COMMONWEALTH of VIRGINIA

DEPARTMENT OF HEALTH

OFFICE OF DRINKING WATER

Culpeper Field Office

M. Norman Oliver, MD, MA
State Health Commissioner

400 S. Main Street, 2nd Floor
Culpeper, VA 22701
Phone: 540-829-7340
Fax: 540-829-7337

SUBJECT: Culpeper County
Waterworks: Clevengers Village
PWSID No.: 6047035

September 9, 2019

Paul Howard
Culpeper Co Environmental Svcs
118 West Davis Street, Suite 101
Culpeper, VA 22701

Dear Mr. Howard:

The Virginia Department of Health, Office of Drinking Water has completed a Source Water Assessment for your waterworks. Attached you will find a copy of the assessment. Please note that the susceptibility class assigned is relative and not intended to be a definitive determination.

The Virginia Department of Health is available to provide assistance to waterworks in developing a Source Water Protection Plan. Available forms of assistance include:

- Source Water Protection Plan Development & Implementation Assistance –This program provides assistance to **develop** and **implement** SWPPs, at **no cost to the waterworks**, through engineering firms contracted by VDH. This program is available to community waterworks serving less than 50,000 people which process water directly from a drinking water supply source.
- Wellhead Protection Implementation Projects Grants –This program provides **grants to support the implementation** of wellhead protection projects such as well abandonment, educational outreach, wellhead fencing, advancing ordinances, emergency response planning, hazardous waste collection, and protection area delineation. This program requires that the waterworks have a protection strategy in-place (i.e. a protection plan) and an active source water protection committee.
- Direct Technical Assistance – VDH-ODW can offer a number of forms of technical assistance to waterworks to aid in the development and implementation of protection plans. This assistance includes SWPP templates and instructions to use the templates, GIS mapping (such as the maps included in your Source Water Assessment), and assistance locating source water protection funding opportunities.

For more information on these forms of assistance, please visit our webpage at http://www.vdh.virginia.gov/drinking-water/source-water-programs/, or contact Aaron Moses, PE, Special Projects Engineer at (804)864-7492 or aaron.moses@vdh.virginia.gov.

Because your waterworks is classified as a community waterworks, the following information from the Source Water Assessment must be included in the Consumer Confidence Report issued by the waterworks with a brief summary of the susceptibility to contamination of each drinking water source.

Sincerely,

Duncan Daugherty

Duncan Daugherty
District Engineer
Culpeper Field Office

JLD

Enclosure: Source Water Assessment Report

cc: VDH – Central Office

VIRGINIA DEPARTMENT OF HEALTH
SOURCE WATER ASSESSMENT REPORT

SUBJECT: Culpeper County
PWSID No.: 6047035

Date: August 29, 2019
Waterworks Name: Clevengers Village
Waterworks Owner: Culpeper Co Environmental Svcs

For each source serving the subject waterworks this report includes, maps showing the source water assessment area (divided into Zones 1 and 2 with Zone 1 having greater influence on the source), an inventory of potential sources of contamination, and a rudimentary determination of the source's relative susceptibility to contamination. Information in this report is provided to aid in efforts toward Source Water Protection.

The Source Water Assessment of the subject waterworks has yielded the following results:

Source Name	Relative Susceptibility to Contamination	Explanation
Well 11	High	Ground water or ground water under the direct influence of surface water source constructed in an area that tends to promote migration of contaminants with potential sources of contamination in the Zone 2 assessment area
Well 12	High	Ground water or ground water under the direct influence of surface water source constructed in an area that tends to promote migration of contaminants with potential sources of contamination in the Zone 2 assessment area
Well 16	High	Ground water or ground water under the direct influence of surface water source constructed in an area that tends to promote migration of contaminants with potential sources of contamination in the Zone 2 assessment area
Well 18	High	Ground water or ground water under the direct influence of surface water source constructed in an area that tends to promote migration of contaminants with potential sources of contamination in the Zone 2 assessment area

The susceptibility determination(s) for this waterworks' source(s) were determined using the information detailed on the following table:

Source Name	Source Water Type	Source Sensitivity Determination	Number of Potential Sources of Contamination in Zone 1	Number of Potential Sources of Contamination in Zone 2
Well 11	Groundwater	Sensitive	0	3
Well 12	Groundwater	Sensitive	0	3
Well 16	Groundwater	Sensitive	0	5
Well 18	Groundwater	Sensitive	0	4

The number of Potential Sources of Contamination (PSC) in Zones 1 and 2 are determined from information contained in the VDH-ODW GIS system. This information was predominantly obtained

from the relevant regulating agencies and may not have been recently field verified. If your field inspections do not agree with the supplied Potential Sources of Contamination maps, please contact Aaron Moses, PE, at (804)864-7492 to provide updated information and to request an updated Source Water Assessment Report.

The criteria utilized for delineation of the Source Water Assessment Area is explained in Attachment A, Source Water Assessment Area Delineation. The criteria utilized for placement into a particular susceptibility class is explained on Attachment B, Source Water Susceptibility Determination. The susceptibility class is not intended to be a definitive determination. A list of definitions of key terms used in this report is included on Attachment C.

The following attachments are part of this report:

- Attachment A – Source Water Assessment Area Delineation
  - Zone 1 Potential Sources of Contamination Map (one for each source)
  - Zone 2 Potential Sources of Contamination Map (one for each source)
  - Potential Sources of Contamination Summary (one for each source)
  - Potential Sources of Contamination Inventory (one for each source)
  - Zone 2 Land Use Map (one for each source)
  - Typical Contaminants Compendium
  - Data Bibliography
- Attachment B – Source Water Susceptibility Determination
- Attachment C – Definitions

Note that GIS shape files and digital copies of the attached maps are available from the Culpeper Field Office.

Attachment A
Source Water Assessment Area Delineation

VDH uses three categories of drinking water sources to delineate an assessment area: Groundwater, Groundwater Under the Influence of Surface Water (GUDI), and Surface Water. All assessment areas are segregated into Zone 1 and Zone 2 assessment areas.

The Zone 1 assessment area is a priority zone for managing potential sources of contamination where contamination is believed to pose the greatest risk. The Zone 2 assessment area is a secondary zone for managing potential sources of contamination where the time of travel for contaminants to reach the source is expected to be greater than in Zone 1.

Source Water Assessment Areas are determined as follows:

Ground Water Assessment Area

- Zone 1 = 1000-foot fixed radius surrounding source
- Zone 2 = 1-mile fixed radius surrounding source and outside of Zone 1

Surface Water Assessment Area

- Zone 1 = Watershed area within a 5-mile fixed radius of the raw water intake
- Zone 2 = Total watershed area outside of Zone 1

Ground water Under the Direct Influence of Surface Water

With no identified flowing surface source

- Zone 1 = 1000-foot fixed radius surrounding source
- Zone 2 = 1-mile fixed radius surrounding the source and outside of Zone 1

With identified flowing surface source

- Zone 1 = 1000-foot fixed radius surrounding source
- Zone 2 = Total watershed area upgradient of the source and outside of Zone 1

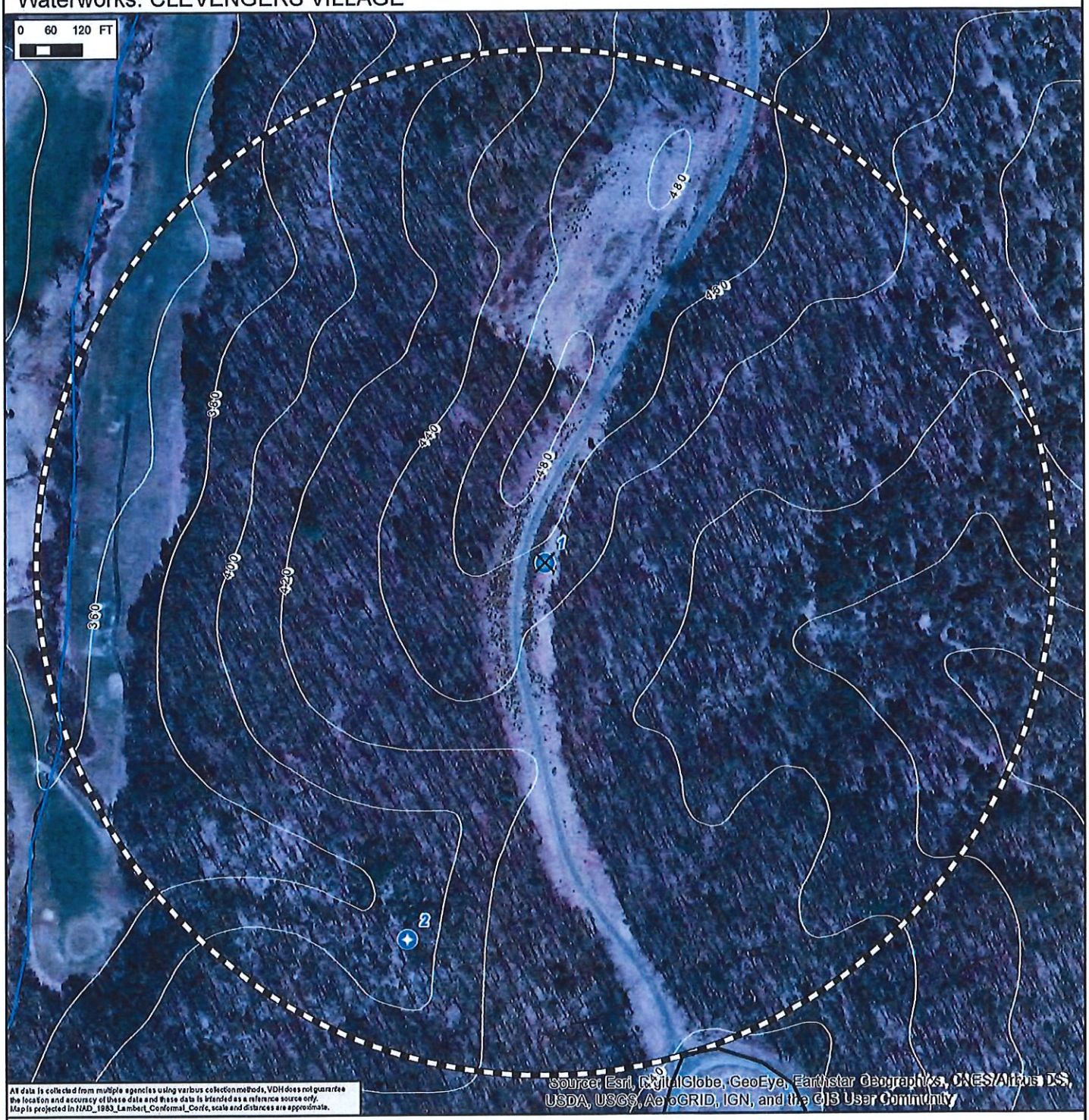
Please see maps in this attachment for information specific to you source(s).

PWSID: 6047035.0
Source ID: WL001
Facility: WELL 11
Waterworks: CLEVENGERS VILLAGE

Swap Zone 1

Date: 11/1/2018

TINWSF_IS: 2682192.0
Jurisdiction: CULPEPER
District: DISTRICT 09



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- Source
- Intake
- Well
- GUDIS
- Floodplains
- 100 Year
- 500 Year
- Streams
- Contours
- Waterbodies
- Other PSC
- Mines - Other
- Mines - Abandoned
- Mines - Active
- Injection Wells
- Tire Piles
- Superfund
- Marinas
- Landfills
- Industrial
- Hospitals
- RCRA
- Golf Courses
- NPDES
- Petroleum Tank - Active
- Petroleum Tank - Closed
- Boat Ramps
- Airports
- Oil Gas Wells
- Impaired Streams
- Roads
- Rails
- Petroleum Pipeline
- Natural Gas Pipeline
- Zone 1
- Zone 2
- Impaired Waterbodies
- Karst Area

PWSID: 6047035.0
Source ID: WL001
Facility: WELL 11
Waterworks: CLEVENGERS VILLAGE

SWAP Zone 2

Date: 11/1/2018

TINWSF_IS: 2682192.0
Jurisdiction: CULPEPER
District: DISTRICT 09

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VIRGINIA DEPARTMENT OF HEALTH - OFFICE OF DRINKING WATER

POTENTIAL SOURCES OF CONTAMINATION SUMMARY

County\City: CULPEPER PWSID: 6047035 Source ID: WL001

Facility: WELL 11 Waterworks: CLEVENGERS VILLAGE

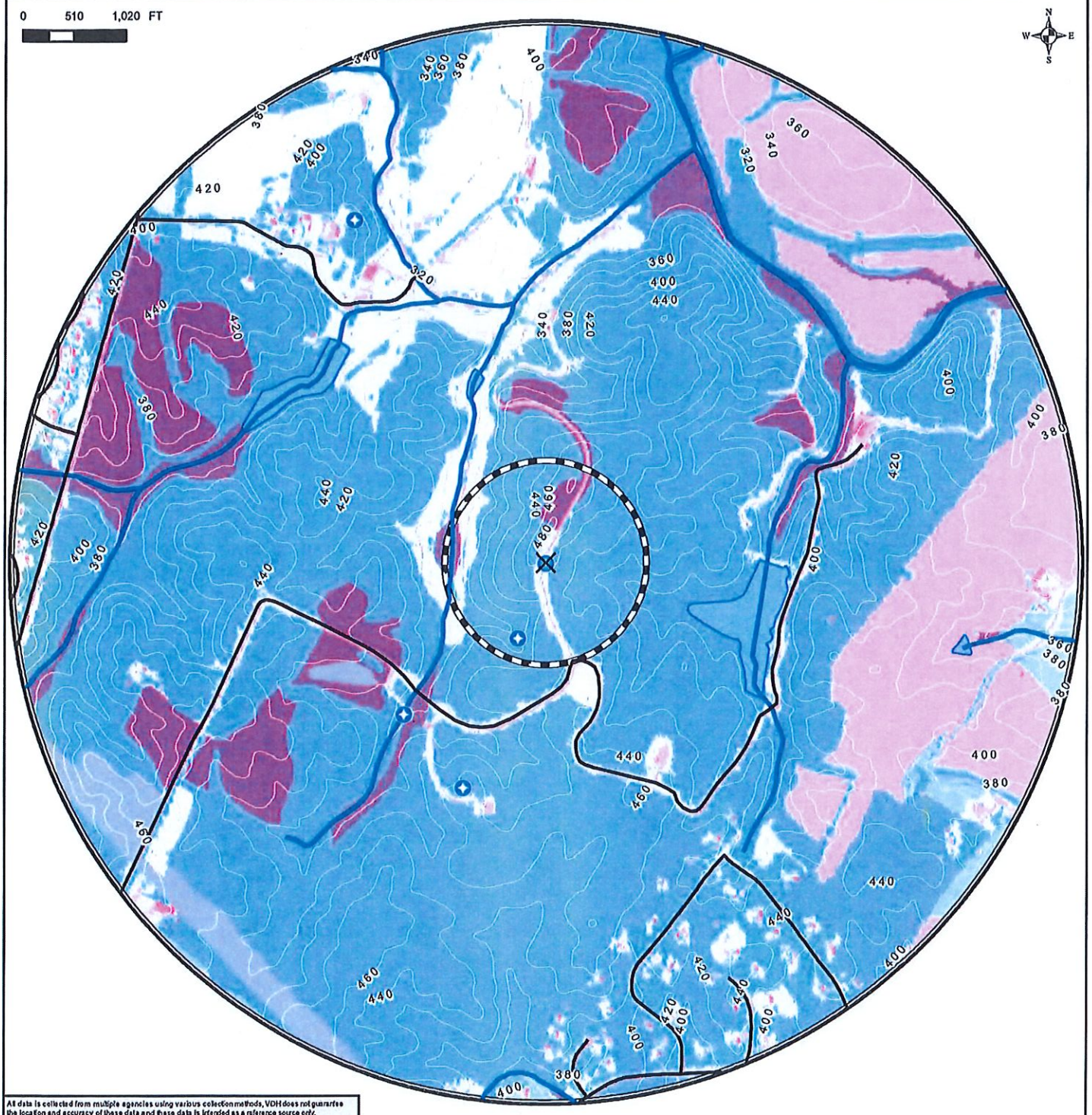
Facilty Type	Zone 1 Count	Zone 2 Count	Total
Golf Course	0	1	1
Other PSC	0	1	1
Point Discharge	0	1	1
Sum	0	3	3

PWSID: 6047035.0
Source ID: WL001
Facility: WELL 11
Waterworks: CLEVENGERS VILLAGE

SWAP Zone 2 Land Use

Date: 11/1/2018

TINWSF_IS: 2682192.0
Jurisdiction: CULPEPER
District: DISTRICT 09



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- Zone 1
- Zone 2

- Roads
- Rails
- Impaired Streams
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- Impaired Waterways
- Waterbodies

Land Use

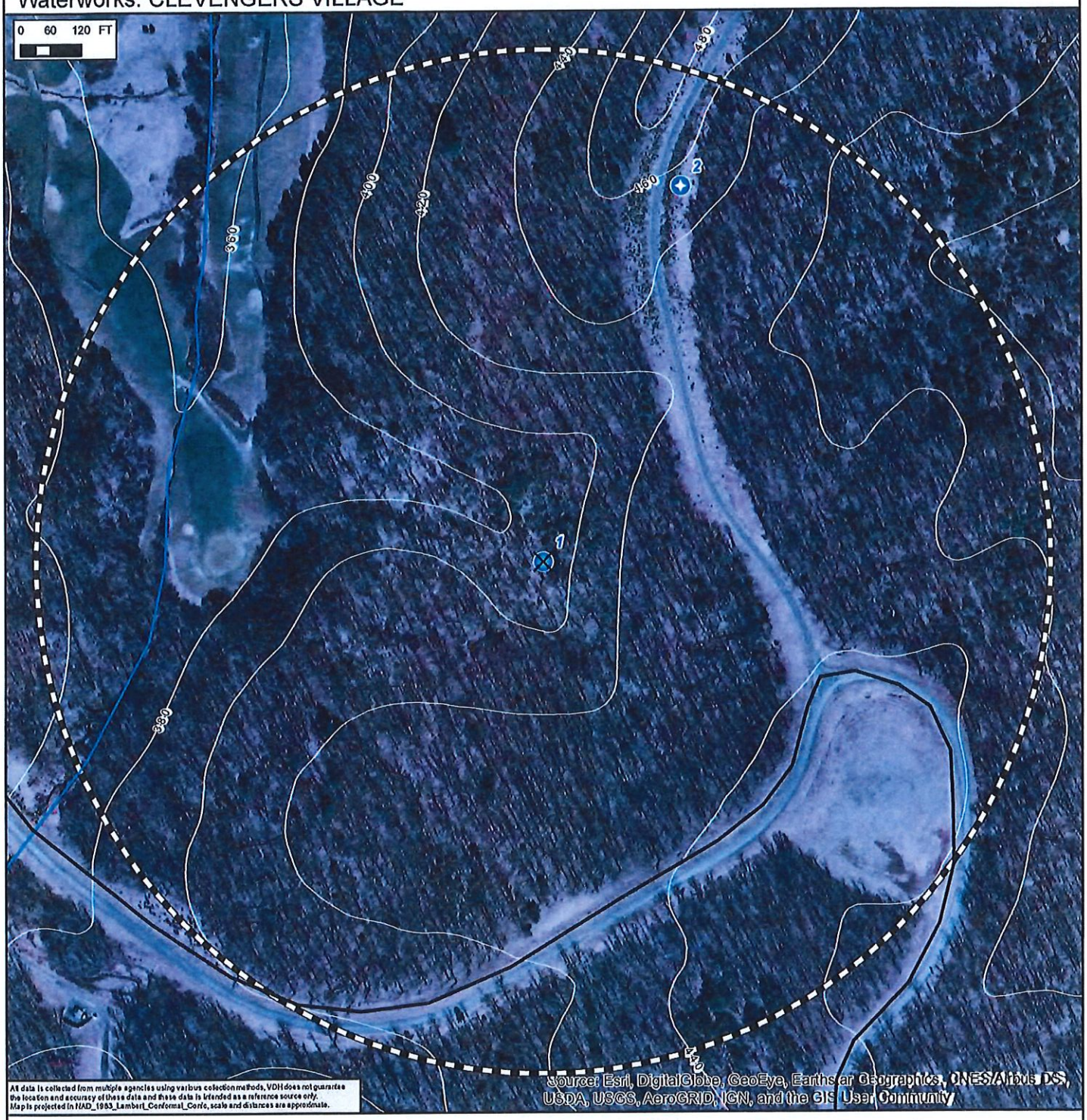
- Additional Extracted Impervious
- Barren
- Crop
- Forest Harvest
- Hardwood Forest/Pine Forest/Mixed Forest
- Local Buildings/Roads/Pavement
- Pasture
- Scrub
- Trees
- Turf/Grass
- Water
- Wetland

PWSID: 6047035.0
Source ID: WL002
Facility: WELL 12
Waterworks: CLEVENGERS VILLAGE

Swap Zone 1

Date: 11/1/2018

TINWSF_IS: 2682196.0
Jurisdiction: CULPEPER
District: DISTRICT 09



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- Mines - Abandoned
- Mines - Active
- Injection Wells
- Tire Piles
- Superfund
- Marinas
- Landfills
- Industrial
- Hospitals
- RCRA
- Golf Courses
- NPDES
- Petroleum Tank - Active
- Petroleum Tank - Closed
- Boat Ramps
- Airports
- Oil Gas Wells
- Impaired Streams
- Roads
- Rails
- Petroleum Pipeline
- Natural Gas Pipeline
- Zone 1
- Zone 2
- Impaired Waterbodies
- Karst Area

PWSID: 6047035.0
Source ID: WL002
Facility: WELL 12
Waterworks: CLEVENGERS VILLAGE

SWAP Zone 2

Date: 11/1/2018

TINWSF_IS: 2682196.0
Jurisdiction: CULPEPER
District: DISTRICT 09

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- Zone 2
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- Karst Area

VIRGINIA DEPARTMENT OF HEALTH - OFFICE OF DRINKING WATER

POTENTIAL SOURCES OF CONTAMINATION SUMMARY

County\City: CULPEPER PWSID: 6047035 Source ID: WL002

Facility: WELL 12 Waterworks: CLEVENGERS VILLAGE

Facilty Type	Zone 1 Count	Zone 2 Count	Total
Golf Course	0	1	1
Other PSC	0	1	1
Point Discharge	0	1	1
Sum	0	3	3

VIRGINIA DEPARTMENT OF HEALTH - OFFICE OF DRINKING WATER

Potential Sources of Contamination Inventory

County/City: CULPEPER | Waterworks: CLEVENGERS VILLAGE | PWSID: 6047035 | Source ID: WL002 | Facility: WELL 12

Evaluated by: | Date: | Reviewed by: | Date:

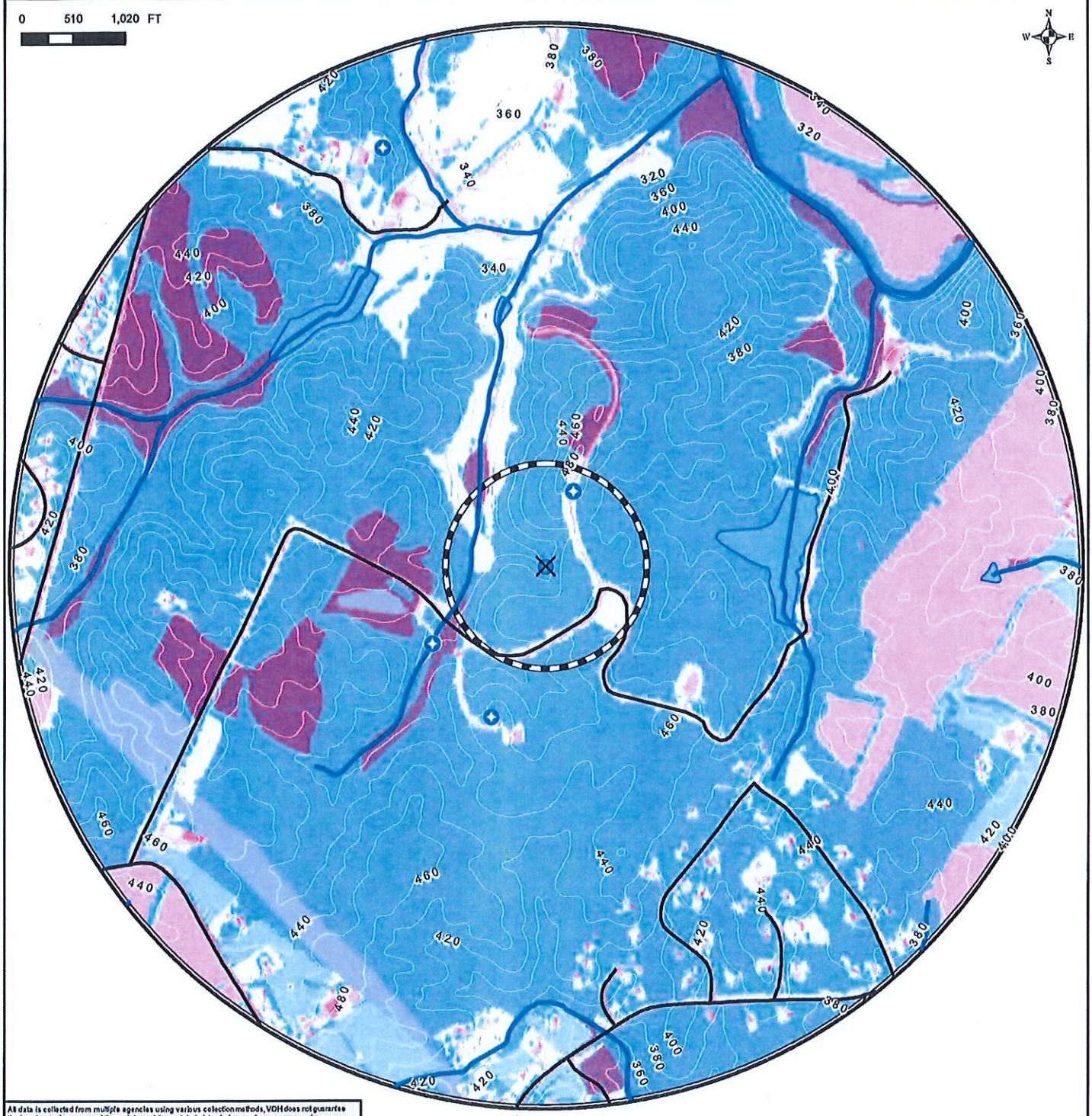
Map ID	Distance to Source (miles)	Contaminant Type	Facility Type	Property Owner/Business Name	Mailing Address/Location
1	0.63	Site Specific	Point Discharge	CLEVENGERS VILLAGE WWTP - NEW	19525 CLEVENGERS UTILITY RD JEFFERSONTON VA 22724
2	0.72	Inorganics, Microbial, SOCs, VOCs	Other PSC	Kennith M Thompson	PO Box 1160, Warrenton VA 20186
3	0.83	Inorganics, SOCs, VOCs	Golf Course	South Wales Golf Club	18363 Golf Lanen Jeffersonton VA 22724

PWSID: 6047035.0
Source ID: WL002
Facility: WELL 12
Waterworks: CLEVENGERS VILLAGE

SWAP Zone 2 Land Use

Date: 11/1/2018

TINWSF_IS: 2682196.0
Jurisdiction: CULPEPER
District: DISTRICT 09



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- Zone 2

- Roads
- Rails
- Impaired Streams
- Streams
- Contours
- Impaired Waterways
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Land Use

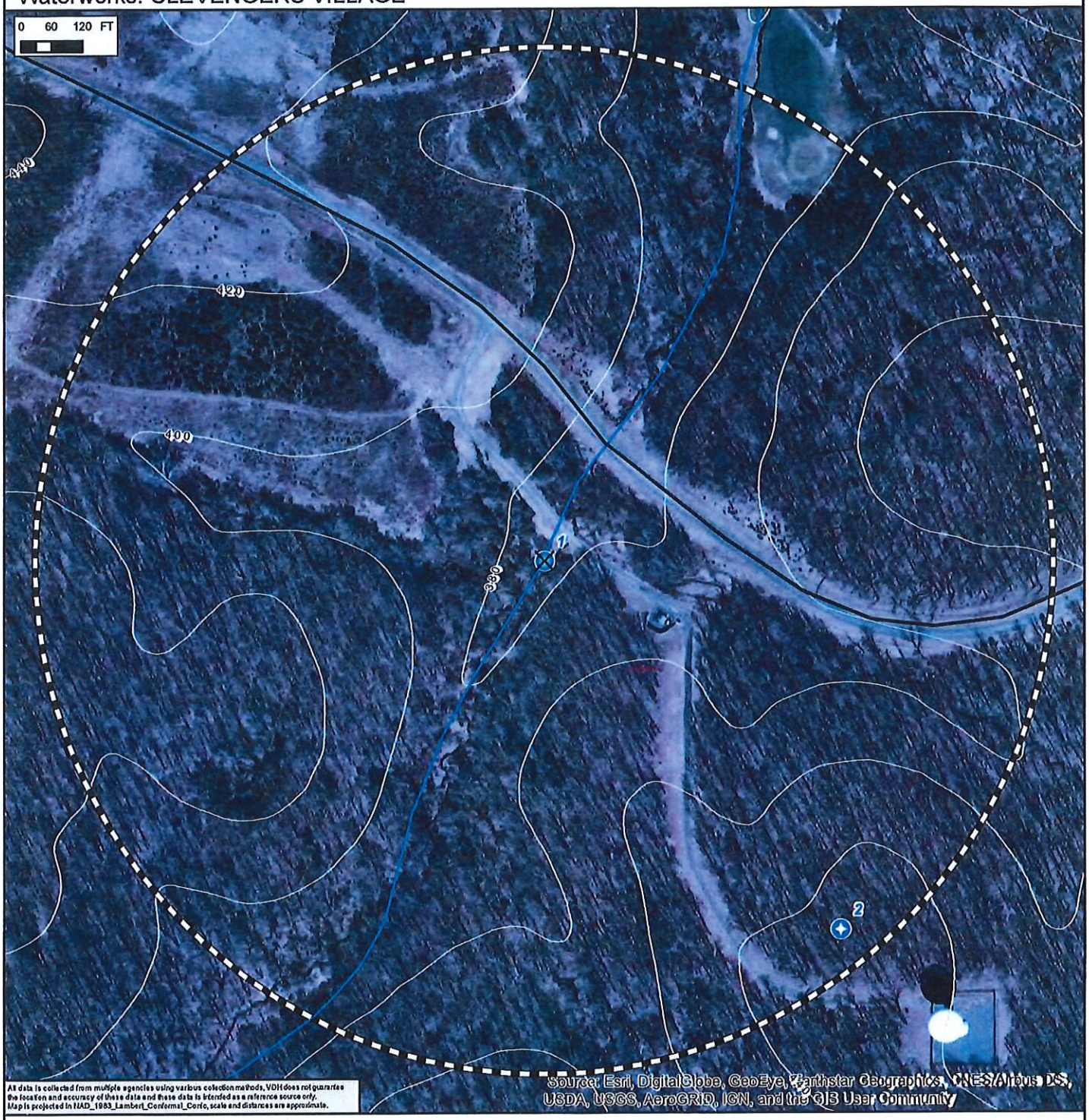
- Additional Extracted Impervious
- Barren
- Crop
- Forest Harvest
- Hardwood Forest/Pine Forest/Mixed Forest
- Local Buildings/Roads/Pavement
- Pasture
- Scrub
- Trees
- Turf/Grass
- Water
- Wetland

PWSID: 6047035.0
Source ID: WL003
Facility: WELL 16
Waterworks: CLEVENGERS VILLAGE

Swap Zone 1

Date: 11/1/2018

TINWSF_IS: 2682197.0
Jurisdiction: CULPEPER
District: DISTRICT 09



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Contours
Waterbodies

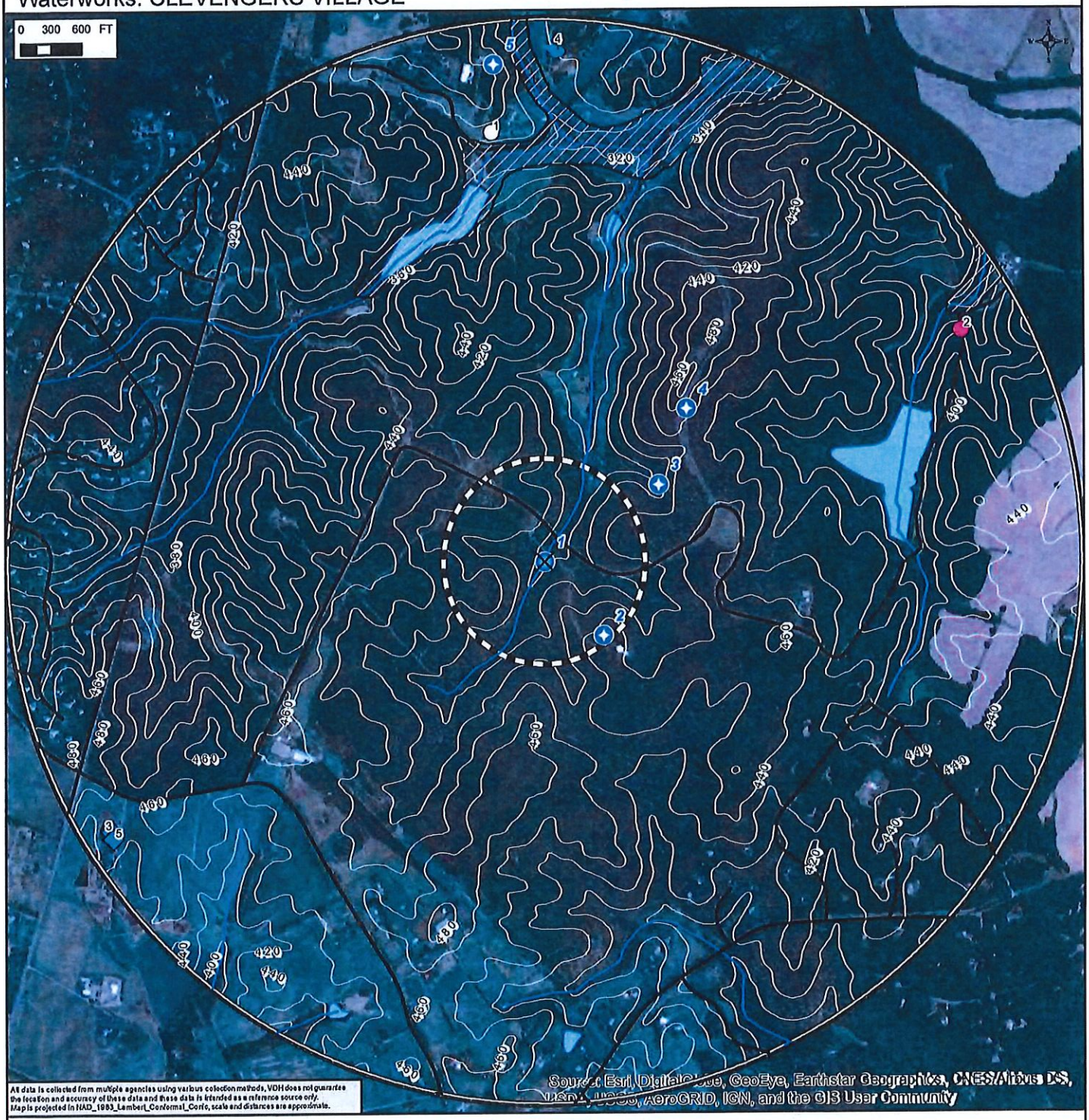
Other PSC
Mines - Other
Mines - Abandoned
Mines - Active
Injection Wells
Tire Piles
Superfund
Marinas
Landfills
Industrial
Hospitals
RCRA
Golf Courses
NPDES
Petroleum Tank - Active
Petroleum Tank - Closed
Boat Ramps
Airports
Oil Gas Wells
Impaired Streams
Roads
Rails
Petroleum Pipeline
Natural Gas Pipeline
Zone 1
Zone 2
Impaired Waterbodies
Karst Area

PWSID: 6047035.0
Source ID: WL003
Facility: WELL 16
Waterworks: CLEVENGERS VILLAGE

SWAP Zone 2

Date: 11/1/2018

TINWSF_IS: 2682197.0
Jurisdiction: CULPEPER
District: DISTRICT 09



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- Zone 1
- Zone 2
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- Karst Area

VIRGINIA DEPARTMENT OF HEALTH - OFFICE OF DRINKING WATER

POTENTIAL SOURCES OF CONTAMINATION SUMMARY

County\City: CULPEPER PWSID: 6047035 Source ID: WL003

Facility: WELL 16 Waterworks: CLEVENGERS VILLAGE

Facilty Type	Zone 1 Count	Zone 2 Count	Total
Closed Storage Tank Release	0	2	2
Golf Course	0	1	1
Other PSC	0	1	1
Point Discharge	0	1	1
Sum	0	5	5

VIRGINIA DEPARTMENT OF HEALTH - OFFICE OF DRINKING WATER

Potential Sources of Contamination Inventory

County/City: CULPEPER Waterworks: CLEVENGERS VILLAGE PWSID: 6047035 Source ID: WL003 Facility: WELL 16

Evaluated by: Date: Reviewed by: Date:

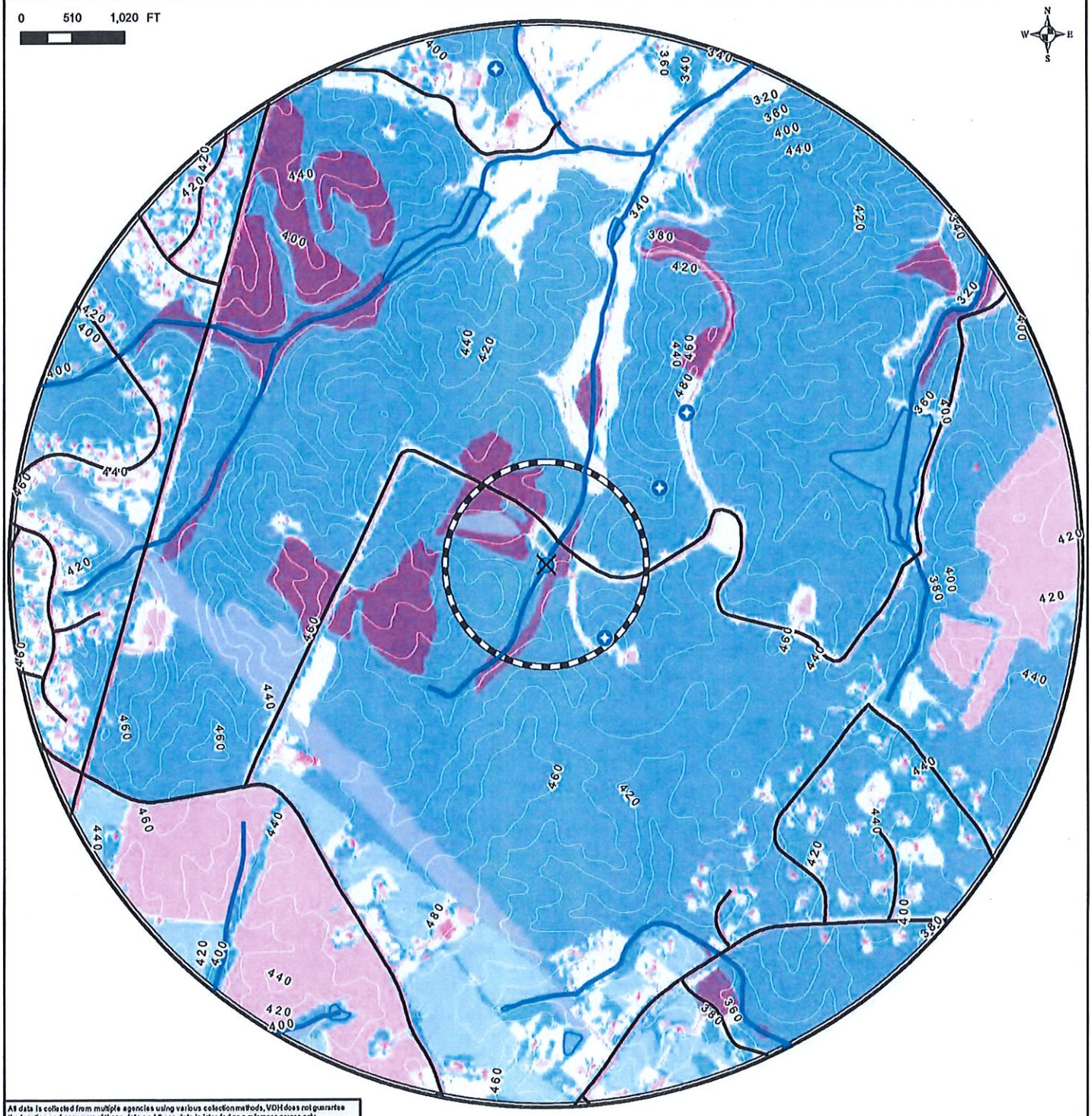
Map ID	Distance to Source (miles)	Contaminant Type	Facility Type	Property Owner/Business Name	Mailing Address/Location
1	0.80	Inorganics, Microbial, SOCs, VOCs	Other PSC	Kennith M Thompson	PO Box 1160, Warrenton VA 20186
2	0.88	Site Specific	Point Discharge	CLEVENGERS VILLAGE WWTP - NEW	19525 CLEVENGERS UTILITY RD JEFFERSONTON VA 22724
3	0.95	Inorganics, SOCs, VOCs	Closed Storage Tank Release	Hoke Priscilla Residence	4102 Jeffersonton Rd Jeffersonton VA 22724
4	0.95	Inorganics, SOCs, VOCs	Golf Course	South Wales Golf Club	18363 Golf Lanen Jeffersonton VA 22724
5	0.95	Inorganics, SOCs, VOCs	Closed Storage Tank Release	Hoke Priscilla Property	4102 Jeffersonton Rd Jeffersonton VA 22724

PWSID: 6047035.0
Source ID: WL003
Facility: WELL 16
Waterworks: CLEVENGERS VILLAGE

SWAP Zone 2 Land Use

Date: 11/1/2018

TINWSF_IS: 2682197.0
Jurisdiction: CULPEPER
District: DISTRICT 09



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- Source
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- Well
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- Zone 1
- Zone 2

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Land Use

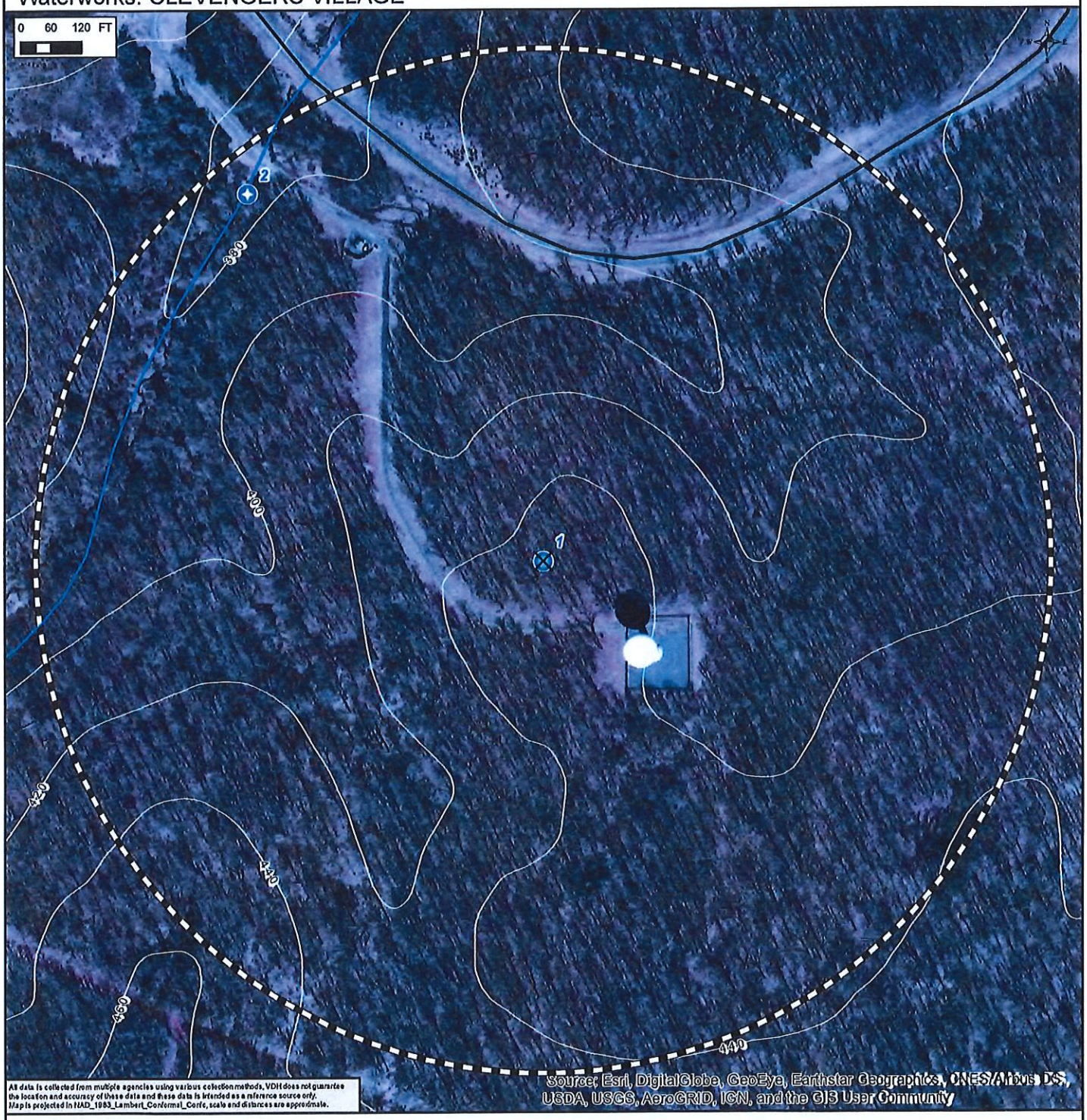
- Additional Extracted Impervious
- Barren
- Crop
- Forest Harvest
- Hardwood Forest/Pine Forest/Mixed Forest
- Local Buildings/Roads/Pavement
- Pasture
- Scrub
- Trees
- Turf/Grass
- Water
- Wetland

PWSID: 6047035.0
Source ID: WL004
Facility: WELL 18
Waterworks: CLEVENGERS VILLAGE

Swap Zone 1

Date: 11/1/2018

TINWSF_IS: 2682198.0
Jurisdiction: CULPEPER
District: DISTRICT 09



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- Other PSC
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- Mines - Abandoned
- Mines - Active
- Injection Wells
- Tire Piles
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- Landfills
- Industrial
- Hospitals
- RCRA
- Golf Courses
- NPDES
- Petroleum Tank - Active
- Petroleum Tank - Closed
- Boat Ramps
- Airports
- Oil Gas Wells
- Impaired Streams
- Roads
- Rails
- Petroleum Pipeline
- Natural Gas Pipeline
- Zone 1
- Zone 2
- Impaired Waterbodies
- Karst Area

PWSID: 6047035.0
Source ID: WL004
Facility: WELL 18
Waterworks: CLEVENGERS VILLAGE

SWAP Zone 2

Date: 11/1/2018

TINWSF_IS: 2682198.0
Jurisdiction: CULPEPER
District: DISTRICT 09

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VIRGINIA DEPARTMENT OF HEALTH - OFFICE OF DRINKING WATER

POTENTIAL SOURCES OF CONTAMINATION SUMMARY

County\City: CULPEPER PWSID: 6047035 Source ID: WL004

Facility: WELL 18 Waterworks: CLEVENGERS VILLAGE

Facilty Type	Zone 1 Count	Zone 2 Count	Total
Closed Storage Tank Release	0	2	2
Other PSC	0	1	1
Point Discharge	0	1	1
Sum	0	4	4

VIRGINIA DEPARTMENT OF HEALTH - OFFICE OF DRINKING WATER

Potential Sources of Contamination Inventory

County/City: CULPEPER Waterworks: CLEVENGERS VILLAGE PWSID: 6047035 Source ID: WL004 Facility: WELL 18

Evaluated by: Date: Reviewed by: Date:

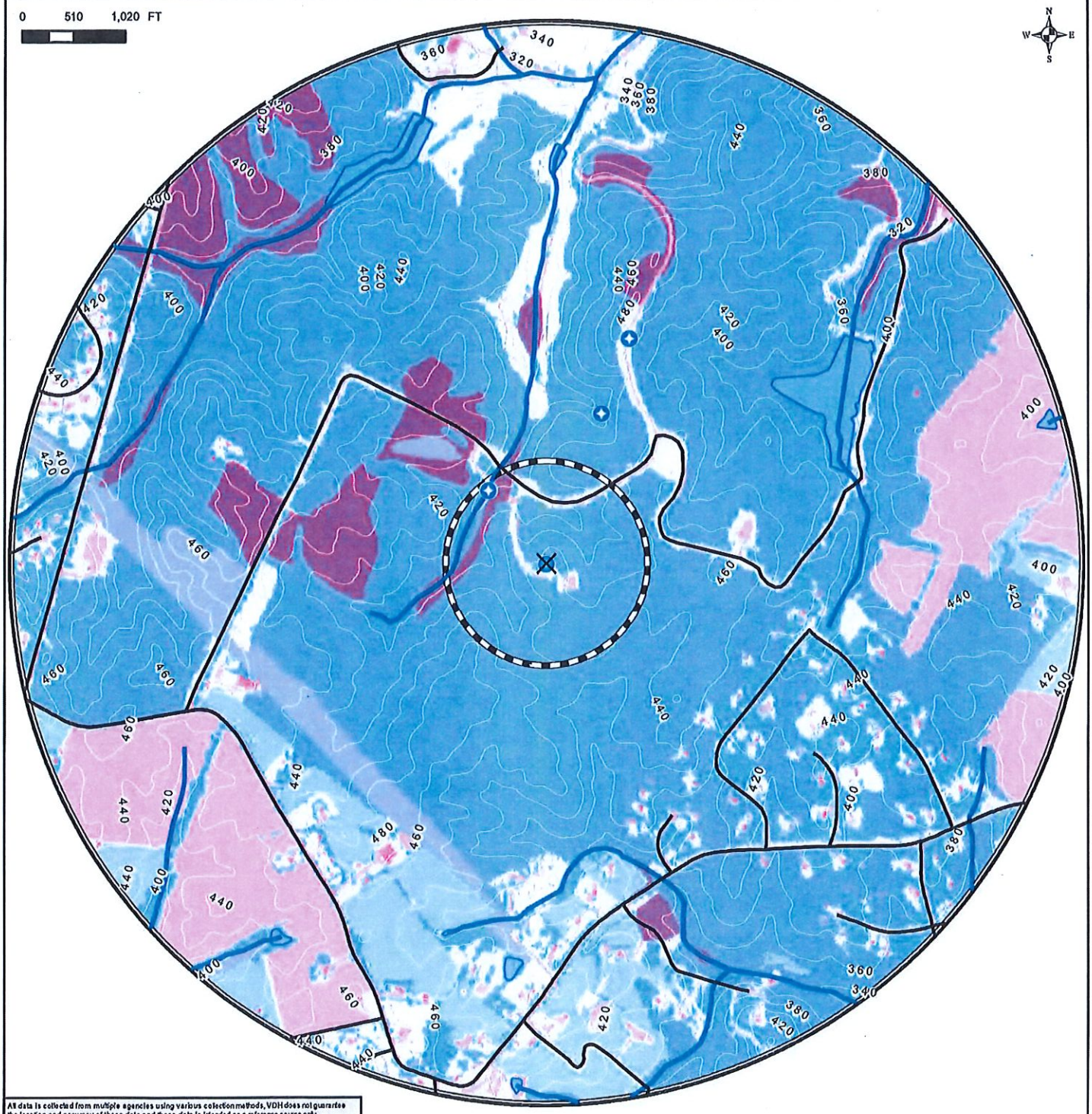
Map ID	Distance to Source (miles)	Contaminant Type	Facility Type	Property Owner/Business Name	Mailing Address/Location
1	0.87	Site Specific	Point Discharge	CLEVENGERS VILLAGE WWTP - NEW	19525 CLEVENGERS UTILITY RD JEFFERSONTON VA 22724
2	0.95	Inorganics, Microbial, SOCs, VOCs	Other PSC	Kennith M Thompson	PO Box 1160, Warrenton VA 20186
3	0.98	Inorganics, SOCs, VOCs	Closed Storage Tank Release	Hoke Priscilla Residence	4102 Jeffersonton Rd Jeffersonton VA 22724
4	0.99	Inorganics, SOCs, VOCs	Closed Storage Tank Release	Hoke Priscilla Property	4102 Jeffersonton Rd Jeffersonton VA 22724

PWSID: 6047035.0
Source ID: WL004
Facility: WELL 18
Waterworks: CLEVENGERS VILLAGE

SWAP Zone 2 Land Use

Date: 11/1/2018

TINWSF_IS: 2682198.0
Jurisdiction: CULPEPER
District: DISTRICT 09



All data is collected from multiple agencies using various collection methods, VDH does not guarantee the location and accuracy of these data and these data is intended as a reference source only. Maps projected in NAD_1983_Lambert_Conformal_Conic, scale and distances are approximate.

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment
www.vdh.virginia.gov
Office of Drinking Water
Safe Drinking Water for a Healthy Virginia

- Source
- Intake
- Well
- GUDIS
- Zone 1
- Zone 2

- Roads
- Rails
- Impaired Streams
- Streams
- Contours
- Impaired Waterways
- Waterbodies

Land Use

- Additional Extracted Impervious
- Barren
- Crop
- Forest Harvest
- Hardwood Forest/Pine Forest/Mixed Forest
- Local Buildings/Roads/Pavement
- Pasture
- Scrub
- Trees
- Turf/Grass
- Water
- Wetland

Virginia Department of Health, Office of Drinking Water
Source Water Assessment Program Typical Contaminants Compendium (Rev. December 2015)

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[5]; lawn and garden maintenance chemicals[5]; gasoline; motor oil	Inorganics, SOCs, VOCs
Parking lots/malls	Hydrocarbons; heavy metals; building wastes[5]	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.

Data Bibliography
for
Source Water Assessment Program
Updated: April 27, 2017

Class	Organization	Layer	Date Posted	Available Via
DEM	USDA	Ned10m36075e7.tif	NA	https://gdg.sc.egov.usda.gov/
PSC	DEQ	deqswro (Petroleum Releases)	4/26/2017	http://www.deq.virginia.gov/ConnectWithDEQ/VEGIS/VEGISDatasets.aspx
PSC	DEQ	tirepiles	11/18/2013	Steve Coe Program Coordinator - Recycling & Waste Tire Management Virginia Department of Environmental Quality 629 E. Main Street, Richmond, VA 23219 Toll Free: 1-800-592-5482 804-698-4029 Direct 804-698-4224 Fax steve.coe@deq.virginia.gov
PSC	DMME	oil_gas_wells		https://www.dmme.virginia.gov/webmaps/DGO/
PSC	EPA/DEQ	discharge_nodischarge	6/22/2015	Discharge: http://www.epa.gov/enviro/geo_data.html No Discharge: Betsy K. Bowles Animal Feeding Operations Program Coordinator Virginia Department of Environmental Quality 629 East Main Street Richmond, VA 23219 804-698-4059 Direct 804-698-4032 Fax betsy.bowles@deq.virginia.gov
PSC	EPA	hazrcra	6/22/2015	http://www.epa.gov/enviro/geo_data.html
PSC	EPA	industrial_sites	6/22/2015	http://www.epa.gov/enviro/geo_data.html
PSC	EPA	superfund	6/22/2015	http://www.epa.gov/enviro/geo_data.html

Data Bibliography
for
Source Water Assessment Program
Updated: April 27, 2017

Class	Organization	Layer	Date Posted	Available Via
PSC	EPA	uic	10/27/2015	Mark Nelson, Hydrologist US EPA Wheeling Office 1060 Chapline Street Wheeling, WV 26003 304.234.0286 nelson.mark@epa.gov
PSC	MSHA	mines	4/16/2014	Stephen Gigliotti Chief of Coal Mine Health & Safety 202-693-9479 Direct 202-693-9558 Fax gigliotti.stephen@dol.gov
PSC	VDGIF	boat_ramps	6/6/2011	http://www.dgif.virginia.gov/gis/data/
PSC	VDH	lua	2002	Roy Soto, PE, PMP Special Projects Engineer Virginia Department of Health, Office of Drinking Water James Madison Building 109 Governor St, Room 628 Richmond, VA 23219 804-864-7516 Direct roy.soto@vdh.virginia.gov
PSC	VDH	marinas	4/13/2012	http://www.vdh.virginia.gov/EnvironmentalHealth/ONSITE/MARINA/marinawithpublicpumpoutsmap.htm
PSC	VEDP	airports	5/31/2012	

Data Bibliography
for
Source Water Assessment Program
Updated: April 27, 2017

Class	Organization	Layer	Date Posted	Available Via
PSC	VDH	hospitals	1/23/2013	Graham Truelove Data Warehouse Supervisor Virginia Department of Health Office of Information Management and Health IT 109 Governor Street, 449 Richmond, Virginia 23219 Phone: 804-864-7226 Mobile: 703-344-3150 Email: Graham.Truelove@vdh.virginia.gov
PSC	VEDP	landfills	8/7/2013	
PSC	ESRI	Virginia_golf_courses	7/1/2008	
Public Water Supplies	VDH	Water Sources	11/13/2015	Roy Soto, PE, PMP Special Projects Engineer Virginia Department of Health, Office of Drinking Water James Madison Building 109 Governor St, Room 628 Richmond, VA 23219 804-864-7516 Direct roy.soto@vdh.virginia.gov
Reference	DCR	conslands	3/22/2015	http://www.dcr.virginia.gov/natural-heritage/document/conslands.zip
Reference	DCR	Watersheds_nwbd	10/14/2009	http://www.dcr.virginia.gov/soil-and-water/hu
Reference	DEQ	Impaired waterways	2014	http://www.deq.virginia.gov/ConnectWithDEQ/VEGIS/VEGISDatasets.aspx
Reference	DGMR	Sinkholes	11/28/2011	http://www.arcgis.com/home/item.html?id=2d34b6e577d9435ca2d27abc67a048b9

Data Bibliography
for
Source Water Assessment Program
Updated: April 27, 2017

Class	Organization	Layer	Date Posted	Available Via
Reference	DOF	Land Use	2/8/2005	Virginia Department of Forest, Division of Resource Information http://www.dof.virginia.gov/resources/gis/vfcm05_l2_grid.zip
Reference	EIA	pipelines_petroleumproduct	12/15/2014	http://www.eia.gov/maps/map_data/PetroleumProduct_Pipelines_US_EIA.zip
Reference	EIA	pipelines_naturalgas	03/11/2016	http://www.eia.gov/maps/map_data/NaturalGas_InterIntrastate_Pipelines_US_EIA.zip
Reference	FEMA	floodplains	05/16/2016	http://msc.fema.gov/portal/advanceSearch
Reference	FWS	nwi_wetlands	05/12/2016	http://www.fws.gov/wetlands/Downloads/State/VA_wetlands.zip
Reference	USGS	geophysical	2005	http://pubs.usgs.gov/of/2005/1325/#VA
Reference	USGS	geophysical_karst	08/01/2014	http://pubs.usgs.gov/of/2014/1156/downloads/USKarstMap.zip
Reference	USGS	streams_nhd and waterbodies_nhd	4/14/2016	ftp://nhdftp.usgs.gov/DataSets/Staged/States/FileGDB/HighResolution/

Attachment B
Source Water Susceptibility Determination

The following table details the process for determining a sources susceptibility to contamination.

Source Water Type	Sensitive Source[1]	PSC Present in Assessment Area		Susceptibility
		For Ground Water sources does a PSC exist in the Zone 1 assessment area or does a PSC exist in Zone 2?	For Surface Water sources does a PSC exist in the Zone 1 assessment area?	
Groundwater →	NO →	NO →		Very Low
		YES →		Low
	YES →	NO →		Moderate
		YES →		High
Surface Water →	YES →		NO →	Moderate
			YES →	High

1. A Class II B (or better) well that is constructed in accordance with the Virginia *Waterworks Regulations* and has a completed Uniform Water Well Completion Report (GW-2) that shows evidence in the driller's log that the well withdraws water from a confined aquifer is deemed to be non-sensitive. A confined aquifer is defined by the United States Environmental Protection Agency as "an aquifer bounded above and below by impermeable beds or by beds of distinctly lower permeability than that of the aquifer itself; an aquifer containing confined groundwater" (40 CFR 260.10). All other sources are deemed to be sensitive.

Attachment C
Definitions

Aquifer:	A water bearing geological unit that will yield water to wells or springs.
Aquitard:	An underground confining bed of earthen material that retards, but does not prevent, the flow of water between adjacent aquifers.
Confined or Non-sensitive Aquifer:	An aquifer bounded above and below by impermeable beds or by beds of distinctly lower permeability than that of the aquifer itself; an aquifer containing confined groundwater
Delineation:	The process of defining or mapping a boundary that approximates the areas that contribute water to a particular water source used as a public water supply. For surface waters, the land area usually consists of the watershed for a reservoir or stream. For ground water sources, the boundary typically approximates the surface area that contributes water to the aquifer.
Ground Water:	All water obtained from sources not classified as surface water (or surface water sources), or groundwater under the direct influence of surface water.
Ground Water Under the Direct Influence of Surface Water (GUDI):	Any water beneath the surface of the ground with (i) significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens such as Giardia lamblia, or Cryptosporidium. It also means (ii) significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH that closely correlate to climatological or surface water conditions.
Identified Flowing Surface Source:	A surface water stream that enters the ground water by flowing into a sinkhole, Leaking through the bottom of a stream bed, or by other means and which has been verified through tracer or other studies to reemerge from the ground as a spring of through a well; or which flows beneath broken rubble (which is strewn down the side of a mountain) with openings to the atmosphere and which is collected at a 'springbox'.
Potential Sources of Contamination:	Facilities, sites, and activities that have the potential to affect the underlying ground water aquifers or nearby surface waters supplying a waterworks.
Raw Water Intake:	The suction intake that draws water from a surface water source for use as a public water supply.
Sensitivity:	The relative ease, with which a contaminant applied near the land surface, or to the subsurface, can migrate to the delineated source water area.
Source Water Assessment:	An assessment to provide information on the potential contaminant threats to the water source(s) of a waterworks and the susceptibility of those sources to contamination.
Surface Water:	All water open to the atmosphere and subject to surface runoff.
Susceptibility to Contamination:	The determined classification (or rating) of the susceptibility of a source to contamination based on its sensitivity and the presence of land use activities of concern, potential sources of contamination, or potential conduits to ground water (for ground water sources only) within the assessment area. This classification is not intended to be definitive.
Watershed:	A topographical area that is within a line drawn connecting the highest points uphill of a drinking water intake or otherwise known area of recharge from which overland flow drains to a water supply intake.