

A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace

One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping

Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil

The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are:

Platy: Flat and laminated

Prismatic: Vertically elongated and having flat tops

Columnar: Vertically elongated and having rounded tops

Angular blocky: Having faces that intersect at sharp angles (planes)

Subangular blocky: Having subrounded and planar faces (no sharp angles)

Granular: Small structural units with curved or very irregular faces

Structureless soil horizons are defined as follows:

Single grained: Entirely noncoherent (each grain by itself), as in loose sand

Massive: Occurring as a coherent mass

Stubble mulch

Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil

Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling

Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum

The part of the soil below the solum.

Subsurface layer

Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow

The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit

The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer

The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil

The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus

Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts

Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine

An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation)

An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field

generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology)

A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes

Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

Texture, soil

The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer

Otherwise suitable soil material that is too thin for the specified use.

Till

Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain

An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil

The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope

The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil

The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements

Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread

The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Tuff

A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.

Upland

An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill

The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation

Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve

A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very stony spot (map symbol)

A spot where 0.1 to 3.0 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surface of the surrounding soil is covered by less than 0.01 percent stones.

Water bars

Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering

All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth’s surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded

Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wet spot (map symbol)

A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit.

Wilting point (or permanent wilting point)

The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow

The uprooting and tipping over of trees by the wind.

APPENDIX C

Source Water Protection Emergency Response Plan

Town of Onancock

Sample
Emergency Response Plan

Contents

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Section 1.
System Information

Keep this basic information easily accessible to authorized staff for emergency responders, repair people, and the news media.

System information

<table>
<tr><td>System Identification Number</td><td colspan="2">VA3001620</td></tr>
<tr><td>System Name and Address</td><td colspan="2">Town of Onancock, 15 North Street Onancock Virginia</td></tr>
<tr><td>Basic Description and Location of System Facilities</td><td colspan="2">Design Capacity: 377,600 gpd
Estimated Water Demand: 288,000 gpd

Source of Supply:
<table>
<tr><th>Well Name</th><th>Depth (feet)</th><th>Aquifer</th></tr>
<tr><td>Well 7</td><td>220</td><td rowspan="3">Middle Yorktown-Eastover</td></tr>
<tr><td>Well 8</td><td>220</td></tr>
<tr><td>Well 9</td><td>220</td></tr>
</table>

Finished Water Storage: 300,000 gallon tank</td></tr>
<tr><td>Location/Town</td><td colspan="2">Onancock, Virginia</td></tr>
<tr><td>Population Served and Service Connections from VDH</td><td>~XXXX people</td><td>___ connections</td></tr>
<tr><td>System Owner</td><td colspan="2">Town of Onancock</td></tr>
<tr><td>Name, Title, and Phone Number of Person Responsible for Maintaining and Implementing the Emergency Plan</td><td colspan="2">Matt Spuck, Town Manager, (757)-787-3363</td></tr>
</table>

Section 2.
Chain of Command – Lines of Authority

The first response step in any emergency is to inform the person at the top of this list, who is responsible for managing the emergency and making key decisions.

Chain of command – lines of authority

Name and Title	Responsibilities During an Emergency	Contact Numbers
Matt Spuck, Town Manager	Makes decision regarding the utilization of an alternative water supply,	(757)-787-3363
Plant Manager	In charge of running water treatment plant, performing inspections, maintenance and sampling and relaying critical information, assessing facilities, and providing recommendations to the water operator or manager.	
Water Operator	In charge of operating the water system, performing inspections, maintenance and sampling and relaying critical information, assessing facilities, and providing recommendations to the water system superintendent.	
Office Administrator	Responsible for administrative functions in the office including receiving phone calls and keeping a log of events. This person will provide a standard carefully pre-scripted message to those who call with general questions. Additional information will be released through the water system manager.	
Field Staff	Delivers door hangers and supports water operator.	

Section 3.
Events that Cause Emergencies

The events listed below may cause water system emergencies. They are arranged from highest to lowest probable risk.

Events that cause emergencies

Type of Event	Probability or Risk (High-Med-Low)	Comments
Earthquake	Low	Have backup communication plan in place. Radios and cell phones may not work after an earthquake.
Hurricane or Tornado	High	Possible with severe storms.
Floods	High	Area located within a flood plain.
High Winds/Thunderstorms	High	System is vulnerable to high wind events. Power may be disrupted.
Ice Storms	Med	These fierce storms have the power to cause major power outages and freeze water pipes. The ice slows the ability of crews to get to areas to make repairs.
Waterborne diseases	Low	Organisms such as Giardia and Cryptosporidium can contaminate water supplies and cause waterborne diseases.
Human-caused events	Low	Human-caused events that can result in a water system emergency include chemical spills, vandalism, terrorism, cyber-attack, fires, construction accidents, and basic neglect of maintaining the system.
Vandalism	Low	Increase lighting, install locks on doors and hatches, and put up security fencing.
Terrorism	Low	Need to be trained on suspicious activity
System Neglect	Low	System neglect, often referred to as deferred maintenance, is a major cause of emergencies.
Cross Connections	Low	Under backflow conditions, unprotected cross-connections can provide a path for biological, chemical, or physical contaminants to enter the water supply.
Construction Accidents	Med	The utility must be aware of construction in and around the system and be prepared to respond quickly to an accident if it happens.
Chemical Spills	Med	Spills can come from motor vehicles, trains, airplanes, boats, or fixed containers. They can occur at any time without warning, and many solvents are able to leach through PVC pipes.

Section 4.
Emergency Notification

Notification call-up lists - Use these lists to notify first responders of an emergency.

Emergency Notification List

Organization or Department	Name & Position	Telephone	Night or Cell Phone	Email
Local Law Enforcement	Town of Onancock Police Department	911 or (757)-787-8577		
	Town of Onancock Police Chief	911 or (757)-787-8577		ewilliams@onancock.com
Fire Department	Town of Onancock Volunteer Fire Department	911 or (757)-787-7778		
	Accomack County Department of Public Safety	(757)-789-3610		safety@co.accomack.va.us
Emergency Medical Services	Town of Onancock Volunteer Fire Department	911 or (757)-787-7778		
Water System Personnel	Matt Spuck, Town Manager	(757)-787-3363		matt.spuck@onancock.com
Key Vendors	Chemical Supplier(s) Diesel Supplier(s) Pump Specialist(s) Power Generator Rentals Bottled Water Service			
Hospitals	Riverside Shore Memorial Hospital	(757)-3022100		website
Nursing Home				

Priority Customers

Organization or Department	Name & Position	Telephone	Night or Cell Phone	Email

State, Federal or Tribal Notification List

Organization or Department	Name & Position	Telephone	Night or Cell Phone	Email
State or Tribal Police	Virginia State Police	804-674-2000		
Regulatory Agency State/Federal/Tribal	Office of Drinking Water VDH	434-836-8416	434-660-1704	
	Department Environmental Quality	540-598-2790		
Authorized Testing Laboratory				

Service / Repair Notifications

Organization or Department	Name & Position	Telephone
Electric		
Electrician		
Gas Supplier		
Water Testing Lab.		
Sewer Utility		
Telephone Co.		
Plumber		
Pump Supplier		
Utility Location		
Call Before you Dig		811
Rental Equipment		
Chemical Supplier		
Well Drilling Co.		
Pipe Supplier		

Media Notification List		
Organization or Department	**Name & Position**	**Telephone**
Newspaper local		
Newspaper local		
Radio		
TV Station		

Notification procedures

Notify water system customers of potential water shortage

Who is Responsible:	Wherever the public water supply diminishes to the extent that the public health, safety and welfare are in danger, the mayor or town council shall declare the existence of a water emergency. Whenever such emergency is declared, the public shall be notified by means selected by the mayor or council. If an emergency exists in the town arising, either wholly or substantially, out of a shortage of water supply, the mayor or the town manager is authorized to order the restriction or prohibition of any or all of the following uses of public water supply: (1) Watering of shrubbery, trees, lawns, grass, plants or other vegetation. (2) Washing of automobiles, trucks, trailers of any other type of mobile equipment, except in facilities operating with a water recycling system approved by the town; provided, further, that any facility operating with an approved water recycling system must prominently display, in public view, a sign stating that such a recycling system is in operation. (3) Washing of sidewalks, streets, driveways, parking areas, service station aprons, exterior of homes, apartments, commercial or industrial or any other outdoor surface. (4) The operation of any ornamental fountain or other structure making a similar use of water. (5) The filling of swimming or wading pools or the refilling of swimming or wading pools which were drained after the effective date of the order. (6) The use of water hydrants for any purpose other than necessary governmental operations. (7) The serving of drinking water in restaurants, cafeterias or any other establishment, unless requested to do so by the individual being served.
Procedures:	• Water system manager confers with key staff to verify problems. • Water system manager organizes staff to develop the message to be delivered to the customers. Customers are notified via an automatic dialer. • Water system manager consults with state drinking water staff regarding the problem. • Water system manager with assistance from staff prepares door hangers, signs and radio message. • Water operator continues to investigate problem and make repairs as necessary. • The water shortage notification will be distributed by: 1. Field staff placing “water shortage notices” on doors and along travel routes. 2. Staff will place signs on main travel routes into the community. 3. Water system manager contacts radio station and requests issuance of the water shortage notice and request to curtail water use. 4. Administrative support person will provide a pre-scripted message to phone callers and log in each phone call. • Water operator continuously updates the water system manager on water shortage. Once water shortage is resolved, re-notify customers.

Alert local law enforcement, state, federal, or tribal drinking water officials, and local health agencies

Who is Responsible:	Town Manager
Procedures:	Town Manager will notify local primacy agency concerning emergencies and seek guidance on consulting with other agencies.

Contact service and repair contractors

Who is Responsible:	Water Plant Manager
Procedures:	Contact subcontract company to authorize repairs and conduct work and investigation of water issues

Contact neighboring water systems, if necessary

Who is Responsible:	Water Plant Manager
Procedures:	Contact neighboring water systems

Procedures for issuing a health advisory

Who is Responsible:	Town Manager
Procedures:	The Town Manager will coordinate the issuance of a health advisory based on guidance from the Virginia Department of Health (VDH) and state/federal regulations.

Other procedures as necessary

Who is Responsible:	
Procedures:	

Section 5.
Effective Communication

Communication with customers, the news media, and the general public is a critical part of emergency response.

Designated public spokesperson

Designate a spokesperson (and alternate) and contact your local primacy agency for delivering messages to the news media and the public.

Designate a spokesperson and alternates

Spokesperson	Alternate
Town Manager	

Health advisories

During events when water quality and human health are in question, it may be necessary to issue a health advisory that gives advice or recommendations to water system customers on how to protect their health when drinking water is considered unsafe. These advisories are issued when the health risks to the consumers are sufficient, in the estimation of the water system, state or tribal, or local health officials, to warrant such advice.

Health advisories usually take the form of a drinking water warning or boil water advisory. Communication during these times is critical. Health advisories should always be well thought out and provide very clear messages.

The U.S. Environmental Protection Agency has put together a number of tools, including fact sheets, brochures, forms, and templates to help prepare for a health advisory. These are on the web at: https://www.epa.gov/waterqualitysurveillance/water-contamination-response-resources/

Section 6.
Response Actions for Specific Events

In any event, there are a series of general steps to take:

1. Analyze the type and severity of the emergency;
2. Take immediate actions to save lives;
3. Take action to reduce injuries and system damage;
4. Make repairs based on priority demand, and
5. Return the system to normal operation.

The following tables identify the assessment, set forth immediate response actions, define what notifications need to be made, and describe important follow-up actions.

A. Power outage

Assessment	The Town of Onancock water system is vulnerable to power outages. There is no backup generator at the raw water pump station. In the event of a power outage at the raw water pump station the system must revert to gravity flow and will decrease to 1.6-1.8 MGD.
Immediate Actions	1. Assess whether the outage is likely to last more than 6 hours. If no, be on alert for changing conditions and monitor storage tanks. If yes, complete the following steps: 2. System will revert to gravity flow. Perform all needed functions to ensure this transition. 3. Implement water shortage response actions to inform customers to cut back on water usage until power is restored.
Notifications	1. Power Company – let them know that a public water system is experiencing an outage and the system's production will be decreased as it reverts to gravity flow. Please ask them to advise how long before the power is restored. 2. Customers – cut back on water usage until power is restored.
Follow-up Actions	1. Turn off any necessary functions required while system operates via gravity flow. 2. Return system to general power supply. 3. Inspect reservoirs and pumping facilities to ensure proper operation. 4. Remove portable source water pump 5. Update ERP as needed.

B. Distribution line break

Assessment	Operator
Immediate Actions	Direct maintenance to fix the line break.
Notifications	Residents affected by line break/boil water notice.
Follow-up Actions	Disinfection and sampling of water line after placing it in service. Update ERP as needed. Rescind boil water notice.

C. Chlorine treatment equipment failure

Assessment	Operator
Immediate Actions	1. Isolate equipment and repair or replace. 2. In case of chlorine release, restrict access to area until completion of cleanup. 3. Notify emergency response personnel. 4. Ensure cleanup is conducted by trained personnel only. Wear adequate personal protective equipment. 5. Remove all combustible and flammable materials. 6. Ventilate area. 7. Consult safety data sheet before any clean up efforts begin. 8. Once clean up is complete proceed with repair or replacement of equipment. 9. Test for chlorine residual at normal sampling points, and in water storage if necessary. 10. As indicated by tests, dose water in storage with chlorine, flush system, or both if necessary.
Notifications	Local government occupational safety and health agency and environmental authorities if spill occurs. Notify emergency response personnel. Have designated personnel ready to immediately notify the NRC, LEPC, and SERC/VDEM. Any release in excess of 10 lbs is a CERCLA reportable release and notification and reporting requirements must be followed. Local primacy agency if inadequate chlorine residual is found.
Follow-up Actions	Retest for residual chlorine and microbial contamination. Update ERP as needed if necessary.

D. Treatment equipment

Assessment	Operator
Immediate Actions	1. Isolate equipment and repair or replace. 2. Consult manufacturer's guidance documents for equipment troubleshooting and repair options. 3. Test treated water for normal treatment performance parameters 4. If treated water is off-spec do not send to treated storage.
Notifications	VDH if inadequate treatment is found. Public notification as per guidance from the VDH, and in accordance of the Safe Drinking Water Act.
Follow-up Actions	Notify public as per guidance from the VDH and send a copy to them in accordance with the Safe Drinking Water Act. Update ERP as needed.

E. Source pump failure

Assessment	Operator and Maintenance Personnel
Immediate Actions	Restart pump and check control panel for causes, have electrician review controls and pump starter, repair or replace pump if required.
Notifications	Notify residents if pump is down over 24 hours to reduce water usage.
Follow-up Actions	Notification of residents when pump is repaired and water service is back to normal. Update ERP as needed.

F. Microbial (coliform, *E. coli*) contamination

Assessment	Operator should consider whether the amount of material could overload the treatment process, or whether the treatment process could be modified by additional filtration or disinfection to treat the material without damaging the system. It is likely that this type of spill would not impact the treatment process and would not need to halt water production.
Immediate Actions	1. Conduct follow up sampling. 2. Disinfect system through storage reservoirs and flushing system through blow offs/hydrants throughout the system. 3. Measure for Chlorine residual and re-sample for bacteria.
Notifications	Public notification as per guidance by VDH, and in accordance with the Safe Drinking Water Act. See EPA guidance on emergency disinfection of drinking water (September 2017, EPA 816-F-15-003).
Follow-up Actions	Send notice to VDH in accordance with the Safe Drinking Water Act. Update ERP as needed.

G. Chemical contamination

Assessment	In the event of a hazardous material or chemical spill, personnel will take measures to ensure their safety is not in jeopardy. An evaluation of the spill in terms of type, quantity and containment will be made. Facility should plan to shut down intake and use secondary intake until it can be assured the spilled material has been cleaned up or traveled downstream past the intake.
Immediate Actions	Upper management will be notified immediately. Intakes will be shut off and alternate water supplies utilized until the spill is cleaned up. If necessary, a company (qualified to do so) will be contacted to the remove and clean up the spill. Water quality testing is recommended to determine when water quality has been restored and when it is safe to return to normal operations.
Notifications	Public notification as per guidance from the VDH, and in accordance with the Safe Drinking Water Act. Waterworks will notify downstream waterworks, in the event of a contamination event so that they may prepare for a potential contamination event.
Follow-up Actions	Send notice to VDH to meet Safe Drinking Water Act. Update ERP as needed.

H. Vandalism or terrorist attack

Assessment	Operator determines severity of the incident.
Immediate Actions	1. Call Town of Onancock Police. 2. Notify VA WARN if necessary. 3. Assess damage and take necessary action; (a) Fix or repair damage (b) Provide additional protection against future actions (c) Mobilize volunteers to notify residents of vandalism to watch for future actions.
Notifications	Call Virginia WARN if necessary.
Follow-up Actions	Completion of repairs, return system to normal. Update ERP as needed.

I. Drought

Assessment	In the event of actual or impending, regional or State-wide drought conditions, the Virginia Department of Health (VDH) has the authority to require actions designed to mitigate the impacts of a drought and protect the safety and welfare of the public. Actions can be required by the VDH either before a water emergency is declared by the Governor (drought warning requirements) or after its declaration.
Immediate Actions	Institute local water restrictions, notify residents of problems. Curtail use by larger users: As directed by Town Manager Implement metering program: As directed by Town Manager Mandatory water conservation measures: As directed by Town Manager
Notifications	Water Operators will notify residents to curtail water usage to inside use only until problem is solved. Public education: Use radio and tv as directed by City officials Other: Contact Accomack County to insure County residents are aware of need for conservation.
Follow-up Actions	System returns to normal by notifying residents. Update ERP as needed.

J. Flood

Assessment	Town Manager determines severity of the incident.
Immediate Actions	1. Once flood has receded, operator will assess flood damage. 2. Operator and any contractors will repair facilities as needed.

Notifications	Post on City webpage and City facebook page if necessary.
Follow-up Actions	Completion of repairs, return system to normal. Update ERP as needed.

K. Earthquake

Assessment	Town Manager determines severity of the incident.
Immediate Actions	1. Inspect intake equipment for damage or evidence of contamination, piping, valves, meters for damage, chemical feed equipment function. 2. Check for power; electrical panels for damage/fire. Current/voltage imbalance at pump motor, loss of phase at pump motor. 3. Determine if adequate pressure exists. Walk buried water lines looking for wet spots. 4. Collect water samples for coliform contamination and disinfectant residual throughout the system. 5. Check storage facility for leaks, foundation cracks, broken or loose rivets or welds, check ladder before using it. 6. Check water level and gauge accuracy.
Notifications	Contact Utilities Director (Thomas Fore) and update on damage assessment.
Follow-up Actions	Completion of repairs, return system to normal. Update ERP as needed.

L. Hazardous materials spill in vicinity of sources or system lines

Assessment	Bridge crossings in SWPA are at high risk for materials to reach waterways in the event of an accident involving hazardous materials.
Immediate Actions	1. Notify emergency personnel. 2. Would seek guidance from Fire District.
Notifications	Hazmat Team will determine severity of the leak and the need to contact others.
Follow-up Actions	Once informed conditions are safe, assess damage, repair facilities, and update ERP as needed.

M. Electronic equipment failure

Assessment	Operator and contracted company.
Immediate Actions	Bring in contractor to fix controls. Backup Leatherwood Creek intake water supply as necessary or contact local water supplier.
Notifications	Residents if controls have failed for a lengthy time and water problems exist. Post information on City Website and City Facebook Page.
Follow-up Actions	If residents were originally notified of problem, inform them that the problem has been resolved. Update ERP as needed.

N. Cyber attack

Assessment	Operator to determine the severity of the attack.
Immediate Actions	1. Assess damage and direct computer system repairs as needed. 2. Repair hardware components (if necessary), replace software, as necessary, install improved electronic security, as necessary. 3. Review Water Plant Emergency Response plan on Cyber Attacks
Notifications	Contact the Town Manager. If determined necessary contact VDH, and local law enforcement.
Follow-up actions	Report completion of repairs to Town Manager. Update ERP as needed.

O. Other

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

Section 7.
Alternative Water Sources

Intertie to adjacent water supply system

Water Systems Within One-Quarter Mile of our System	Feasibility of Connecting
Interconnections with other Public Water Systems:	

Alternate source(s) of water

The Water Treatment Plant Manager or operator will call the Town Manager; the Town Manager will call the VA Department of Health and the County Emergency Response Coordinator for consultation and to put into action the chosen alternative supply.

Alternative Sources	Names	Phone	Availability	Is the Water Safe for Drinking?
Bottled water suppliers	National Guard	TBD	Unknown	No
Tanker trucks in the area available to deliver bulk water	National Guard	TBD	Unknown	No

Source Management
Each tank is separate and can be isolated to provide water to its immediate customers, until supply in tank is gone. In total the tanks have a about 1 day supply. Because of abbott they use 1.5 MGD.

Conservation
Call our Emergency Services Coordinator for mandatory conservation measures

Emergency Treatment
Chemicals dependent on type of contamination; decision made by VDH and Plant Manager

Point of Use Treatment
Up to homeowner

Boiled Water
Emergency Service Coordinator issue notice with VDH; Public Works and local police staff distribute fliers; announcements in all local media

Bottled Water

Buy bottled water; ESCoordinator will contact state agencies for assistance; nearby Wal-Mart has supply as well as Shanendoah Water Company in Roanoke (540-342-5361)

Tank Trucks
ESCoordinator will Contact National Guard for bulk delivery

Section 8.
Returning to Normal Operation

Returning to normal operations

Action	Description and Actions
Inspect, flush, and disinfect the system	Water operator and support staff inspect all system facilities, ensure all water quality tests have been done and the system has been flushed and disinfected if necessary. Water operator makes a report to the water system manager. Water system manager makes decision on current condition of system.
Verify water quality	Water system manager verifies water quality sampling results.
Coordinate with VDH	Water system manager coordinates with VDH on system condition and water quality results.
Notify customers	Water system manager meets with water operator and communications lead to write notice to customers. Water system manager directs communications lead to distribute public notice.

Section 9.
Plan Approval

Plan approval

This plan is officially in effect when reviewed, approved, and signed by the following people:

Name/Title	Signature	Date

APPENDIX D

Educational Materials

Protecting Your Surface Water: What to do:

- Recognize and manage possible sources of contamination on your property.
- Use hazardous products as directed and dispose of them properly.
- Conserve water.
- Use biodegradable soap when washing your car.
- Select plants in your yard that requires low fertilizer application.
- If you have a heating oil tank, check it regularly for leaks.

What NOT to do:

- Do not dispose of used motor oil and other hazardous chemicals by pouring them on the ground, into a storm drain, or down the drain.
- Do not indiscriminately spray pesticide where a pest problem has not been identified.
- Do not divert storm drains or basement pumps into septic systems.
- Do not dump any trash or waste near a sinkhole or streams.

Ways to Get Involved:

- Participate in clean-up activities in your neighborhood.
- Help identify potential sources of contamination in your source water protection area.
- Help educate your neighbors and others about source water protection.

Did You Know?
Just 1 gallon of gasoline can contaminate 1,000,000 gallons of water!

Hazardous Waste Disposal:

Household Hazardous Waste is accepted by:

* Regional Household Hazardous Waste Collection Facility located at Accomack County Painter Convenience Center (16490 Wayside Drive Painter)
More information:
https://www.co.accomack.va.us/home/showpublisheddocument/15689/637849465446170000

A Quick Summary Review of Source Water Protection:

- Your Community is privileged to have extremely high quality drinking water. Conservation of this water is essential.
- Your Community is taking a proactive approach to ensure that your drinking water stays safe and pure.
- You are living on top of your drinking water and your actions can affect the drinking water for the entire community.

More Information is Available:

On Source Water Protection at:
http://www.epa.gov/sourcewaterprotection

On Septic Systems at:
http://water.epa.gov/infrastructure/septic/

On Water Conservation at:
http://www.epa.gov/watersense/

On Watershed Management at:
http://water.epa.gov/type/watersheds/index.cfm

On Hazardous Waste Disposal at:
https://www.epa.gov/hw

For questions regarding the Town of Onancock Source Water Protection Plan, please contact: Matt Spuck.

For reporting a spill or similar emergency please contact: XXX-XXX-XXXX

Source Water Protection Plan:

Keeping Your Water Supply Safe

Town of Onancock

ONANCOCK 1680

Prepared in cooperation with:

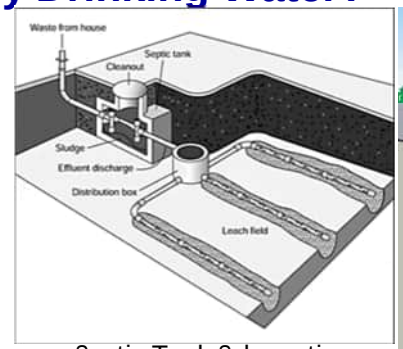
CHA VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

What are the Threats to My Drinking Water?

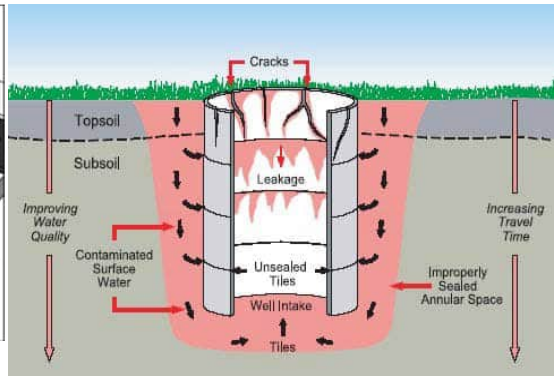
In order to avoid costly remediation, it is vital to reduce or prevent chemical and microbiological contamination of source waters. There are many normal day-to-day activities that could have the unintended consequence of compromising the community's drinking water supply. Some of the activities include:

- 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.
- Improperly secured or improperly constructed private drinking water wells.

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

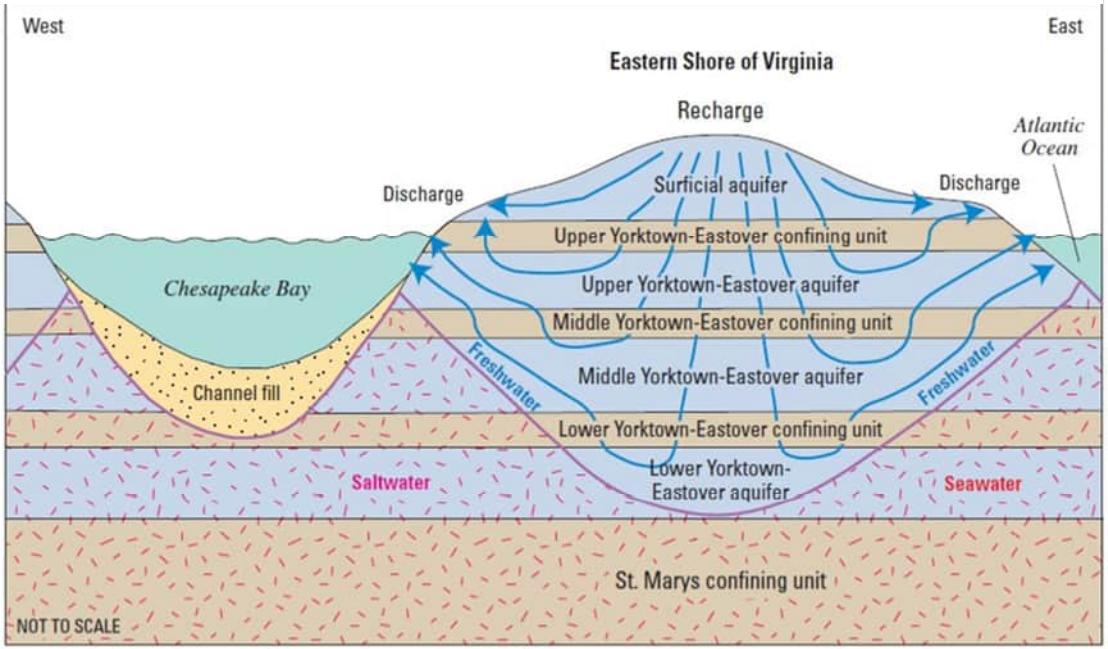


Septic Tank Schematic



Why Should Source Water Protection Matter to Me?

The drinking water that you receive from the Town of Onancock comes from the Middle Yorktown-Eastover Aquifer. The freshwater aquifers are divided by confining units comprised of very fine sand, silt, and clay. Because the Yorktown-Eastover aquifers are confined, their groundwater availability is characterized by low recharge rate, high storage, and low susceptibility to contamination.



Source: USGS Virginia Eastern Shore Groundwater Resources 2021.

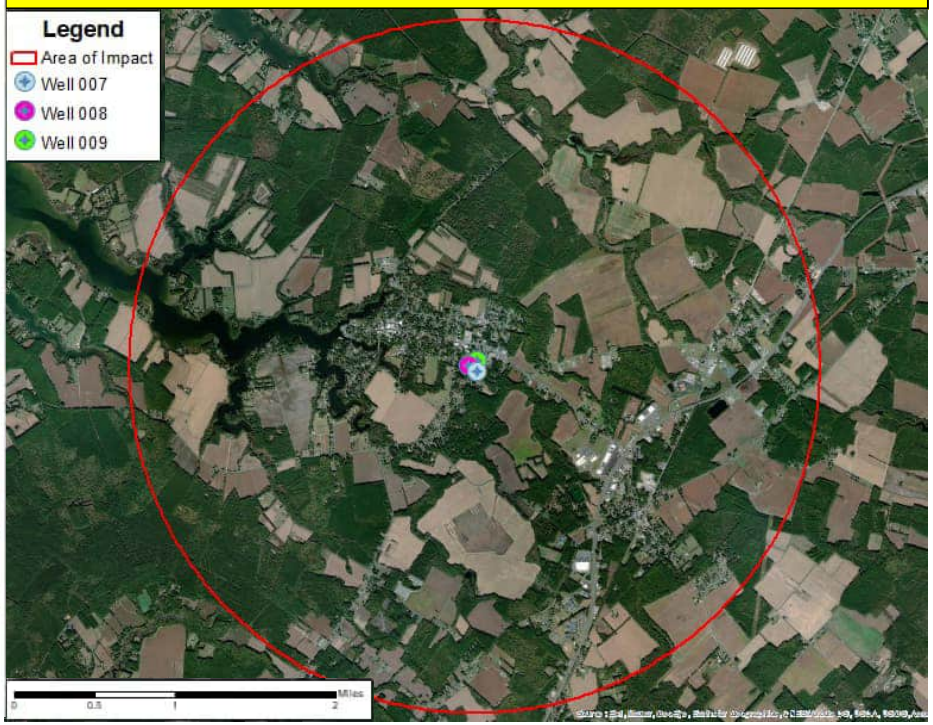
EXPLANATION

General direction of ground-water flow

What is Source Water Protection?

Source Water Protection is a method of preventing contamination of a public water supply by effectively managing potential conduits which could transmit contamination into the groundwater that supplies the Town of Onancock. The Source Water Protection Plan helps safeguard the water supply and everyone in the community needs to be involved for the plan to be successful!

The figure below shows the Source Water Protection Area for the Town of Onancock wells



Out of Sight, Out of Mind?

When it comes to lots of things, once something is out of our sight, we often no longer think about its consequences. Did you ever think about what happens to the salt you threw on your sidewalk last week to melt the ice? When that big pile of snow the snowplow left at the end of the street melted, where did all that salt mixed in the snow go? Water (from melting snow) dissolves that salt (or other contaminates) and can infiltrate into the groundwater that we all drink, especially in areas where sinkholes or other features exist that promote the rapid infiltration of groundwater. Here are some things that you can do to help:

1. Where possible, use non-chemical methods (such as sand/kitty litter for traction).
2. When using salt, use the minimum amount required for effective traction control.
3. Avoid using salt in sinkhole areas and try to direct run off from streets away from sinkholes to prevent contaminated water from rapidly infiltrating into the groundwater. Slow infiltration allows for the soil to act as a filter and remove some types of contamination.

Don't Be a 'Drain' to the Water Supply

The most likely people to contaminate the local water supply are not rogue individuals or a terrorist group, it is you and your neighbors. Well-meaning consumers dispose of hazardous materials down their kitchen and bathroom sinks on a regular basis. Some hazardous household wastes include: paints, household cleaners, herbicides and pesticides, floor/furniture polish, batteries, and automobile fluids. These are items that should not be dumped down drains or disposed of with the curbside trash.

Take Care of Your Septic System So It Won't Poop Out

Septic tanks allow for the storage and treatment of human wastes in areas where no sewer system exists. The treatment occurs by bacterial decomposition resulting in material called sludge. Contamination of your water source groundwater from septic tanks can be caused by several factors. If the drain field is located too close to the drinking water source, then the water may not have time to be filtered sufficiently before it comes out of your tap. Poor design, faulty construction, and incorrect operation and maintenance can also cause problems with the system and lead to contamination of the water supply. Several things you can do to make sure your septic system continues to work effectively include:

1. When possible, do not overload the system with excess use of water. Each system is rated for a certain number of people and certain amount of material.
2. Do not dump hazardous household chemicals (paints, cleaners, auto fluids, etc.), cooking oils, or grease down the drain.
3. Avoid parking cars or other vehicles on the drain field.
4. Try to avoid planting trees on or near the drain field.
5. Maintain your septic system by having your tank pumped every 3-5 years.

Garbage In, Garbage Out

Have you seen the naturally occurring bowl or cone shaped holes in or around your subdivision? These holes known as sinkholes are common in areas where carbonate rocks, which easily dissolve in groundwater, are present below the surface. Historically sinkholes have been inviting sites for people to dump trash and other wastes. However, dumping can contaminate the groundwater since sinkholes act as a direct conduit to the groundwater, your

drinking water source. The direct conduit from the sinkhole to the groundwater allows very little filtering of the material coming in. Think of it as “garbage in (to the sinkhole), garbage out (of your tap)”. Besides direct dumping, sinkholes are also affected by other sources

of contamination including the application of fertilizers, herbicides, and pesticides, leakage associated with improperly lined landfills, and faulty septic systems that seep directly into the groundwater. Prevent potential contamination of your water source by not dumping garbage into sinkholes and minimize the use of chemicals around them. Remember what you put in a sinkhole could end up in your tap.

Are You Fertilizing Your Water?

Have you ever thought about what happens to the fertilizer you put on your grass or in your flower beds? If you over fertilize, the fertilizer might not get completely used and could end up going into your water source. To prevent this from happening, make sure you read and follow the directions on the fertilizer package about the amount and rate of application. You should also fertilize at the times of year and only the plant types specified on the package. If this information is not available on the package, contact the manufacturer. You should also talk with anyone you hire to maintain your lawn or garden to ensure they aren’t over fertilizing. Using the correct application rates at the suggested times for the recommended plants can prevent fertilizer from filtering into the ground and potentially into your water. When you fertilize be careful to not over fertilize or you could end up drinking it.

Who Cares About Rusty Old Tanks?

Ever notice large tanks sticking out of the ground or sitting above the ground? Those tanks are called Above Ground or Underground Storage Tanks (ASTs or USTs). ASTs and USTs can hold a variety of substances such as propane, fuel, or other chemicals and can be found at local businesses, farms, and even private residences. Although storage tanks are great ways to hold large amounts of substances, they can rust and develop cracks over time causing the substances they’re holding to leak into the ground. When these substances leak into the ground they can work their way into your water.

So how can you prevent storage tanks from affecting your water? If you have a storage tank on your property, make sure you check it regularly for signs of leakage. Regular monitoring is the best way to prevent underground storage tanks from leaking. If you notice someone else’s tank is leaking, let them know so they can correct the problem. Placing tanks on concrete pads or asphalt makes leaks more visible and prevents them from getting into the ground. Painting and repairing tanks when you first notice rust or cracks also prevents the tanks from leaking.

How Much Is Too Much?

Sometimes you just need to spray those bugs! Whether Japanese beetles are eating your roses or weeds are overwhelming your grass, pesticides and herbicides are the only way to minimize the damage to your plants, right? Not necessarily.

Integrated pest management (IPM) is the use of biological, cultural and chemical methods to create a comprehensive pest management program. IPM techniques include planting cover crops to prevent weed growth in your garden and putting beneficial insects in your garden to eat the undesirable insects and minimize insect infestations. Another important factor to consider is

buying the right plant for the right place. Plants placed in the required conditions for that plant tend to have fewer insect problems and also require less water. Applying pesticides according to manufacturer's requirements for plant type, rate, and at specified times can also decrease your pesticide use and is considered a part of IPM.

The use of IPM protects the water resources in your area. Not only can you protect local wildlife using IPM, you also can protect your drinking water source. If not applied properly, the chemicals you use in your yard can infiltrate in the ground and contaminate your drinking water source. Think about the chemicals you're spraying in your yard because sometimes the amount you're using just might be too much.

APPENDIX E

Example Correspondence

Insert Address

Re: Town of Onancock Source Water Protection Area

Dear :

The Town of Onancock is taking efforts to protect the community drinking water supply which comes from three groundwater wells located within the Town of Onancock. The Town of Onancock, in conjunction with the Virginia Department of Health and CHA Consulting, Inc., has developed measures that highlight Potential Sources of Contamination and seek to minimize the risk of contamination to the drinking water.

Attached is a map of the associated Source Water Protection Areas (SWPA) for the groundwater wells. The SWPA is the zone where an underground or above-ground spill or similar release of contaminants has the potential to contaminate the water supply.

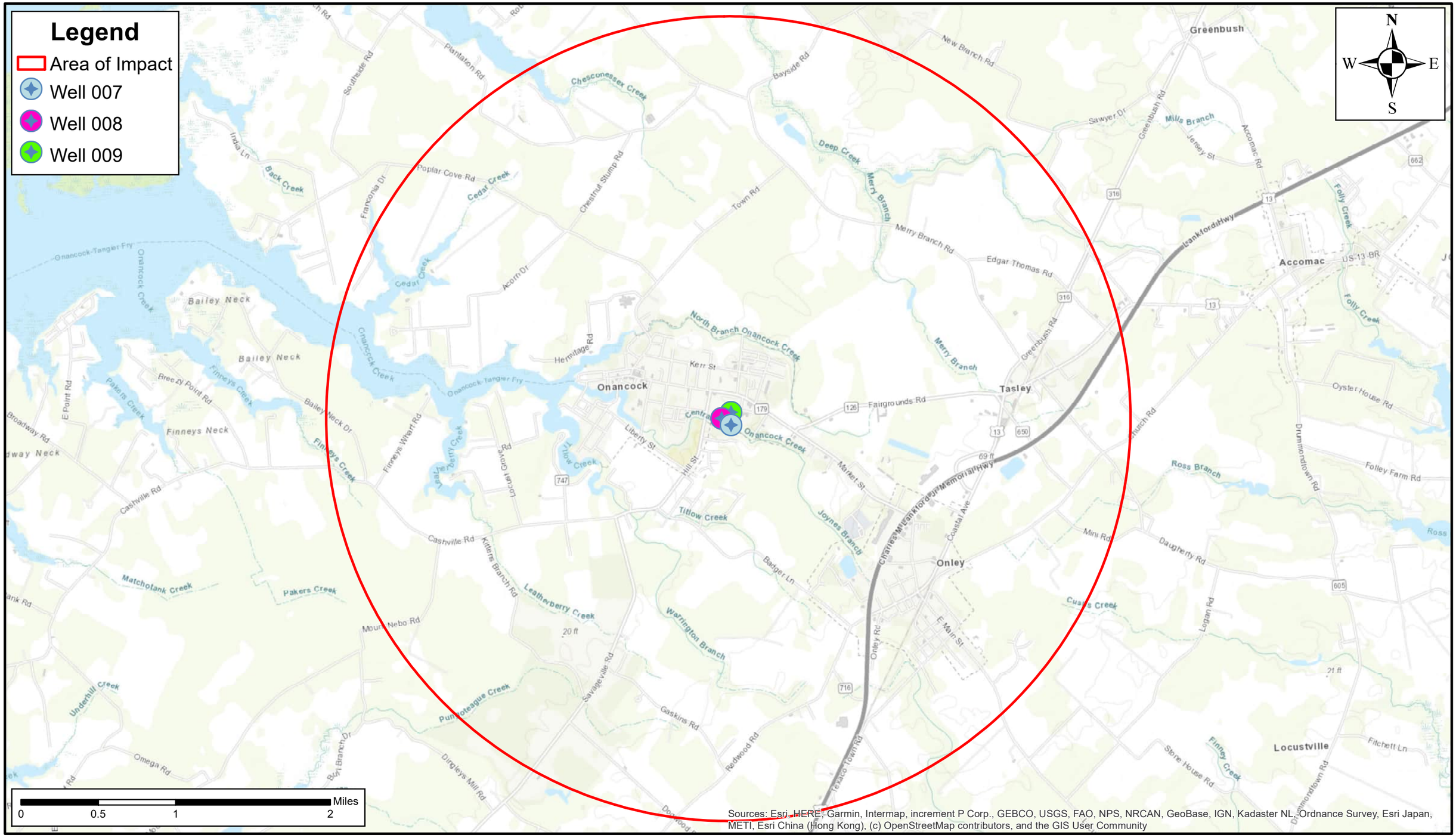
In an event of a spill or an emergency within these areas, that has the potential to impact the groundwater, please notify me as soon as possible at (757) 787-3363. If the spill or emergency occurs during non-working hours or holidays, please notify me as soon as possible XXX-XXX-XXXX.

If you have any questions about this letter or the attached information, please call me (757) 787-3363 or email me at matt.spuck@onancock.com. Thank you for your assistance in this matter.

Sincerely,

Matt Spuck
Town Manager
Town of Onancock

Emergency Departments Contact Information			
Emergency Department Name	**Contact**	**Street Address**	**Mailing Address**
Station 1 - Onancock Volunteer Fire Department	Chief Bryan Appleton	9 Pine Street	PO Box 28 Onancock, VA 23417
Station 2 - Tasley Volunteer Fire & Rescue	Unknown tasleyfireco@gmail.com	23395 Tasley Road	PO Box 68 Tasley, VA 23441
Station 3 - Melfa Volunteer Fire & Rescue	Unknown	28328 Hatton Street	PO Box 100 Melfa, VA 23410
Station 4 - Parksley Volunteer Fire Company	Unknown parksleyvolunteerfireco@gmail.com	18441 Dunne Avenue	PO Box 14 Parksley, VA 23421
Station 5 - Painter Volunteer Fire Company	Unknown painterfire@verizon.net	17116 Wayside Drive	PO Box 275 Painter, VA 23420
Station 6 - Bloxom Volunteer Fire Company	Unknown bloxomvfc@yahoo.com	15312 Bayside Drive	PO Box 132 Bloxom, VA 23308
Station 7 - Wachapreague Volunteer Fire Company	Unknown wachapreaguevfc@verizon.net	1 High Street	PO Box 390 Wachapreague, VA 23480
Station 8 - Tangier Volunteer Fire Company	Unknown tangierfiredept@hotmail.com	16344 Main Ridge Road	PO Box 64 Tangier, VA 23440
Station 9 - Atlantic Volunteer Fire & Rescue	Unknown	10071 Atlantic Road	PO Box 207 Atlantic, VA 23303
Station 10 - Oak Hall Rescue	Unknown	30057 Ambulance Road	PO Box 128 Oak Hall, VA 23416
Station 11 - New Church Volunteer & Rescue	Unknown info@ncvfr.org	4275 Firehouse Street	PO Box 218 New Church, VA 23415
Station 12 - Saxis Volunteer Fire Company	Unknown	8337 Free School Lane	PO Box 98 Saxis, VA 23427
Station 13 - Chincoteague Volunteer Fire Company	Unknown	5052 Deep Hole Road	PO Box 691 Chincoteague, VA 23336
Station 14 - Greenbackville Volunteer Fire Department	Unknown	1468 Ellis Street	PO Box 156 Greenbackville, VA 23356



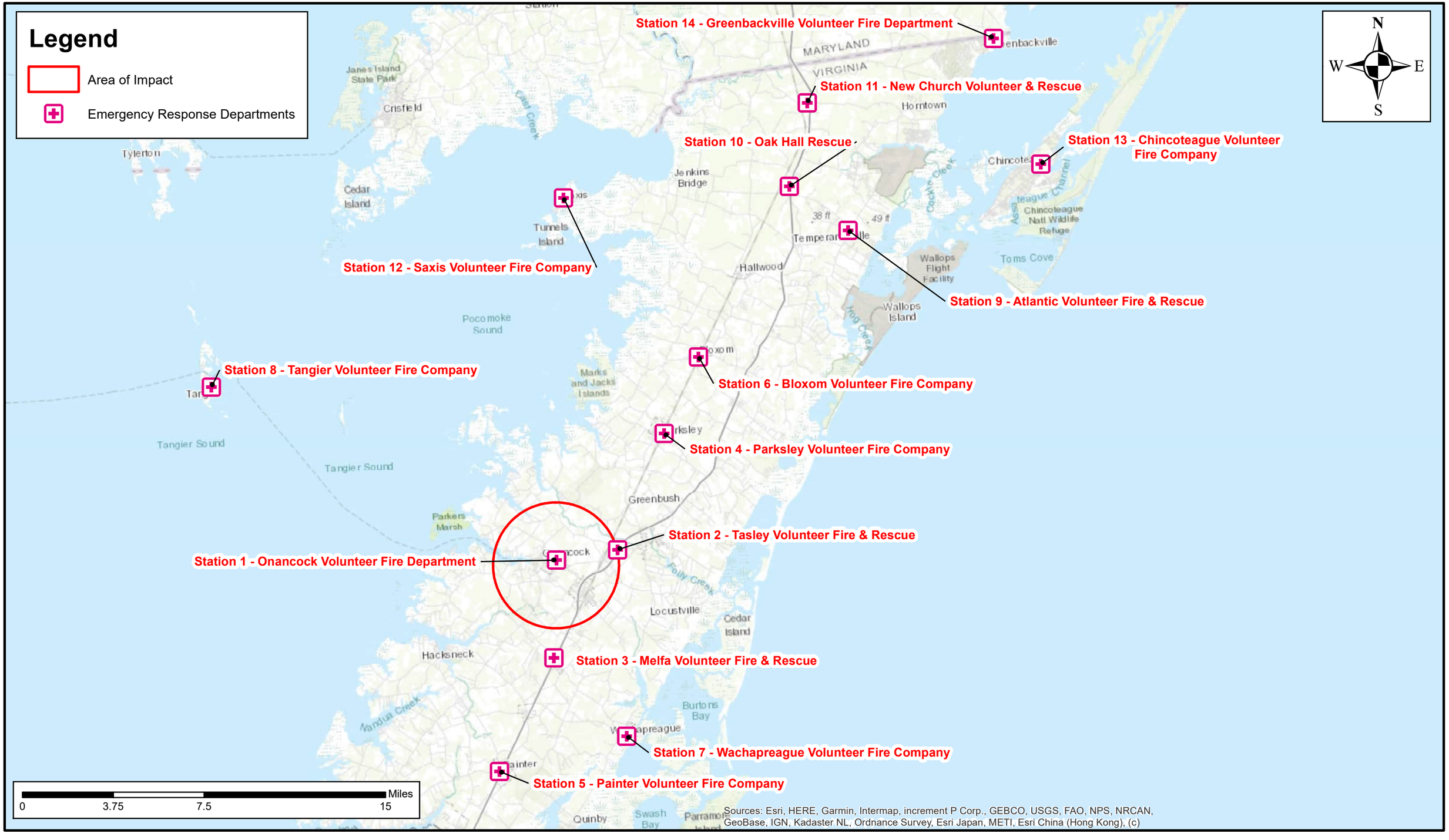
Job No:
077507
NOV 2023

FIGURE 1

SOURCE WATER PROTECTION AREA

TOWN OF ONANCOCK SOURCE WATER PROTECTION PLAN

1341 Research Center Dr.
Suite 2100
Blacksburg, VA 24060
www.chasolutions.com



Job No: 077507 **NOV 2023**	Appendix E	**EMERGENCY RESPONDERS LOCATION MAP** **TOWN OF ONANCOCK SOURCE WATER PROTECTION PLAN**	1341 Research Center Dr. Suite 2100 Blacksburg, VA 24060 www.chasolutions.com

www.chasolutions.com