Northampton County

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Northampton County Water Supply Plan

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Virginia's Eastern Shore

MALCOLM PIRNIE

3100-001

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Acronyms Used in the Report

A-N PDC	Accomack-Northampton Planning District Commission
BGS	below ground surface
CWS	community water systems
D0	unusually dry conditions (U.S. Drought Monitor)
D1	moderate drought conditions (U.S. Drought Monitor)
DACS	Department of Agriculture and Consumer Services
DCR	Department of Conservation and Recreation
DEQ	Department of Environmental Quality
DGIF	Department of Game and Inland Fisheries
DHR	Department of Historic Resources
DNH	Department of Natural Heritage
DOF	Department of Forestry
ESA	Endangered Species Act
ESGWMA	Eastern Shore Groundwater Management Area
FT	feet
JPA	Joint Permit Application
MG	million gallons
MGD	million gallons per day
MSL	mean sea level
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
TMDL	total maximum daily load
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
VDMTF	Virginia Drought Monitoring Task Force
VLR	Virginia Landmarks Register
VMRC	Virginia Marine Resources Commission
VPA	Virginia Pollution Abatement
VPDES	Virginia Pollutant Discharge Elimination System
VWPP	Virginia Water Protection Permit
WWTP	Wastewater Treatment Plant

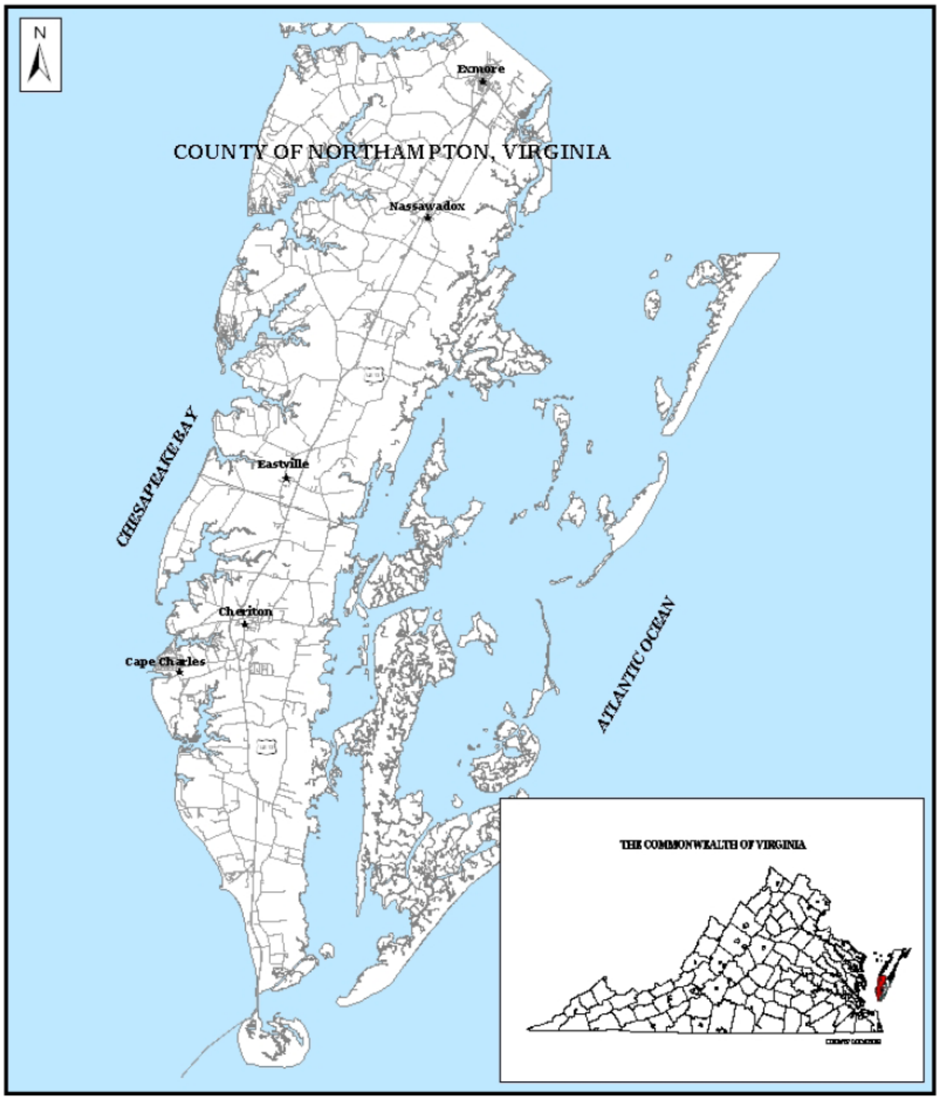
1. Introduction

This report comprises the Water Supply Plan for Northampton County. In 2003, the Virginia General Assembly amended the Code of Virginia to require the development of a comprehensive statewide water supply planning process that would (1) ensure that adequate and safe drinking water is available to all citizens of the Commonwealth, (2) encourage, promote, and protect all other beneficial uses of the Commonwealth's water resources, (3) encourage, promote and develop incentives for alternative water sources. In addition, the General Assembly required that local or regional water supply plans would be prepared and submitted to the Virginia Department of Environmental Quality (DEQ) in accordance with criteria and guidelines developed by the Virginia Water Control Board. The DEQ subsequently develop Local and Regional Water Supply Planning Regulations (9 VAC 25-780) to implement the mandates of the Code. In addition to administering the requirements of 9 VAC 25-780, DEQ has provided assistance for preparing local and regional water supply plans (WSPs) in the form of grants, workshops, and guidance documents.

In 2009, Northampton County commissioned Malcolm Pirnie Inc. to prepare a WSP that meets the requirements of 9 VAC 25-780 with financial assistance from the Accomack-Northampton Planning District Commission (A-N PDC) and from DEQ in the form of a Regional WSP Competitive Grant. All five of the incorporated towns in the County also agreed to participate in the development of the Northampton Regional WSP: Cape Charles, Cheriton, Eastville, Exmore, and Nassawadox.

The first phase of the planning process focused on the collection of water supply and water use information, identification of environmental resources affecting the use and potential development of water supplies, and a projection of future water demand by residential, commercial, industrial and agricultural users. The second phase of the planning process focused on demand management, drought contingency planning, identifying current or future water supply deficits or surpluses, and identifying existing or potential risks to ensuring that adequate water supplies are available for the Planning Region. Where the analysis identified current or future risks to ensuring adequate water supplies, the planning process evaluated alternatives for the enhancement of existing or the development of new water supplies.

Figure 1-1: Northampton Location Map



Source: Northampton Comprehensive Plan, 2009[1].

1.1. Background

Northampton County is composed of the southern portion of the Eastern Shore of Virginia peninsula and its surrounding islands and is situated between the Atlantic Ocean to the East and the Chesapeake Bay to the West and South (Figure 1-1). Northampton County is bordered on the north by Accomack County and connected to mainland of Virginia at Virginia Beach via the Chesapeake Bay-Bridge Tunnel (Route 13).

1.1.1. Water Resources

Northampton County is surrounded on three sides by saltwater and has no streams of any substantial size and therefore has no significant source of surface water and must depend on groundwater as its sole source of drinking water.

Fresh groundwater is present in a series of four major aquifers predominantly comprised of sand, gravel, and shell material. The four major aquifers are present in the majority of the County and are, in order of increasing depth below ground surface, the Columbia (unconfined), and the upper, middle, and lower Yorktown-Eastover (confined) aquifers. Aquifers deeper than the lower Yorktown-Eastover contain salty water which effectively limits their use for most applications and are currently not used as a source of drinking water.

The four freshwater aquifers are generally separated by sedimentary confining units comprised largely of very fine sand, silt, and clay, with each confining unit being named after the underlying aquifer. The entirety of Northampton County (and therefore its aquifers) is located within the Eastern Shore Groundwater Management Area (ESGWMA) as defined by the Virginia Ground Water Management Act of 1992, which requires a permit from DEQ for any person or entity wishing to withdraw in excess of 300,000 gallons per month from a declared GWMA.

The majority of drinking water needs in the County are met through withdrawals from groundwater water wells screened in the (confined) Yorktown-Eastover aquifers, while the rest is met through withdrawals from groundwater wells screened in the (surficial) Columbia aquifer. Groundwater availability in the Columbia Aquifer is characterized by relatively large recharge rates, lower aquifer storage, and a higher susceptibility to contamination; conversely, groundwater availability in the Yorktown-Eastover Aquifers is characterized by relatively low recharge rate, higher aquifer storage and lower susceptibility to contamination.

There are about one dozen tidal creeks in Northampton County, which are largely supplied from groundwater discharge. Although surface water is not used as a source of drinking water in the County, it is an important resource for irrigation water and for shellfish, finfish, and other wildlife habitat.

1.2. Organization of the WSP

The organization of the Northampton County WSP follows the same structure as the WSP regulation (9 VAC 25-780) and is as follows:

Section one consists of the present introductory information.

Section two provides a summary of current information on existing water sources including community water supply systems and self-supplied agricultural and non-agricultural users according to the requirements of 9 VAC 25-780-70.

Section three provides a summary of current water usage in Northampton County for each of the community water supply systems and for agricultural and non-agricultural self-supplied users according to the requirements of 9 VAC 25-780-80.

Section four is divided into two major subsections. The first subsection provides descriptions the geologic, hydrologic, and meteorologic conditions pertaining to the existing water resources of Northampton County according to the requirements of 9 VAC 25-780-90A. The second subsection provides descriptions of the relevant environmental conditions that pertain to or may affect existing water supply sources in the County according to the requirements of 9 VAC 25-780-90B.

Section five provides a description of the methodology and results of future water use projections through to the 2030 planning horizon for community water supply systems and for agricultural and non-agricultural self-supplied users according to the requirements of 9 VAC 25-780-100

Section six provides a description of planned water demand management strategies according to the requirements of 9 VAC 25-780-110.

Section seven provides a summary of drought response and contingency plans including three graduated stages of response for community water supply systems and self-supplied users who withdraw more than an average of 300,000 gallons per month according to the requirements of 9 VAC 25-780-120.

Section eight provides a description of the adequacy of existing sources to meet current and projected water demands, a statement of need based information contained in the preceding sections, and a description of potential alternatives to bridge the gap between existing sources and future demands according to the requirements of 9 VAC 25-780-130.

Sections nine and ten provide a list of conclusions and references, respectively.

2. Existing Water Sources (9 VAC 25-780-70)

This section summarizes water source information for Northampton County, and provides more detailed descriptions of water source information within each of the jurisdictions, in accordance with 9 VAC 25-780-70. The Eastern Shore peninsula contains no major streams or other surface water supplies capable of acting as a potable water supply; therefore, ground water is the primary resource for water needs in Northampton County. This section provides available well information for Community Water Systems and large self-supplied non-agricultural users, as well as a list of large agricultural users, and an estimate of the population served by individual wells using less than 300,000 gallons per month.

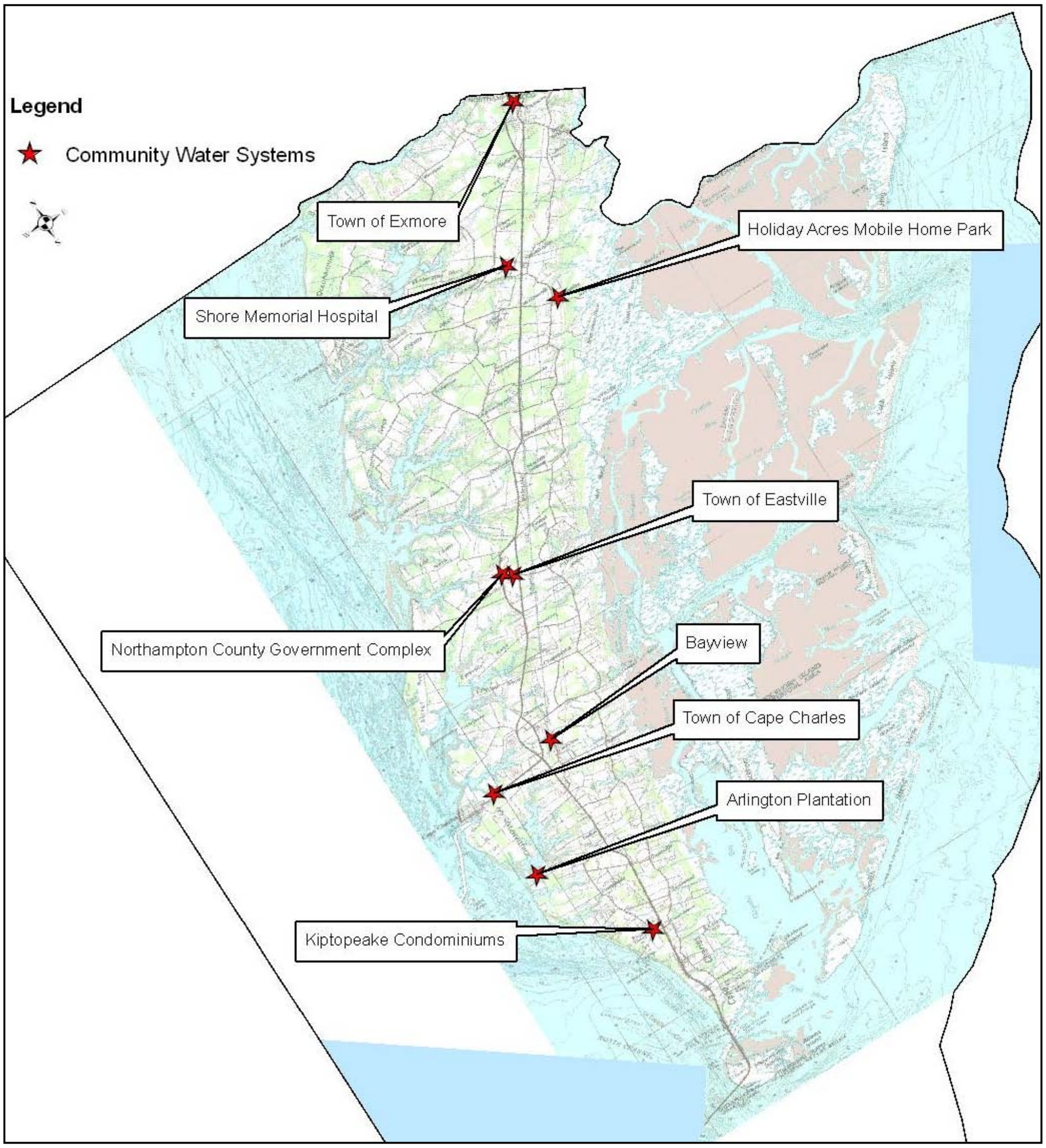
2.1. Community Water Systems

A Community Water System is defined as "a waterworks that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents, and is regulated by the Virginia Department of Health Waterworks Regulation" (12 VAC 5-590). In Northampton County, the following Community Water Systems utilize groundwater to supply their residents:

- Arlington Plantation
- Bayview
- Town of Cape Charles (Cape Charles Municipal Corporation)
- Town of Eastville
- Town of Exmore
- Holiday Acres Mobile Home Park
- Kiptopeake Condominiums
- Northampton County Government Complex
- Shore Memorial Hospital

Groundwater well details (i.e. Well ID, depth, casing and screen depth) are provided in Appendix A. In some cases, specific well information was not readily available after reasonable search and is therefore listed as N/A in the tables in Appendix A. The locations of these Community Water Systems are shown on Figure 2-1. Table 2-1,

Figure 2-1: Community Water Systems in Northampton County



below, summarizes the VDEQ permitted annual and maximum monthly withdrawals, as well as the VDH permitted capacities of the Community Water Systems in the County.

Table 2-1:
Northampton County CWS: Permitted Withdrawals

	VDEQ Permitted Withdrawals		
WATER SYSTEM NAME	Total Annual Withdrawal (MG)	Max. Monthly Withdrawal (MG)	VDH Permitted Capacity (GPD)
ARLINGTON PLANTATION			19,600
BAYVIEW			29,000
CAPE CHARLES, TOWN OF	252.2	25.3	360,000
EASTVILLE, TOWN OF	23.7	2.9	150,000
EXMORE, TOWN OF	60.8	9.92	400,000
HOLIDAY ACRES MOBILE HOME PARK			22,500
KIPTOPEAKE CONDOMINIUMS			
NORTHAMPTON COUNTY GOVERNMENT COMPLEX	16.206	2.03	19,600
SHORE MEMORIAL HOSPITAL	37.11	3.64	173,200

There are no community water systems supplied by surface water in Northampton County.

2.2. Purchased Water Source

No community water systems in Northampton County purchase water from outside of the County. Availability of water for community purchase outside of the County region was not evaluated as part of this water supply plan because the primary source of water in the County is groundwater, which typically serves the population in the immediate area.

2.3. Large Self-Supplied Users

Non-community water systems, or self-supplied users, of greater than 300,000 gallons per month are categorized into non-agricultural and agricultural users. The following sections provide information regarding the large self-supplied users in Northampton County. The majority of large self-supplied users in the County use groundwater as their primary source, however some agricultural users utilize surface water sources.

2.3.1. Non-Agricultural Large Self-Supplied Users

All non-agricultural large self-supplied users in Northampton County utilize groundwater as their primary source. The four large non-agricultural self supplied users of more than 300,000 gallons of groundwater per month that were identified in the County are as follows:

- Bayshore Concrete Products of Cape Charles
- Best Western Sunset Beach Resort
- Cherrystone Family Camping Resort
- YMCA Family Campground

Groundwater well details (i.e. Well ID, depth, casing and screen depth) are provided in Appendix B. In some cases, specific well information was not readily available after reasonable search and is therefore listed as N/A in the tables in Appendix B. Table 2-2 summarizes the VDEQ permitted annual and maximum monthly withdrawals, as well as the VDH permitted capacities for the large, non-agricultural self-supplied users of groundwater in the County.

Table 2-2:
Non-Agricultural Large Self-Supplied Users: Permitted Withdrawals

WATER SYSTEM NAME	VDEQ Permitted Withdrawals		VDH Permitted Capacity (GPD)
	Total Annual Withdrawal (MG)	Max. Monthly Withdrawal (MG)	
Bayshore Concrete Products Corp Cape Charles	27.70	2.80	124,000
Best Western Sunset Beach Resort	7.65	1.42	
Cherrystone Family Camping Resort	11.10	3.31	
YMCA Family Campground	5.50	1.10	30,000

2.3.2. Agricultural Large Self Supplied Users

Agriculture is the dominant land use in Northampton County, and groundwater is the primary source of irrigation for crops, nurseries and livestock operations. In some cases, groundwater is used to refill irrigation ponds. Some agricultural users utilize surface water for irrigation purposes, and both use types will be discussed in the following sections.

2.3.2.1. Groundwater Sources

A total of nineteen large agricultural self-supplied users were identified in the County that use more than 300,000 gallons per month of groundwater for irrigation. Table 2-3 lists the large agricultural groundwater users in the County, as well as the annual and monthly permitted withdrawal amounts for each user. As shown in this table, the total permitted agricultural groundwater use in the County is 575.6 million gallons (MG) per year.

Table 2-3.
Large Self-Supplied Agricultural Users of Groundwater

FACILITY/SYSTEM NAME	Annual Permitted Withdrawal (gallons)	Monthly Permitted Withdrawal (gallons)
Belote Farm	16,200,000	6,000,000
C and H Farms Incorporated	15,300,000	4,000,000
David's Nursery	150,000,000	25,000,000
Edgehill Farm	7,300,000	1,000,000
Edgewater Farm	13,400,000	6,000,000
Grapeland Farm	31,100,000	14,600,000
Guy Produce Farms	24,800,000	5,500,000
Herbert Nottingham Farm (Cheapside)	10,650,000	3,500,000
Holly Grove Farm	12,960,000	4,320,000
Holts Neck Farm	23,000,000	8,000,000
James Wharf Farm	17,000,000	4,300,000
Lumber Hall Farm	51,400,000	8,300,000
Machipongo Farm	48,800,000	14,100,000
Marshall/Johnson Farm	36,100,000	14,700,000
Midwood Farm	22,800,000	8,000,000
Silver Beach Farm	5,500,000	1,000,000
Tankard Farm	52,000,000	9,000,000
Twin Cedar Farms	22,100,000	10,200,000
Wyatt Farm	15,200,000	4,000,000
Total Permitted Withdrawals (MG)	**575.61**	**151.52**

2.3.2.2. Surface Water Sources

A number of farms and nurseries in the County utilize surface water sources such as ponds for irrigation. While these withdrawals are not permitted by the state, they are required to report their surface water withdrawals. Table 2-4 lists the large agricultural self-supplied users of surface water in the County, as well as the average annual reported use between 2001 and 2006.

Table 2-4.
Large Self-Supplied Agricultural Users of Surface Water

USER NAME	2001-2006 Average Annual Use (MG)
BLACK FARMS	35.20
CHERITON FARMS	2.85
CHEROKEE POINT FARMS	4.32
DAVIDS NURSERY	7.03
HERMITAGE FARMS NURSERY	16.69
KELLAM FARM	12.00
MIDWOOD FARM	4.99
NOTTINGHAM ENTERPRISES INC	16.50
WAYNE T HEATH FARMS INC	16.20
YAROS FARMS INC	289.83

2.4. Small Self-Supplied Users

The Water Supply Planning regulations require that a water plan shall include an estimate of the number of residents and business that are self-supplied by individual wells withdrawing less than 300,000 gallons per month and an estimate of the population served by individual wells" (9 VAC 25-780-70.J).

The estimate of small self-supplied residential users is 9,189 persons. This estimate was developed by subtracting total population served by the Community Water Systems (see Section 3.0) from the estimated 2008 population in Northampton County (as reported in the Northampton County Comprehensive Plan, Part 2, Table 3.3):

County Population – CWS Population Served = Population served by individual wells
(13,517 – 4,328 = 9,189 persons)

For planning purposes, it was assumed than an average of 2.39 persons occupy a residence (based on 2000 estimates, Northampton County Comprehensive Plan); therefore, based on a population served of 9,189 persons, there are an estimated 3,845 small, self supplied residential wells.

Estimating the number of businesses that are self-supplied by groundwater in the County is a bit more difficult. A review of the VDH groundwater permit holders in the County showed that a total of ten non-transient, non-community small users and 29 transient non-community small users rely on groundwater as their primary water source. Table 2-5 contains a list of the transient and non-transient small self-supplied businesses, along with the population served and the water system ID number.

Table 2-5:
Small Self-Supplied Groundwater Users and Population Served

	Population Served	Water System ID
NON-TRANSIENT, NON-COMMUNITY		
BROADWATER ACADEMY	456	VA3131095
CHERITON MIGRANT HEAD START	80	VA3131137
CHESAPEAKE BAY BRIDGE TUNNEL	25	VA3131150
EASTERN SHORE PHYSICIANS & SURGEONS	40	VA3131325
FOOD LION-CAPE CHARLES	90	VA3131220
HARE VALLEY ESAAA/CAA	190	VA3131290
KIPTOPEKE ELEMENTARY SCHOOL	700	VA3131375
NORTHAMPTON COUNTY COMMUNITY FACILITIES	61	VA3131555
OCCOHANNOCK ELEMENTARY SCHOOL	549	VA3131875
STING-RAY`S RESTAURANT	96	VA3131118
TRANSIENT, NON-COMMUNITY		
AMERICAN LEGION POST #400	100	VA3131005
BAYVIEW COMMUNITY HEALTH CENTER	50	VA3131060
BEST VALUE INN (NASSAWADOX)	420	VA3131042
BURROUGHS & BURROUGHS (LANKFORD HIWAY)	46	VA3131100
CAPE MOTEL	36	VA3131124
CURTIS H JONES & SON INC MLC	40	VA3131350
DO-DROP INN	50	VA3131160
EASTERN SHORE NATIONAL WILDLIFE REFUGE	25	VA3131122
EASTVILLE AREA HEADQUARTERS	40	VA3131180
EDGEWOOD MOTEL	30	VA3131205
FRANKTOWN COMMUNITY HEALTH CENTER	99	VA3131155
GREAT MACHIPONGO CLAM SHACK	55	VA3131390

	Population Served	Water System ID
HARDEE`S (CAPE CHARLES)	70	VA3131288
HEATH-KELLAM MLC	28	VA3131760
J.H. WEST SEAFOOD, INC.	32	VA3131920
KIPTOPEAKE INN	100	VA3131302
KIPTOPEKE STATE PARK	555	VA3131373
KIPTOPEKE STATE PARK - CABINS	112	VA3131374
KUZZENS (KMC)	363	VA3131855
KUZZENS (P C KELLAM MLC)	52	VA3131359
LITTLE ITALY PIZZA & DELI	76	VA3131372
MCDONALD`S (CAPE CHARLES)	58	VA3131391
PACIFIC TOMATO GROWERS (CARPENTER MLC)	36	VA3131121
PACIFIC TOMATO GROWERS (EASTVILLE MLC)	74	VA3131216
PEACOCK MOTOR INN	40	VA3131610
RITTENHOUSE MOTOR LODGE	25	VA3131720
ROCK`N ROBIN`S	77	VA3131097
THOMAS B. LONG JR. MLC	50	VA3131371
UVA LONG TERM ECOLOGICAL RESEARCH CENTER	40	VA3131857

Source: USEPA Envirofacts SDWIS (Query 2-22-2010)

2.5. Source Water Assessment Plans or Wellhead Protection Programs

The Eastern Shore of Virginia was designated a Ground Water Management Area in 1976 and any withdrawal of 300,000 gallons per month or more in this area requires a ground water withdrawal permit from DEQ. At the local level, the Eastern Shore of Virginia Ground Water Committee was formed in 1990 to assist local governments and residents in understanding, protecting and managing the ground water resource. The Ground Water Supply Protection and Management Plan for the Eastern Shore of Virginia (1992) provides the basis and guidelines for protecting the ground water resource. In addition to the Ground Water Committee, the two counties have adopted provisions in their ordinances that provide protection to the ground water resource. In November 1998, Accomack County passed an ordinance that includes provisions specific to ground water resource protection. In June 2003, Northampton County passed an ordinance requiring that certain new developments implement specific measures designed to protect and preserve the water resource (Source: http://www.a-npdc.org/groundwater).

3. Existing Water Use (9 VAC 25-780-80)

This section will describe the existing water use in Northampton County, in accordance with the provisions of 9 VAC 25-780-80. Water use is broken down into the following user categories:

- Community Water Systems – including residential use, commercial institutional and light industrial use, heavy industrial use, military use, water production, unaccounted for water losses, and sales to other community water systems.
- Self-Supplied Non-Agricultural Users of more than 300,000 gallons per month
- Self-Supplied Agricultural Users of more than 300,000 gallons per month
- Self-Supplied Users of less than 300,000 gallons per month

Information contained in this section was derived from a number of sources including 2009 VDH waterworks permit/water use reports, individual groundwater permit applications and VDEQ data.

3.1. Community Water Systems

The following information is required for all Community Water Systems (CWS), as stated in 9 VAC 25-780-80.B:

- Population within CWS service area
- Number of connections within CWS service area
- Average and maximum daily withdrawal for each CWS
- The amount of water used within the CWS service area on an average annual basis and on an average monthly basis
- The peak daily use by month
- Disaggregated estimates of water use by different user types (i.e. residential, commercial institutional and light industrial, heavy industrial, etc).

Table 3-1 contains the population and current number of service connections within the service area of each CWS, as reported by VDH. The total population served by

Community Water Systems in Northampton County is 4,328 across 2,123 service connections.

Table 3-1.
Community Water System Service Area Connections and Population

	No. of Service Connections	Service Area Population
WATER SYSTEM NAME		
ARLINGTON PLANTATION	16	30
BAYVIEW	80	160
CAPE CHARLES, TOWN OF	1,113	1,134
EASTVILLE, TOWN OF	161	210
EXMORE, TOWN OF	689	2,000
HOLIDAY ACRES MOBILE HOME PARK	39	80
KIPTOPEAKE CONDOMINIUMS	17	30
NORTHAMPTON COUNTY GOVERNMENT COMPLEX	4	64
SHORE MEMORIAL HOSPITAL	4	620
TOTAL	**2,123**	**4,328**

Historical use for Community Water Systems was extracted from several sources. Total annual use (MG), average daily use and average monthly use was calculated for use reported to the VDEQ between 2003 and 2009 for the following CWS:

- Town of Cape Charles
- Town of Eastville
- Town of Exmore
- Shore Memorial Hospital

Tables 3-2, 3-3 and 3-4 present the total annual use, average daily use, and average monthly use, respectively.

Table 3-2:
VDEQ-Reported Total Annual Use (MG): CWS

	2003	2004	2005	2006	2007	2008	2009
Community Water Systems							
Cape Charles, Town of	48.31	53.52	57.12	57.38	48.42	41.02	30.77
Eastville, Town of	18.69	16.54	16.33	17.09	18.31	17.40	16.80
Exmore, Town of	60.62	61.32	60.54	58.01	48.78	49.78	40.54
Shore Memorial Hospital	30.50		28.95	30.56	30.51	27.22	20.19

Table 3-3:
VDEQ-Reported Average Daily Use (MGD): CWS

	2003	2004	2005	2006	2007	2008	2009
Community Water Systems							
Cape Charles, Town of	0.132	0.147	0.156	0.157	0.133	0.112	0.084
Eastville, Town of	0.051	0.045	0.045	0.047	0.050	0.048	0.046
Exmore, Town of	0.166	0.168	0.166	0.159	0.134	0.136	0.111
Shore Memorial Hospital	0.084		0.079	0.084	0.084	0.075	0.055

Table 3-4:
VDEQ-Reported Average Monthly Use (MG): CWS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Community Water Systems												
Cape Charles, Town of	2.05	1.66	1.80	1.85	2.17	2.30	2.61	2.42	2.14	2.09	1.91	1.87
Eastville, Town of	1.37	0.90	1.07	0.99	1.16	1.15	1.20	1.29	1.17	1.16	1.02	0.87
Exmore, Town of	2.30	2.02	2.16	2.15	2.34	2.61	2.77	2.63	2.43	2.33	2.09	2.24
Shore Memorial Hospital	1.11	0.99	1.10	1.10	1.25	1.35	1.42	1.52	1.27	1.26	1.13	1.09

3.1.1. Holiday Acres Mobile Home Park

Recent water use records were not available for Holiday Acres Mobile Home Park. VDH monthly water use records were available for 1998 - 2002. The total average annual use over this time period was 3.02 MG per year, with an average daily withdrawal of 0.01 MGD (Table 3-5). The average monthly use is presented in Table 3-6, which shows a maximum monthly withdrawal of 0.328 MG in the month of July.

Table 3-5:
VDH-Reported Total Annual and Average Daily Use: Holiday Acres MHP

	1998	1999	2000	2001	2002	Average
Total Annual Use (MG)	2.71	2.52	3.35	3.43	3.11	2.71
Average Daily Use (MGD)	0.007	0.007	0.009	0.009	0.009	0.007

Table 3-6:
VDH-Reported Average Monthly Use (MG): Holiday Acres MHP

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Average Monthly Use (MG)	0.251	0.265	0.223	0.304	0.228	0.311	0.328	0.288	0.293	0.259	0.284	0.207

3.1.2. Northampton County Government Complex

While water use records were not available for the Northampton County Government Complex, according to groundwater withdrawal permit documentation, the average monthly maximum withdrawal is estimated to be 1.086 MG, while the peak monthly withdrawal is 1.120 MG (during landscaping season).

Water use records were not available for the following Community Water Systems in Northampton County:

- Arlington Plantation
- Bayview
- Kiptopeake Condominiums

Maximum day and peak day water use by month data were not available for any of the Community Water Systems in the County. Water use records are reported to the VDEQ and VDH on a monthly basis, so peak day use is not able to be calculated using existing records.

There are no large, self-supplied non-agricultural or agricultural users of groundwater or surface water within the service areas of the Community Water Systems. All users within the service area boundaries rely on water supplied by the CWS.

According to information available through VDEQ groundwater withdrawal permits, the primary use type for Community Water Systems in the County is residential use, with the exception of the Town of Exmore (18% of use in the Town is Commercial use). It is assumed that Unaccounted for Water Losses are present in each CWS; however, precise estimates of this use were not readily available.

3.2. Large Self-Supplied Non-Agricultural Users

In accordance with 9 VAC 25-780-80.C, this section provides an estimate of the water used on an average annual basis by all self-supplied non-agricultural users (outside of the Community Water System service areas) of more than 300,000 gallons per month of surface water and groundwater. As discussed earlier, all large self-supplied non-agricultural users in Northampton County rely on groundwater for their water supply needs. Based on VDEQ reported withdrawals, the four large-self supplied groundwater users in the County used a total of 9.98 MG in 2009, which was down from the previous six years of use. Table 3-7 presents the total annual use (in MG) reported to the VDEQ between 2003 and 2009.

Table 3-7:
Total Annual Use by Large-Self Supplied Non-Agricultural Groundwater Users

	2003	2004	2005	2006	2007	2008	2009
SELF-SUPPLIED NON-AGRICULTURAL USERS							
Bayshore Concrete Products Corp Cape Charles	3.59	3.57	3.34	2.13	1.64	2.50	1.36
Best Western Sunset Beach Resort	4.06	3.85	4.63	3.54	3.66	2.96	1.87
Cherrystone Family Camping Resort	6.89	6.55	6.66	5.25	7.11	4.67	3.98
YMCA Family Campground	2.02	2.41	3.20	3.22	4.27	2.88	2.76
Total (MG)	**16.57**	**16.39**	**17.84**	**14.13**	**16.69**	**13.02**	**9.98**

3.3. Large Self-Supplied Agricultural Users

In accordance with 9 VAC 25-780-80.D, this section provides an estimate of the water used on an average annual basis by all self-supplied agricultural users (outside of the Community Water System service areas) of more than 300,000 gallons per month of surface water and groundwater. Average annual surface water use by agricultural large self-supplied users was presented previously in Table 2-4. These use estimates were calculated as the average annual use between 2001 and 2006, based on withdrawals reported to the VDEQ.

Table 3-8 presents the total annual groundwater withdrawals that were reported to the VDEQ between 2003 and 2008 by large, self-supplied agricultural users in the County.

Table 3-8:
Total Annual Use by Large-Self Supplied Agricultural Groundwater Users

Agricultural User	2003	2004	2005	2006	2007	2008
Belote Farm	2,160,000	1,260,000	8,280,000	3,888,000	15,516,000	2,160,000
C and H Farms						
David's Nursery	75,142,000	65,560,000	74,184,000	83,045,000	100,187,000	44,207,000
Edgehill Farm	2,808,000	2,851,200	2,818,800	1,879,200	2,095,200	766,800
Edgewater Farm	154,000	2,890,000	344,000	3,030,000	10,590,000	5,960,000
Grapeland	86,335	447,282	726,638	598,256	30,050,459	13,254,900
Guy Produce Farm	2,909,700	4,481,300	287,300			
Herbert Nottingham Farm		2,500,000				
Lumber Hall Farm	43,119,050	41,473,030	45,232,730	40,175,260	39,420,120	13,540,330
Machipongo Farm					6,000	6,000
Marshall/Johnson Farm	4,778,500	21,705,700	1,185,582	1,042,749	33,367,415	9,834,600
Midwood Farm	791,610	652,590	4,949,080	836,700	2,105,890	2,939,790
Silver Beach Farm	1,195					
Tankard Farm		1,748,500	5,336,700	3,231,500	16,891,900	7,080,600
Twin Cedar Farm	172,600	1,102,425	169,033	1,237,386	32,517	8,392
Wyatt Farm	1,190,000				6,600,000	

3.4. Small Self-Supplied Use Outside of the Community Service Areas

In accordance with 90 VAC 25-780-80.E, this section contains an estimate of water use by small self-supplied users of groundwater that are outside of the Community Service Areas. This use includes residential and business and is calculated as follows:

- Residential Use: Estimate of Population Served by Individual Wells * Average Per Capita Use Rate of 75 gpcd
  - 9,189 persons * 75 gpcd = 0.69 MGD

- Business Use: Estimate of Total Population Served (as presented in Table 2-5) * Average Per Capita Use Rate
  - 5,066 persons served * 50 gpcd = 0.25 MGD

- Total Small Self-Supplied Use: Residential Use plus Business Use
  - 0.69 MGD + 0.25 MGD = 0.94 MGD

4. Existing Water Resource Conditions (9 VAC 25-780-90)

This section is divided into two parts, which contain: 1) a description of the physical environment pertaining to the geologic, hydrology, and meteorological conditions in Northampton County and 2) a description of existing environmental conditions that pertain to, or may affect sources that provide the current supply in fulfillment of requirements of 9 VAC 25-780-90. Potential environmental resource issues pertaining to new water supplies are discussed Section **Error! Reference source not found.**. Special attention is given to the potential effects of water usage on current environmental conditions and to mitigating strategies and which reduce or avoid such potential effects.

4.1. Physical Environment

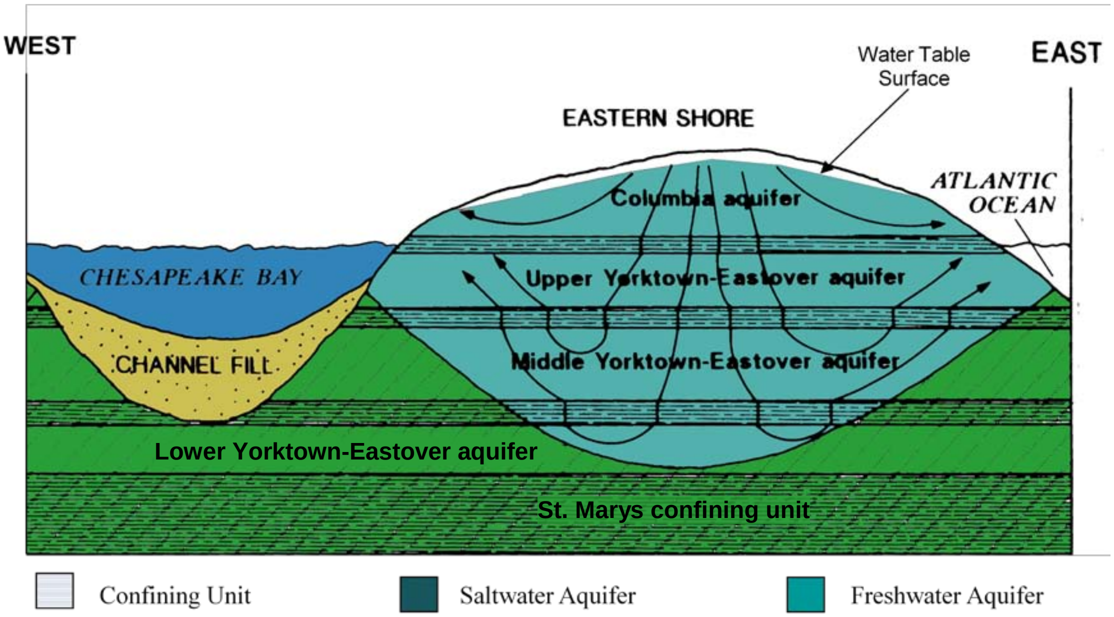
4.1.1. Geologic/Hydrogeologic Setting

There have been a substantial number of local and regional studies on the geologic and hydrologic characteristics of the sediments on the Eastern Shore of Virginia and adjacent areas of Maryland. Many of these studies have dealt principally with geologic descriptions of the formational units. The geology of the Eastern Shore consists of unconsolidated deposits of interbedded clay, silt, sand, and gravel, with variable amounts of shell material. These deposits thicken and slope eastward, and form a system of layered aquifers and confining units. The total sediment thickness ranges from approximately 2,000 feet in the western areas to as much as 7,000 feet to the east[2]. These sediments generally overlie a bedrock basement that also dips northeastward.

The aquifers are comprised of sand, gravel, and shell material, and confining units are comprised of clay and silt and are divided into the unconfined Columbia aquifer (water table aquifer), and a series of confined aquifers and intervening semi-confining units (Figure 4-1). The low permeability confining units restrict downward ground water movement. The confined aquifers, in order of increasing depth, are: Yorktown-Eastover (includes upper, middle, and lower Yorktown aquifers), St. Marys Choptank aquifer, Brighteast aquifer, and upper, middle, and lower Potomac aquifers. Fresh ground water generally occurs only in the upper 300 feet of sediments and at shallower depths along the coastlines of the Easter Shore and is limited to the Columbia and Yorktown aquifers.

These aquifers have been designated by the EPA as the sole source aquifers for the entirety of Northampton County and the majority of Accomack County to the North.

Figure 4-1: Conceptual Groundwater Flow System of the Virginia Eastern Shore



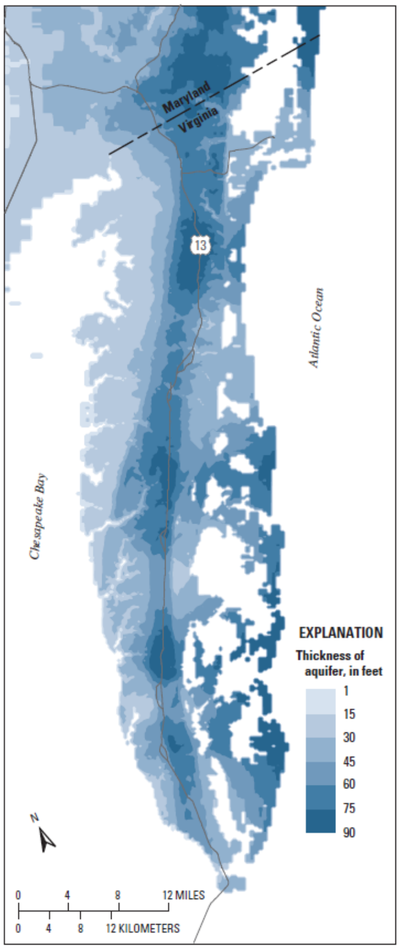
Source: Richardson, 1992[3].

The Columbia and Yorktown aquifers consist of a sequence of sandy units separated by fine-grained facies, which are predominately fine sandy silts and clayey fine sands. The confining units separating the aquifers are leaky, and there is significant ground water flow through these layers. Flow through the confining units is the sole source of recharge for the Yorktown aquifer in the Eastern Shore of Virginia. Within the individual aquifers there commonly exist discontinuous silty and clayey layers that locally serve to restrict vertical flow.

4.1.1.1. Columbia Aquifer

The Columbia aquifer is the uppermost aquifer and is unconfined over most of the area. Sediments comprising this aquifer unconformably overlie the Yorktown aquifers, and are in turn, unconformably overlain by Holocene sediments. Aquifer properties are primarily dependent on lithology and thickness of the water producing sands, gravels and shell materials. Thickness of the Columbia aquifer and depth to water vary with topography.

Figure 4-2: Thickness of the (surficial) Columbia Aquifer



Source: Sanford, et al, 2009[2]

Beneath most of the Eastern Shore of Virginia, thickness of the Columbia aquifer generally ranges from 20 feet near the coast to 60 feet inland (Figure 4-2). Thickness near the central corridor of the Eastern Shore can exceed 100 feet in some areas, and depth to ground water is typically within 10 feet of the surface. To the northwest, the Columbia aquifer generally does not exceed 20 feet in thickness, and to the south and east, the aquifer thickness typically ranges from 40 to 140 feet.

The principal water-bearing unit for the Columbia aquifer on the Eastern Shore of Virginia is generally comprised of Beaverdam Sand. The thickness of the Beaverdam Sand typically ranges between 15 and 30 feet on the Eastern Shore, and in some local areas is has been eroded and replaced by younger channel deposits.

Overlying the Beaverdam Sands are generally discontinuous sand and silt units interbedded with silty and clayey units that serve as local sources of ground water. These sediments include the Walston Silt, the Omar Formation, the Ironshire Formation, the Parsonburg Sand, and the Sinepuxent Formation.

Transmissivities reported for the Columbia aquifer range from 100 to 50,000 ft^2/day. On the Eastern Shore of Virginia, transmissivities are somewhat lower, typically ranging between 1,000 and 4,000 ft^2/day. The general increase in transmissivity to the north appears to be a function of both increasing thickness and increasing hydraulic conductivity.

Water levels in the Columbia aquifer on the Eastern Shore are generally subparallel to surface topography. The highest elevations on the Eastern Shore are along the central ridge, with maximum elevations of +30 to +45 feet (ft) above mean sea level (msl) in the central portion of the peninsula decreasing toward the coastline to approximately +10 ft msl near the tidal marshes. Overall, it appears that depth to ground water is between 10 and 20 ft below ground surface (bgs) for the upland areas and 5 to 10 ft bgs beneath the lower terrace deposits. Ground water from the Columbia aquifer is not used for any single large withdrawals on the Eastern Shore, therefore there are not any mappable cones of depression in this aquifer. However, the Columbia aquifer is extensively used as a supply source for self-supplied domestic, smaller non-domestic, and irrigation water demands.

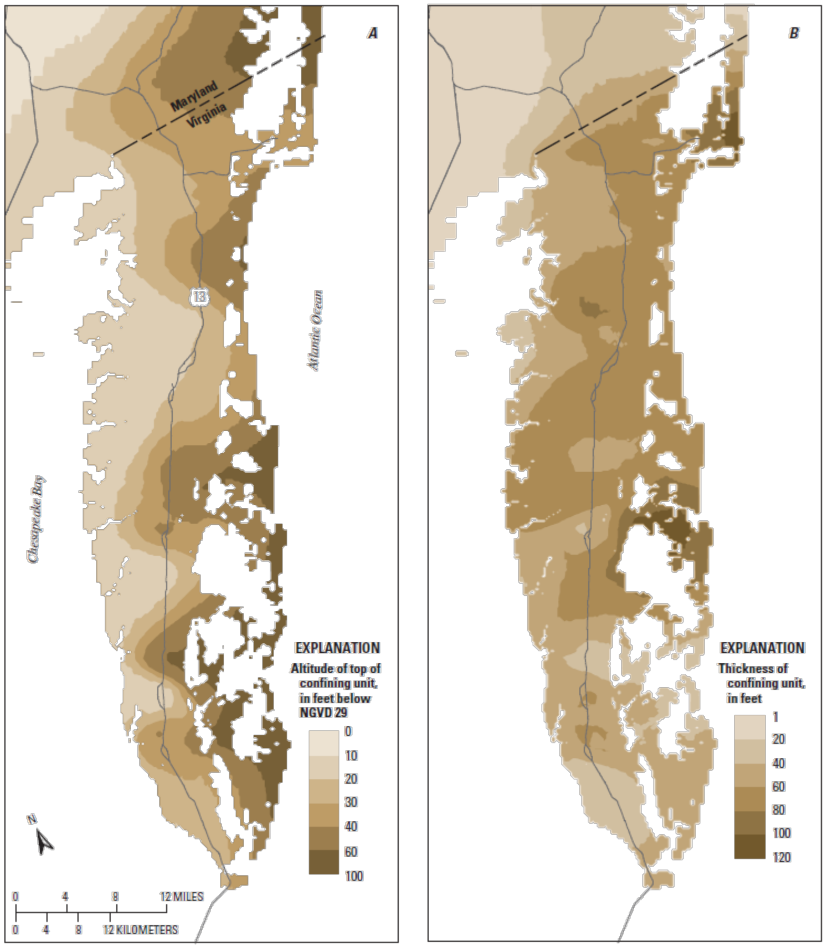
The Columbia aquifer on the Eastern Shore subcrops into the Chesapeake Bay to the west and Atlantic Ocean to the east. Where it subcrops, freshwater discharges directly from the aquifer into the estuarine and ocean water, respectively.

4.1.1.2. Upper Yorktown Confining Unit

The upper Yorktown confining unit consists predominately of marine fine sandy silt with some clay and averages 15 to 30 ft thick (Figure 4-3). These sediments are for the most part reworked sediments from the upper Yorktown Formation and may locally contain fluvial silts and clays. The upper Yorktown confining unit typically consists of a sequence of lenticular interbedded silts, clays, and fine sands and is not massive. In some locations, sandy channel deposit shave breached the confining unit and cut into the underlying upper Yorktown aquifer. There are two such paleochannels on the Eastern Shore of Virginia located near Exmore and Eastville. While this unit is aerially extensive, and only locally absent, it serves to restrict vertical movement of ground water and not effectively preclude it, as evidenced by the fact that the principal source of freshwater recharge and discharge for the Yorktown aquifers on the Eastern Shore is through the confining units. Recharge is discussed in Section 4.1.3 below.

The top of the upper Yorktown confining unit in the Eastern Shore is approximately -10 ft msl along the western margin (Chesapeake Bay) to -60 ft msl along the eastern margin (ocean side). Dip of this unit is 2 to 3 feet per mile and strikes northeast, parallel with the orientation of the peninsula.

Figure 4-3: Top elevation (a) and thickness (b) of the Upper Yorktown Confining Unit



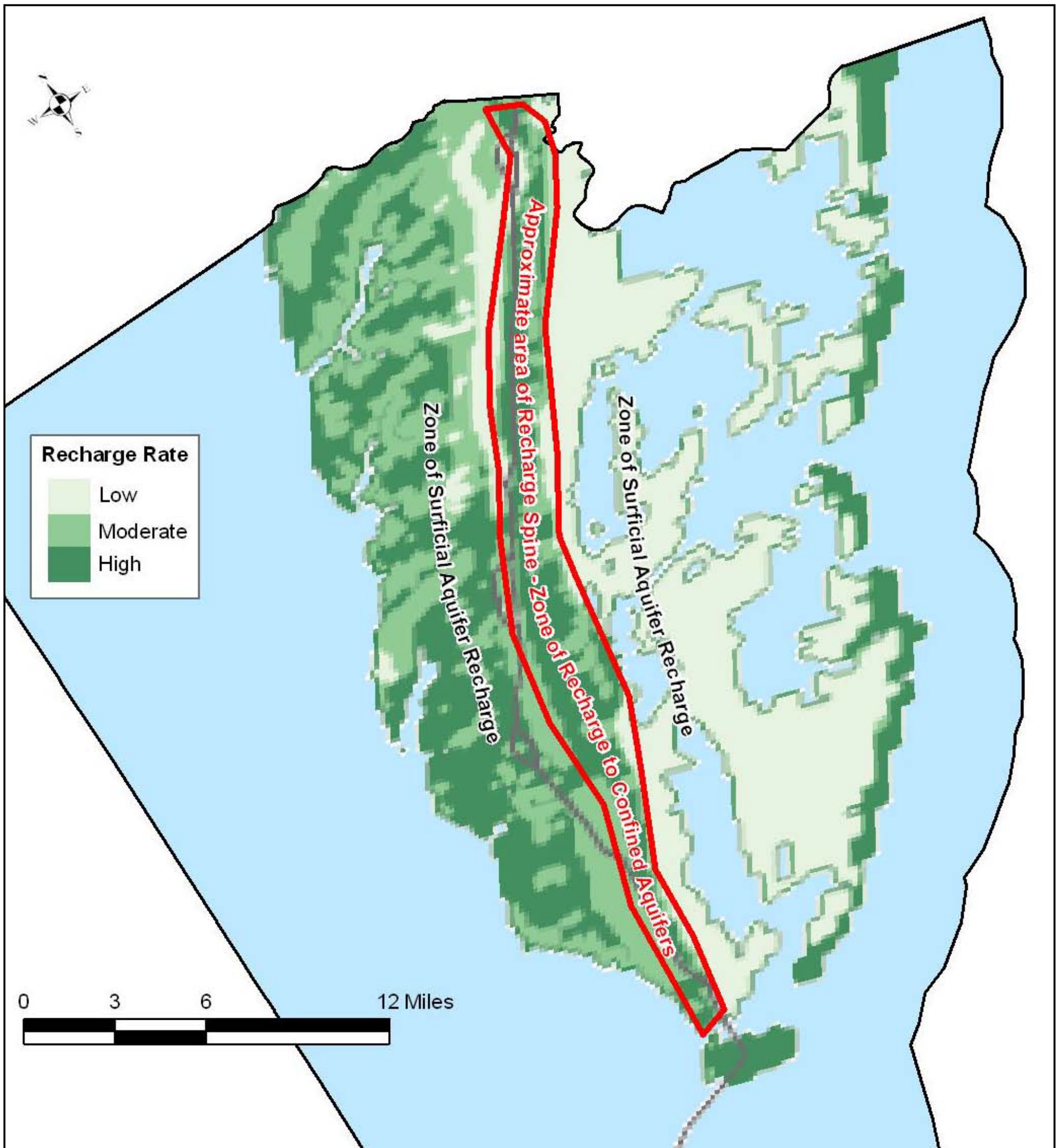
Source: Sandford, et al, 2009[2].

4.1.1.3. Upper Yorktown Aquifer

The upper Yorktown aquifer is the uppermost unit of the Yorktown-Eastover aquifer system, and is generally defined as the first significant sand unit occurring below the unconformity separating the basal Columbia Group sediments from the Chesapeake Group sediments. Sediments deposited in channel fills which incised into the Yorktown Formation have also been identified as the upper Yorktown aquifer, even though it is not clear if there is a good hydraulic connection between the channel fill sediments and the Yorktown Formation sediments. These channel fill deposits have been identified in the Eastern Shore near Exmore and Eastville. Over most of its extent, the Upper Yorktown aquifer consists of gray fine to medium sand with shell fragments commonly present. Locally, discontinuous coarse sand and gravel layers and thin lenses of blue clayey silt are often present.

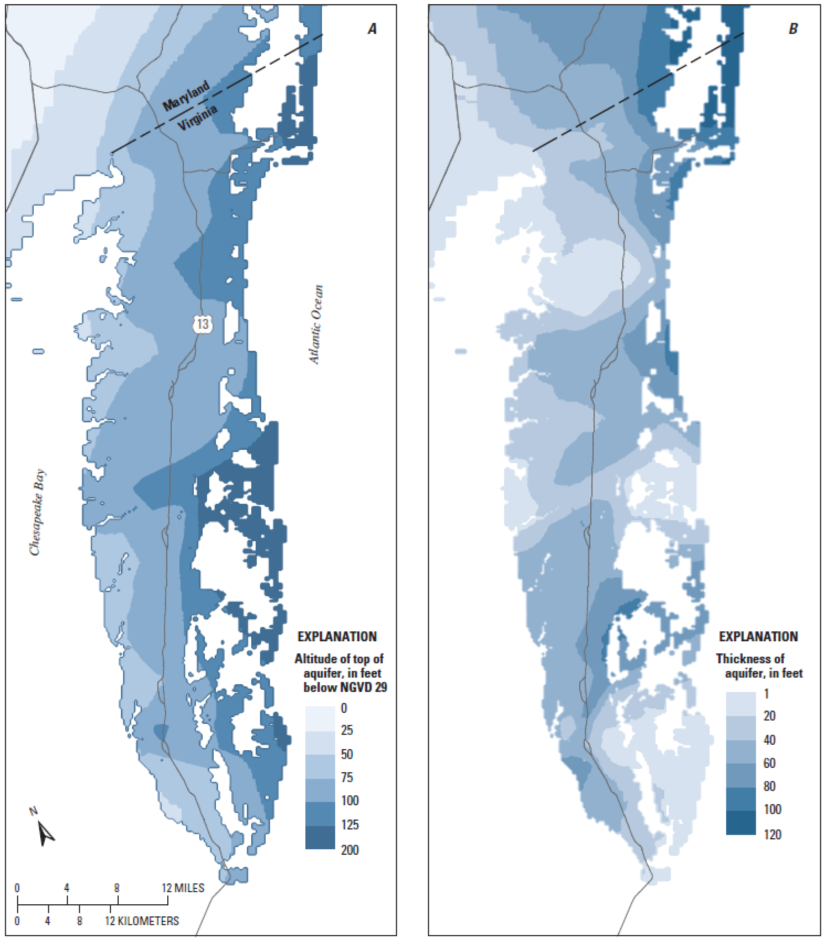
Surficial recharge to the upper Yorktown aquifer occurs along a northeast striking belt, called the “recharge spine”, approximately 1.5 to 4 miles wide. This recharge area is present along the length of the Eastern Shore and provides freshwater recharge through the overlying confining unit (Figure 4-4). There are also significant, somewhat discontinuous, areas with relatively high recharge rates in the western half of the County, that provide recharge to the surficial aquifer only.

Figure 4-4: Relative Recharge Rates in Northampton County



Source: Sanford, et al, 2009[2].

Figure 4-5: Top elevation (a) and thickness (b) of the Upper Yorktown Aquifer



Source: Sanford, et al, 2009[2]

The top of the aquifer in the Eastern Shore is approximately -75 feet msl along the western edge to -125 ft msl to the east (Figure 4-5). Dip of the upper Yorktown aquifer is approximately 3 feet per mile and strike is northeast, parallel to the peninsula. The upper Yorktown aquifer is typically thinner to the west, where more of the sediments were eroded, and thickens to the east. On the Eastern Shore, the thickness of the upper Yorktown ranges between 15 feet in southwest Northampton County to greater than 100 feet near Assateague Island and is typically between 30 and 60 feet thick (Figure 4-5).

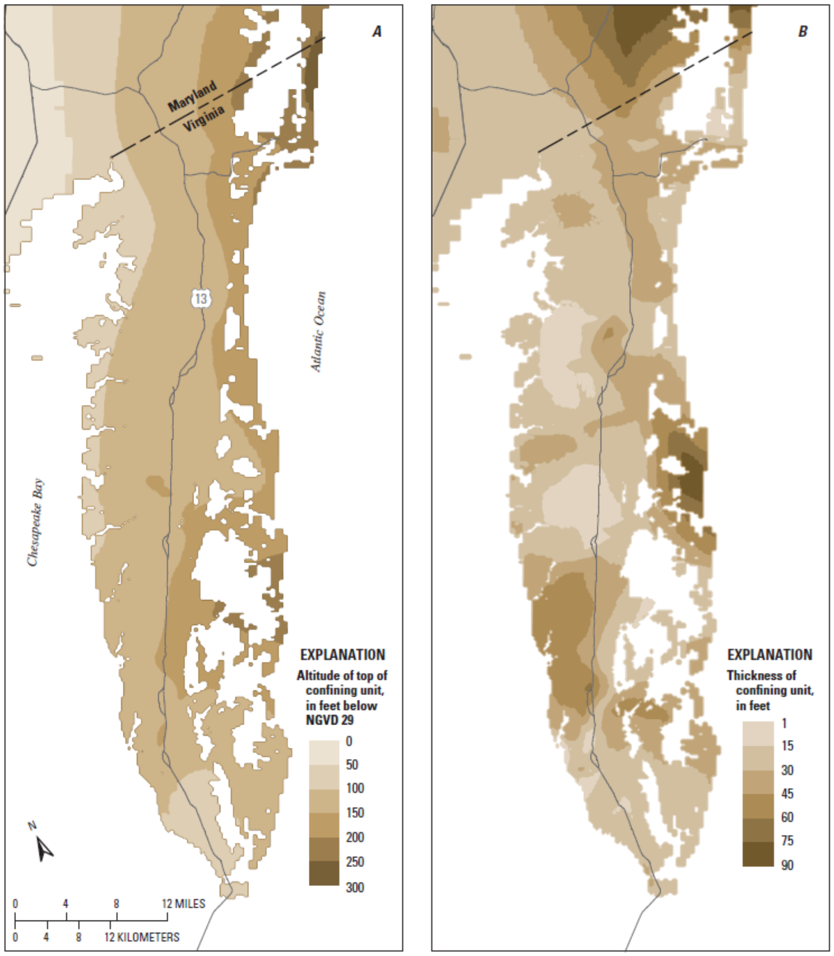
Transmissivity for the upper Yorktown aquifer is generally lower than the Columbia aquifer, and has a lower variability. Transmissivity for this aquifer typically ranges between 1,000 to 5,000 ft^2/day.

Ground water levels on the Eastern Shore follows the same general pattern as the overlying Columbia aquifer, since recharge to this aquifer is from the Columbia. Because the confining unit separating the two aquifers is consistently present over most of the area, there is significant head loss between the two aquifers. A maximum ground water level of +25 ft msl occurs in south central Accomack County, decreasing radially from this point. In Northampton County, ground water level is between +5 and +10 ft , and in central Accomack County, ground water level is +15 to +20 feet MSL, decreasing to +8 to +12 ft msl near the state boundary with Maryland. At the eastern and western coastline, ground water level decreases to approximately +5 ft msl. A short distance offshore, vertical ground water flow direction is expected to reverse, with fresh ground water flow from the upper Yorktown aquifer into the overlying Columbia aquifer. There are several prominent cones of depression resulting from significant ground water withdrawals centered around Temperanceville (Tyson Food), Accomack (Perdue), Exmore, and Cape Charles.

4.1.1.4. Middle Yorktown Confining Unit

The middle Yorktown confining unit is not as continuous or impermeable as the upper Yorktown confining unit, and has been described as allowing substantial leakage between the upper and middle Yorktown aquifers. In some areas this confining unit is absent, and over most of the Eastern Shore, it consists of a zone of interbedded silts and clays with numerous fine sand layers. Thickness of the middle Yorktown confining unit ranges between 15 and 100 ft, and tends to be thinner to the west and south (Figure 4-6).

Figure 4-6: Top elevation (a) and thickness (b) of the Middle Yorktown Confining Unit



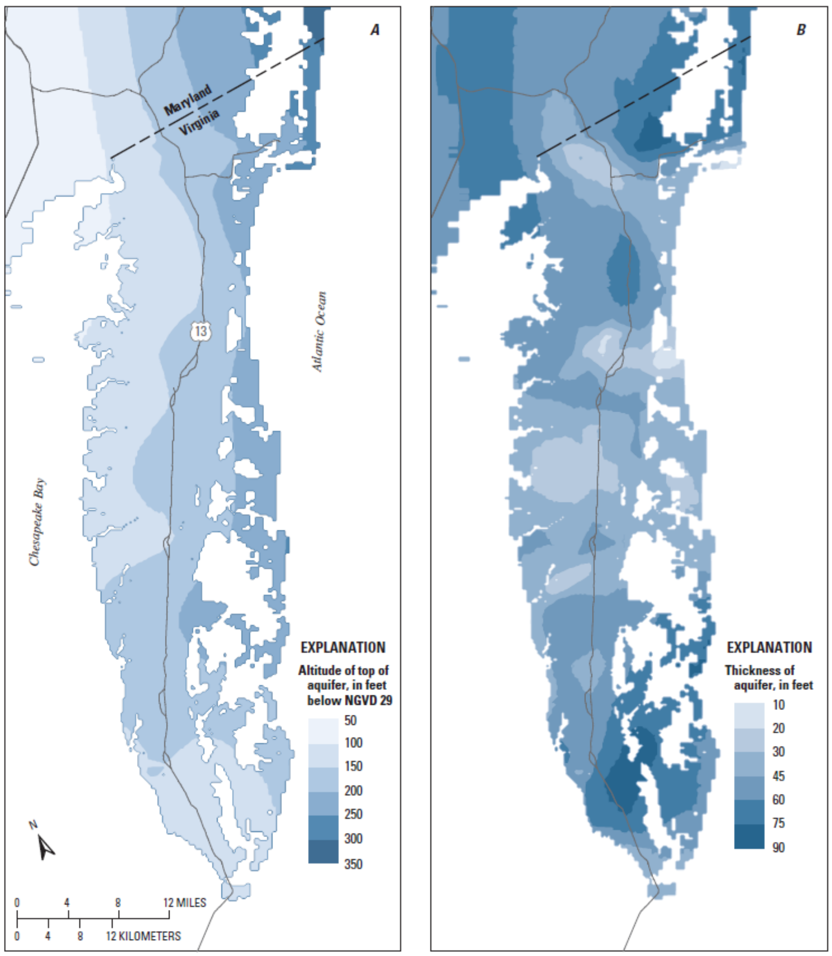
Source: Sanford, et al, 2009[2]

4.1.1.5. Middle Yorktown Aquifer

The middle Yorktown aquifer is an aerially extensive hydrologic unit of the Yorktown-Eastover aquifer system. The middle Yorktown aquifer, over most of its extent in the Eastern Shore is a gray fine sand to silty fine sand with shell fragments prevalent. In some areas, such as near the southern tip of the Eastern Shore, the middle Yorktown aquifer is coarser, consisting of gray medium to fine sand. This unit fines toward central Northampton County to a silty fine sand. Thickness of the middle Yorktown aquifer typically ranges between 30 ft and 60 ft, although locally is can be absent or up to 100 feet thick. The top of the aquifer in the Eastern Shore is between -125 ft msl to -150 ft msl along the western coast increasing to -225 to -250 ft msl to the east (Figure 4-7). The dip of the middle Yorktown is approximately 6 feet per mile, or roughly twice the dip as the overlying Upper Yorktown aquifer beds. As with the other units, strike is northeast, parallel with the peninsula. Transmissivities for the middle Yorktown in the Eastern Shore range between 1,000 and 3,000 ft^2/day.

Ground water levels for the middle Yorktown aquifer on the Eastern Shore are only slightly lower in the central portion than the upper Yorktown, with a maximum ground water elevation between +20 and +25 ft msl near Accomac. At the coast and a short distance offshore, the ground water level in the middle Yorktown is expected to be slightly higher than the upper Yorktown, with the vertical ground water flow reversed to an upward direction. In Northampton County, ground water level typically ranges between +10 and +5 ft msl.

Figure 4-7: Top elevation (a) and thickness (b) of the Middle Yorktown Aquifer

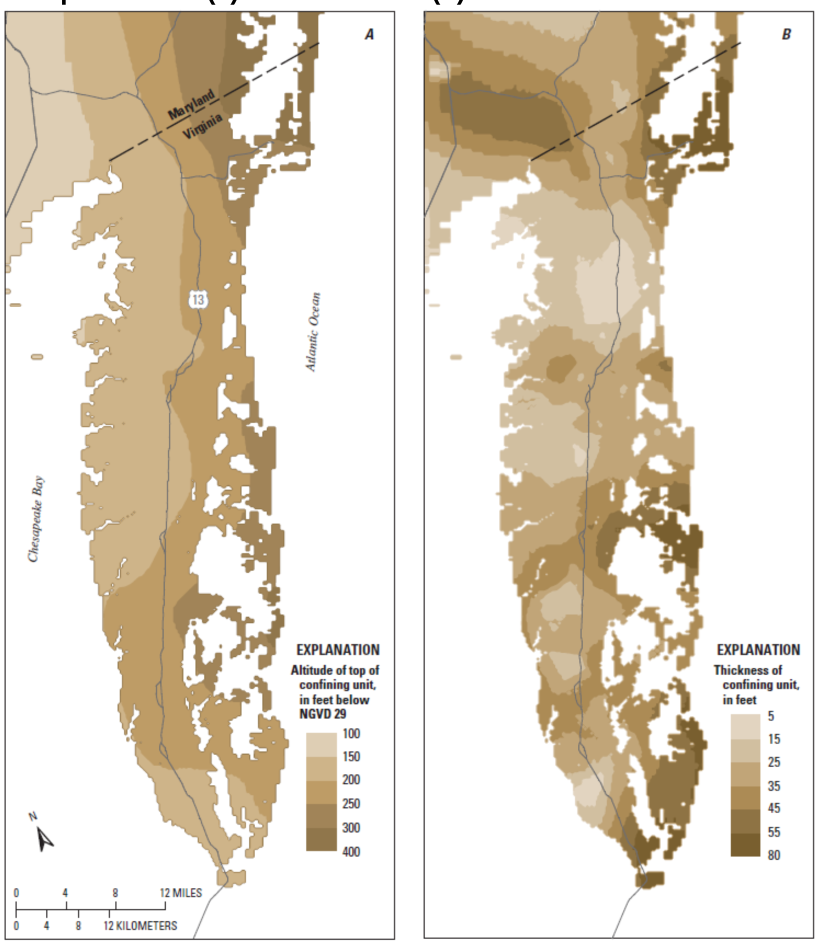


Source: Sanford, et al, 2009[2]

4.1.1.6. Lower Yorktown Confining Unit

The lower Yorktown confining unit has been described only in the Eastern Shore and has not been identified to the north in Maryland. The confining unit is thickest in central and northern Accomack County, thinning to the south and pinching out to the north in Maryland (Figure 4-8). Over the Eastern Shore area, the sediments comprising lower Yorktown confining unit tend to be finer grained than sediments from the middle Yorktown confining unit. As such, the lower Yorktown confining unit appears to restrict vertical flow more than the middle Yorktown confining unit.

Figure 4-8: Top elevation (a) and thickness (b) of the Lower Yorktown Confining Unit



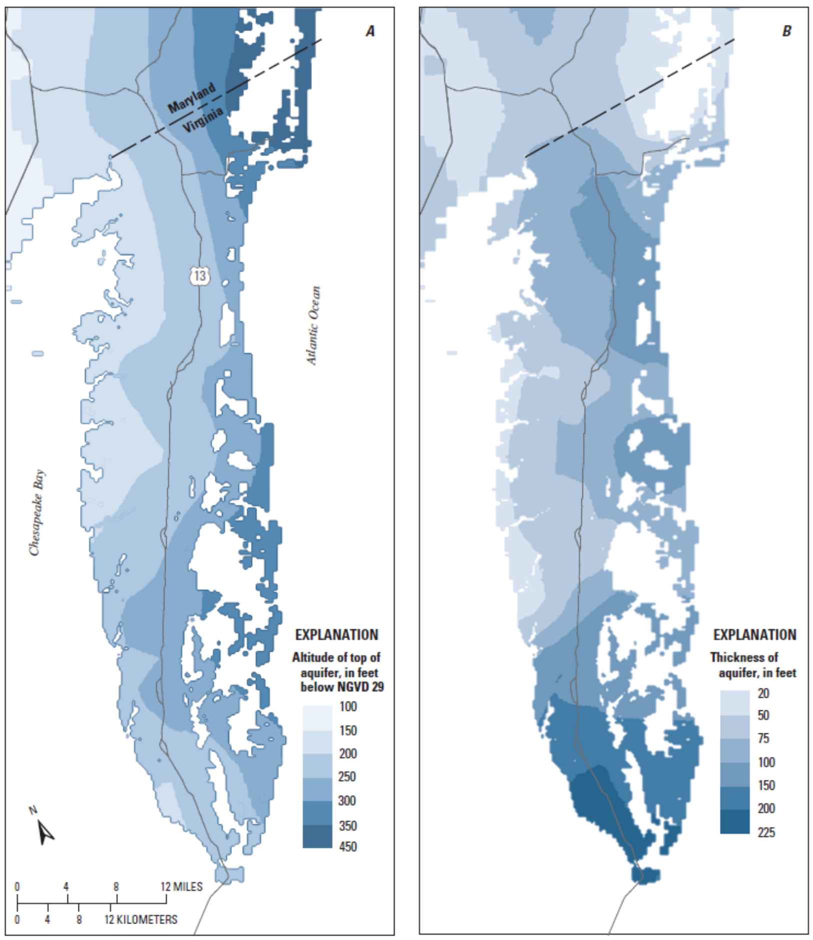
Source: Sanford, et al, 2009[2]

4.1.1.7. Lower Yorktown Aquifer

The lower Yorktown aquifer in the Eastern Shore typically consists of a fining upward sequence of gray fine sand to silty fine sand with shell fragments. In the Eastern Shore, the lower Yorktown aquifer is usually slightly thicker than the overlying middle

Yorktown aquifer, and is generally between 60 and 80 feet thick throughout the area. The top of the lower Yorktown ranges between -175 and -225 ft msl along the western coast to -300 to -350 ft msl along the eastern coast. The dip of the lower Yorktown aquifer is approximately 8 feet per mile, continuing the progressive increase in bed dip with depth exhibited by the overlying units.

Figure 4-9: Top elevation (a) and thickness (b) of the Lower Yorktown Aquifer

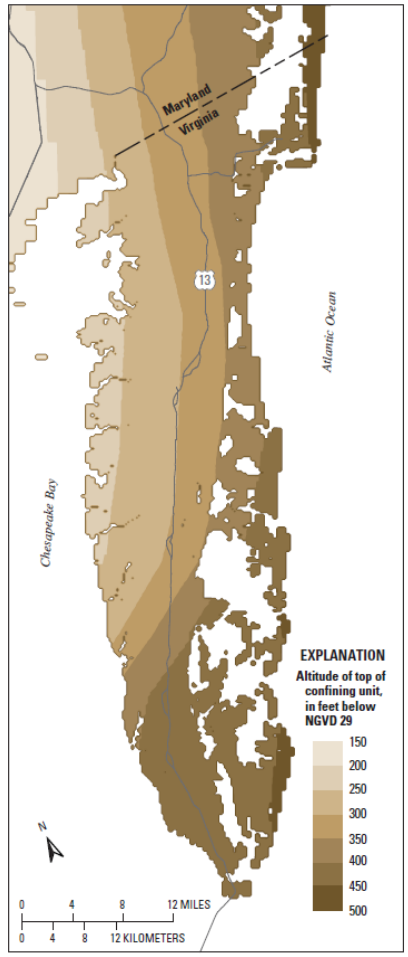


Source: Sanford, et al, 2009[2]

Transmissivity for this aquifer in the Eastern Shore is roughly the same or slightly lower than the middle Yorktown, averaging around 1,200 ft^2/day in areas where the sediments are productive. There are only a few pumping tests conducted in the lower Yorktown of the Eastern Shore and the lower and middle Yorktown aquifer are not differentiated in Maryland. Therefore, there is not a great deal of information on areal variability in transmissivity of the Lower Yorktown.

4.1.1.8. St. Marys Confining Unit

Figure 4-10: Tope elevation of the St Marys Confining Unit



Source: Sanford, et al, 2009[2]

The St. Marys confining unit is defined by the top of the St. Marys Formation and is the most correlative stratigraphic horizon for the sediments in the Eastern Shore and Maryland. The St. Marys confining unit consists of offshore marine very fine sandy silts and clays with abundant shells. This unit comprises sediments from the St. Marys Formation, and separates the lower Yorktown aquifer from the underlying Choptank aquifer. Thickness of the St. Marys confining unit is greater than 100 feet across the entire area, and in most locations exceeds 150 feet. Owing largely to the thickness of this unit, the St. Marys forms an effective confining layer restricting flow between the two aquifers.

In the vicinity of the Virginia Eastern Shore, with the exclusion of Tangier Island, water bearing aquifers below the St. Mary's confining unit are considered too brackish or saline for use as a source of water supply.

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There are two major concerns regarding groundwater in Northampton County, quantity and quality. Groundwater quantity is limited by the nature of the aquifers and must be carefully managed to prevent overuse that can result in saltwater intrusion. Groundwater quality depends on proper management of land use activities that can contaminate aquifers. In recognition of the limited groundwater supply and the potential for contamination, the U.S. Environmental Protection Agency designated the Eastern Shore of Virginia a Sole Source Aquifer in 1997. The designation provides protection to the Shore's water supply by requiring the EPA to review proposed projects on the Shore that are receiving federal financial assistance to ensure they do not endanger the water supply.

4.1.2. Hydrologic Setting

Surface features characteristic of the Coastal Plain of the Eastern Shore include terraces, stream channels, drowned valleys, Carolina bays, swamps and marshes, remnant dunes, and bar-like features formed during the Pleistocene time. The central portion of the Eastern Shore peninsula forms a broad, low ridge which trends northeast-southwest and stands at an elevation ranging from about +25 to +50 ft msl. This central highland area is the principal fresh ground water recharge area for the peninsula and is referred to as the "recharge spine" of the Eastern Shore (Figure 4-4), along with some areas of recharge to the surficial aquifer in the western half of the County. The terrace has maintained the same strand line for almost the entire length of the Atlantic Coastal Plain and is divided into a lower and upper terrace which directs the drainage of the Eastern Shore[4].

The lower terrace, generally located west of Route 13, consists of broad flats broken by large meandering tidal creeks and bordered by tidal marshes[5]. The upper terrace ranges in elevation from +25 to +45 ft msl. The topography of the upper terrace, more complex than the lower terrace, is characterized by shallow sand-rimmed depressions known as Carolina bays. The bays, predominantly oval in shape, exert an important influence on the infiltration, retardation of runoff, and movement of ground water. Between the mainland and the barrier islands are extensive tidal marshes flooded regularly by saltwater and drained by an extensive system of creeks[5]. These systems accept ground water discharge.

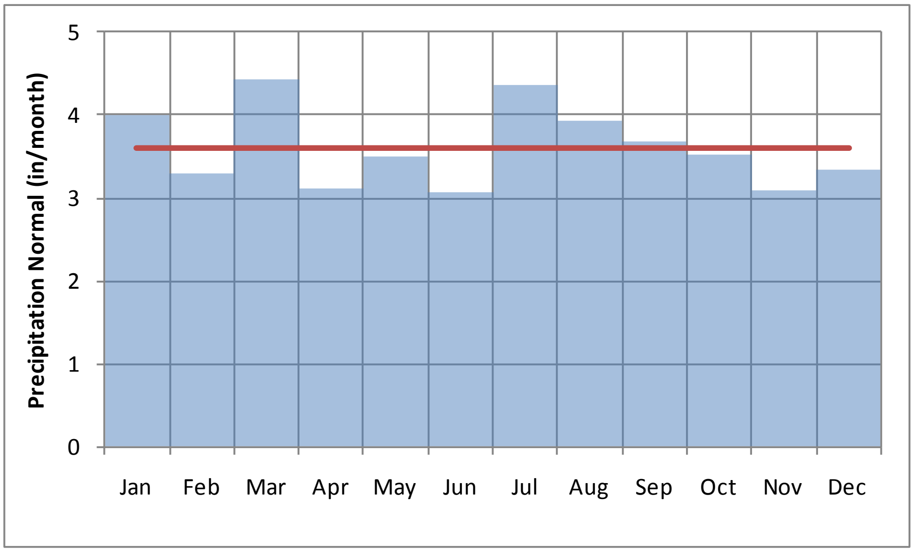
The Eastern Shore is drained by a total thirty small creeks flowing bayward or seaward from the drainage divide which passes the length of the peninsula. The lower reaches of the creeks form tidal estuaries fed by narrow, meandering branches. Because of the low topography and low inflow of freshwater, the creeks are brackish to saline everywhere except for the upper reaches. The estuaries are more pronounced on the Chesapeake Bay side and receive more of the surface and ground water drainage than the smaller creeks on the ocean side[6].

Numerous drainage basins exist on the shore ranging in size from approximately four to six square miles. These basins consist of several small creeks and interconnected ditches. Primary drainage basins of the Eastern Shore of Virginia are Gargathy Creek, Folloy Creek, Finney Creek, Occohannock Creek, and Pungoteague Creek basins in Accomack County; and Mattawoman Creek and Nassawadox Creek basins in Northampton County[7].

4.1.3. Meteorologic Setting

The average annual precipitation on the Eastern Shore is approximately 44 inches. The precipitation normals vary seasonally between 3.0 and 4.5 inches; with the highest months being March and July and the lowest being June and November. Aquifers of the Eastern Shore are recharged by precipitation; however the majority of the precipitation is lost to runoff and evapotranspiration.

Figure 4-11: Precipitation Normals for the Eastern Shore of Virginia



Source: NOAA, 2002[8].

Ground water recharge can be divided into a number of components. Total ground water recharge is the amount of precipitation which is not lost as runoff or evaporation (and evapotranspiration in the unsaturated zone). Of the total ground water recharge to the saturated zone, the principal losses are through evapotranspiration or discharge to surface waters. Loss through evapotranspiration and surface water discharge is most significant in the low lying areas where the water table aquifer is near the surface. The remaining recharge water goes into storage (in the water table aquifer) or recharges the underlying confined aquifers.

There have been a number of ground water recharge values previously estimated for the Eastern Shore. Holme[4] conducted a detailed two year study of ground water recharge from monthly ground water budgets in the Beaverdam Creek basin in Maryland, near the border with Accomack. From his work a recharge value of 12 inches/year was determined, after subtracting ground water loss through evapotranspiration. The 12 inches/year estimate includes recharge which is later lost through discharge to surface waters. Harsh and Laczniak conducted a study of the regional aquifer system of the Northern Atlantic coastal Plain[9]. In this study they estimated that ground water recharge to the water table aquifer is approximately 15 inches/year. A digital-flow-model study in the Coastal Plain of central and southern Delaware[10] used 14 inches/year as an estimate of ground water recharge for the area. More recent studies on the Eastern Shore have estimated that recharge to the unconfined aquifer ranges between 8.5 and 15 inches/year[3] and 12 and 26 inches/year[11].

Fresh groundwater recharge to the underlying confined Yorktown aquifer is generally restricted to the central “spine recharge” area of the peninsula (Figure 4-4). Some of the water that recharges near the center of the peninsula flows vertically through the water table aquifer and underlying confining units to recharge the confined aquifers. This downward flow component decreases with distance from the central recharge area. Ground water flow in the confined aquifers is also primarily horizontal, with some downward flow in the central peninsula and upward flow in coastal discharge areas.

4.2. Existing Environmental Conditions

4.2.1. Threatened and Endangered Species

Northampton County supports populations of a wide variety of flora, and fauna, some of which are of significant economic, recreational, or cultural importance to the county, and several of which are listed as rare, threatened or endangered.

The Virginia Department of Conservation and Recreation (DCR), with authority from the Code of Virginia, established a program to protect habitats of rare, threatened, and endangered plant and animal species; exemplary natural communities, habitats, and ecosystems; and others natural features of the Commonwealth. Resources protected under this program are called “Natural Heritage Resources” under this program. DCR maintains a list of Natural Heritage Resource species believed to be sufficiently uncommon to merit an inventory of their status for each county in the Commonwealth. In all DCR, has listed thirty-eight plant species and twenty-six animal species as Natural Heritage Resources in Northampton County (**Table 4-1**).

Ranking systems have been developed to designate a species’ rarity based on its range-wide status. A species’ global rank is based on its level of occurrence world-wide, whereas its state rank is based on its occurrence within the boundaries of the state of Virginia. Species which are fairly common in other parts of the country but seldom found in Virginia will have different global and state ranks.

The U.S. Fish and Wildlife Service and the National Marine Fisheries Service identify species which receive protection under the Federal Endangered Species Act. Federal status lists a species as endangered, threatened, or as proposed or candidates for listing.

The Endangered Species Act (ESA) of 1973 (7 USC 136; 16 USC 1535 et seq.) was designed to conserve and protect imperiled plant and animal species and the ecosystems on which they depend from extinction. Programs under the ESA are administered individually and jointly by the US Fish and Wildlife Service and by the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service. The law prohibits the "taking" of a listed species or adversely impacting relevant habitat through real or administrative actions. In accordance with the ESA, any future water supply project would be required to consider and avoid potential impacts to listed species within the proposed project footprint as part of federal permitting processes. A permit is usually required by the U.S. Army Corps of Engineers for construction projects, including surface water intakes disturbing "waters of the United States" which includes most rivers and streams. Virginia law also affords protection to state listed species and may affect the permitting process for developing new water supplies. A Virginia Water Protection Permit (WPP) from DEQ is required for both ground and surface water withdrawals. In evaluating the permit application, DEQ may consult with other state agencies responsible for the protection of listed species. Relevant Virginia agencies include the Department of Game and Inland Fisheries (DGIF), the Department of Agriculture and Consumer Services (DACS), and DCR's Division of Natural Heritage (DNH). Protected animal species in Virginia are the responsibility of DGIF, while plant and insect species are the responsibility of DACS. Both agencies work jointly with DNH to maintain an inventory of listed species and their known occurrences in Virginia.

The documented occurrence of a rare, threatened or endangered species within the footprint of a proposed project may necessitate a redesign, mitigation actions, or project limitations, but does not typically prevent approval. Common direct impacts to projects with the potential for impacts to occurring rare, threatened, or endangered species and their habitats include limitations on water withdrawals (often on a seasonal basis) and to require project design, construction, and timing considerations which limit habitat disruption and organism capture, particularly in the case of surface water intakes.

As all of the potable water withdrawals in the County are derived directly from groundwater sources, impacts to rare, threatened and endangered species are usually avoided or relatively simple to mitigate. Water supplies relying on withdrawals from groundwater wells can be designed with small project footprints, limiting habitat disruption, and tend to have a much smaller direct impact on the hydrology of habitats, particularly in the case of wells that are deeply screened.

Proposals for new or expanded water withdrawals and for associated infrastructure should include considerations of the potential to encounter or impact rare, threatened or endangered species. Such development should incorporate consultations with relevant federal and state agencies to determine whether the potential for impacts to listed species is present. Written requests can be made to DGIF and DNH to search for known occurrences of listed species in the vicinity of the project and to determine the likelihood of impacts to the listed species based on the proposed project location and description.

Table 4-1:
Threatened and Endangered Species in Northampton County

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status
PLANTS					
Amaranthus pumilus	Seabeach Amaranth	G2	S1	LT	LT
Carex lupuliformis	False Hop Sedge	G4	S2		
Chamaesyce bombensis	Southern Beach Spurge	G4G5	S2		
Cyperus engelmannii	Engelmann's Umbrella-sedge	G4Q	S1		
Cyperus plukenetii	A Galingale Sedge	G5	S2		
Desmodium ochroleucum	Creamflower Tick-trefoil	G1G2	SH	SOC	
Echinodorus tenellus	Dwarf Burhead	G5?	S1		
Hydrocotyle bonariensis	Coastal-plain Penny-wort	G5	S1?		
Juncus megacephalus	Big-head Rush	G4G5	S2		
Osmanthus americanus var. americanus	Wild Olive	G5T5	S1		
Physalis walteri	Sticky Ground-cherry	G4	S2		
Polygonum glaucum	Sea-beach Knotweed	G3	S1S2		
Solidago latissimifolia	Elliott Goldenrod	G5	S2		
Solidago tortifolia	A Goldenrod	G4G5	S1		
Thelypteris simulata	Bog Fern	G4G5	S1S2		
Tillandsia usneoides	Spanish Moss	G5	S2		
Utricularia juncea	Southern Bladderwort	G5	S2		
ANIMALS					
Anas strepera	Gadwall	G5	S2B,S3N		
Ardea alba	Great Egret	G5	S2S3B,S3N		SC
Charadrius melodus	Piping Plover	G3	S2B,S1N	LT	LT
Charadrius wilsonia	Wilson's Plover	G5	S1B		LE
Cicindela dorsalis dorsalis	Northeastern Beach Tiger Beetle	G4T2	S2	LT	LT
Circus cyaneus	Northern Harrier	G5	S1S2B,S3N		SC
Egretta caerulea	Little Blue Heron	G5	S2B,S3N		SC
Egretta thula	Snowy Egret	G5	S2B,S3N		
Egretta tricolor	Tricolored Heron	G5	S2B,S3N		SC
Eudocimus albus	White Ibis	G5	S1B		
Falco peregrinus	Peregrine Falcon	G4	S1B,S2N		LT
Gelochelidon nilotica	Gull-billed Tern	G5	S2B		LT
Haliaeetus leucocephalus	Bald Eagle	G5	S2S3B,S3N		LT
Hydroprogne caspia	Caspian Tern	G5	S1B,S2N		SC

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status
Nyctanassa violacea	Yellow-crowned Night-heron	G5	S2S3B,S3N		SC
Pelecanus occidentalis	Brown Pelican	G4	S2B,S3N		SC
Plegadis falcinellus	Glossy Ibis	G5	S2B,S1N		SC
Rynchops niger	Black Skimmer	G5	S2B,S1N		
Sciurus niger cinereus	Delmarva Fox Squirrel	G5T3	S1	LE	LE
Sternula antillarum	Least Tern	G4	S2B		SC
Thalasseus maximus	Royal Tern	G5	S2B		
Thalasseus sandvicensis	Sandwich Tern	G5	S1B		SC

Global Ranking System

RANK	DESCRIPTION
G1	Extremely rare and critically imperiled with 5 or fewer occurrences or very few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction
G2	Very rare and imperiled with 6 to 20 occurrences or few remaining individuals; or because of some factor(s) making it vulnerable to extinction
G3	Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range; or vulnerable to extinction because of other factors
G4	Common and apparently secure globally, though it may be rare in parts of its range, especially at the periphery
G5	Very common and demonstrably secure globally, though it may be rare in parts of its range, especially at the periphery
GH	Formerly part of the world's biota with expectation that it may be rediscovered
GX	Believed extinct throughout its range with virtually no likelihood of rediscovery
G?	Unranked, or, if following a ranking, rank uncertain (ex. - G3?)
G_Q	The taxon has a questionable taxonomic assignment, such as G3Q
G_T	Signifies the rank of subspecies or variety. For example, a G5T1 would apply to a subspecies of a species that is demonstrably secure globally (G5) but the subspecies warrants a rank of T1, critically imperiled

State Ranking System

RANK	DESCRIPTION
S1	Extremely rare and critically imperiled with 5 or fewer occurrences or very few remaining individuals in Virginia; or because of some factor(s) making it especially vulnerable to extirpation in Virginia
S2	Very rare and imperiled with 6 to 20 occurrences or few remaining individuals in Virginia; or because of some factor(s) making it vulnerable to extirpation in Virginia
S3	Rate to uncommon in Virginia with between 20 and 100 occurrences; may have fewer occurrences if found to be common or abundant at some of these locations; may be somewhat vulnerable to extirpation in Virginia
S4	Common and apparently secure with more than 100 occurrences; may have fewer occurrences with numerous large populations
S5	Very common and demonstrably secure in Virginia
SH	Formerly part of Virginia biota with expectation that it may be rediscovered
SX	Believed extirpated from Virginia with virtually no likelihood of rediscovery
SE	Exotic; not believed to be a native component of Virginia's flora
SU	Possibly rare, but status uncertain and more data needed
S_?	Rank uncertain; for example, an S2? denotes a species with rarity that may range from S1 to S3, an SE? means a species may or may not be native to Virginia

Source: Virginia DCR, 2010[12]

4.2.2. Anadromous, Trout, and other Significant Fisheries

The Magnuson-Stevens Act, passed by Congress in 1996, promotes direct action to prevent or reverse habitat loss of marine fishery resources. Measures of the Magnuson-Stevens Act are overseen by NOAA's National Marine Fisheries service which coordinates with Regional Fishery Management Councils, resource users, federal and state agencies, to protect, conserve and enhance "essential fish habitat".

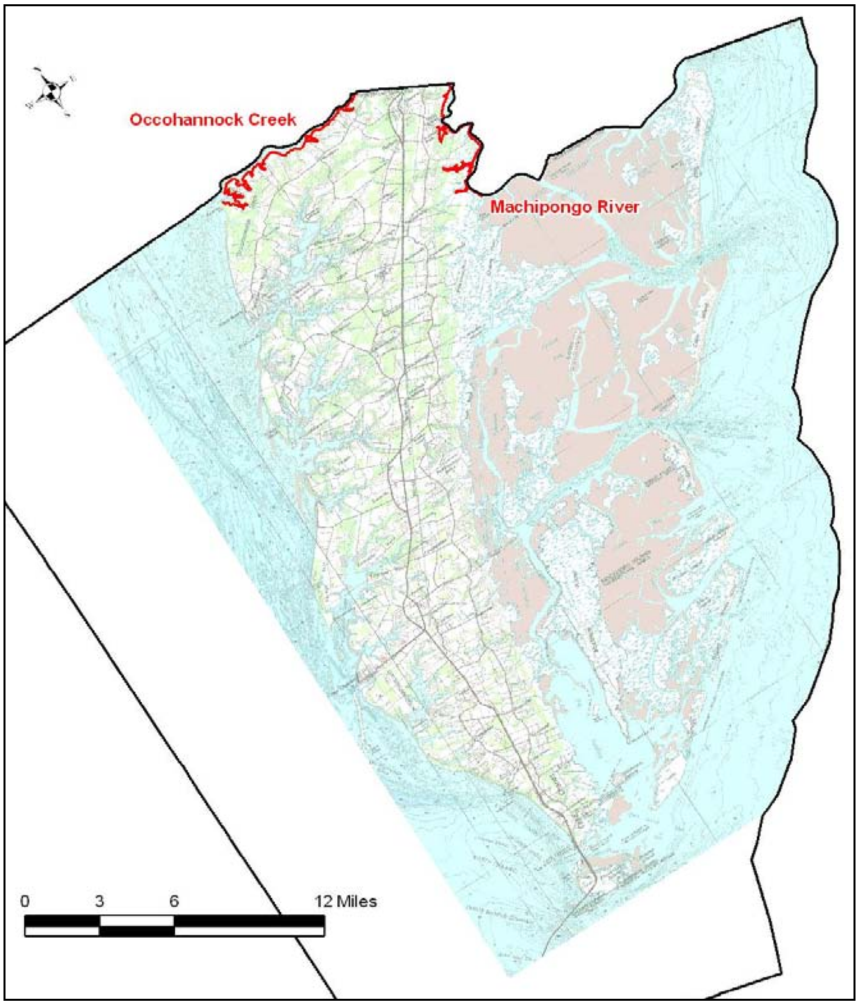
Given that streams and rivers in Northampton County are almost exclusively tidally influenced, freshwater withdrawals, particularly groundwater withdrawals have little impact on anadromous fish and trout. Hard clam aquaculture, which is a significant and growing part of the economy of the Eastern Shore ($24 million in 2004)[13], also occurs in a saltwater environment, and is also therefore minimally impacted by the largely subsurface freshwater withdrawals in the County.

4.2.3. Recreational Significance and State Scenic River Status

The Virginia Scenic Rivers Act, passed in 1970, authorized the designation of scenic rivers. The Scenic Rivers Program was established with the purpose of identifying, designating and protecting streams and rivers of outstanding scenic, recreational, historic, and natural character with a focus in enhancing conservation and wise use of such streams and rivers and adjacent lands. In evaluating permit applications for proposed construction projects within the corridor of a designated stream or river, State agencies must consider the project's potential impacts to the stream and the characteristics leading to its designation. Considerations relevant to scenic rivers may affect project design, siting, and/or withdrawal amounts.

There are currently no recognized State Scenic Rivers in Northampton County; however, Occohannock Creek and Machipongo River have been designated as potential candidates worthy of future study (**Figure 4-12**). Furthermore, as all of the potable water withdrawals in the County are derived directly from groundwater sources, impacts to scenic rivers are usually avoided or relatively simple to mitigate.

Figure 4-12: Candidates for State Scenic River Designation



4.2.4. Sites of Historical or Archeological Significance

The Virginia Landmarks Register (VLR) and the Natural Register of Historic Places (NRHP) are programs of State and National scope, respectively, that seek to identify and preserve important cultural, architectural, and archeological sites. The NRHP has been managed by the National Park Service since 1966 and is the official list of historic resources including structures, sites, objects, and districts that represent the cultural and historical foundations of the nation. The VLR is managed by the Virginia Department of Historic Resources (DHR), is the state's official list of properties important to the history of Virginia. The same criteria are used to evaluate resources for inclusion in both the NRHP and the VLR.

Inclusion in one or both of the Registers encourages the preservation and proper stewardship of the listed property and recognizes its historic value. Numerous incentives exist to encourage stewardship including tax incentives, technical assistance and rehabilitation funding from federal and state agencies; however, property owners accepting these incentives must abide by certain restrictions associated with the relevant program. Property owners in locally designated historic districts are also required to comply with applicable local ordinances.

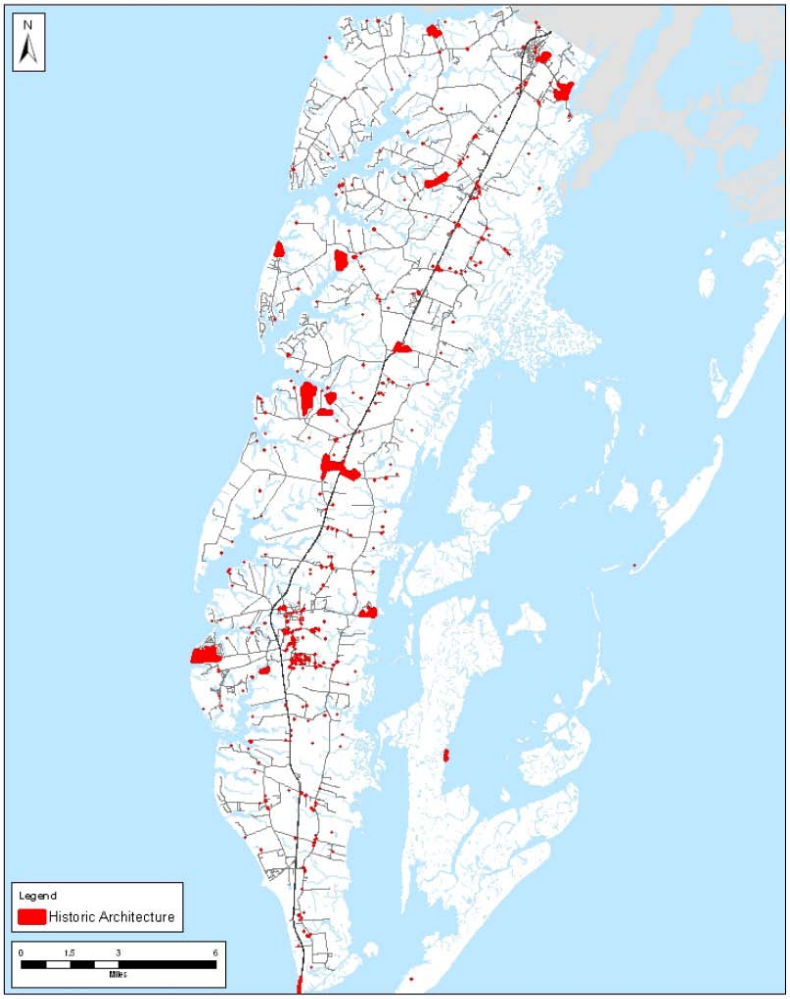
There are a currently twenty-three sites and four districts (Cape Charles, Eastville, and the Northampton County Courthouse and Lumber Company Historic Districts) of historical, architectural, or cultural significance located in Northampton County that are listed in the VLR and NRHP (**Table 4-2** and **Figure 4-13**).

Table 4-2:
National and Virginia Landmark Register Sites in Northampton County

Jurisdiction/Property	USGS Quad Map	VLR	NRHP	DHR File
Almshouse Farm at Machipongo	Franktown	09-12-01	04-01-02	065-0053
Arlington Archaeological Site	Elliott's Creek	03-20-08	05-12-08	065-0001
Benjamin's Department Store	Exmore	03-08-06	05-10-06	065-0528
Brownsville	Nassawadox	12-02-69	02-26-70	065-0003
Cape Charles Historic District	Cape Charles	08-15-89	01-03-91	182-0002
Cape Charles Light Station	Fisherman's Island	12-04-02	06-23-03	065-0071
Cessford	Cheriton	09-10-03	01-16-04	214-0001
Custis Tombs	Elliotts Creek	11-05-68	04-17-70	065-0066
Eastville Historic District	Cheriton	06-18-09	10-01-09	214-0040
Eastville Mercantile	Cheriton	12-01-04	01-20-05	214-5001
Eyre Hall	Cheriton	09-09-69	11-12-69	065-0008
Glebe of Hungar's Parish	Franktown	12-02-69	02-26-70	065-0033
Grapeland	Jamesville	06-21-77	05-06-80	065-0035
Hungars Church	Franktown	07-07-70	10-15-70	065-0012
James Brown's Dry Goods Store	Cheriton	09-12-01	04-01-02	214-0039
John W. Chandler House	Exmore	09-08-04	11-27-04	065-0530
Kendall Grove	Franktown	10-21-80	06-21-82	065-0060
Northampton County Courthouse Historic District	Cheriton	11-16-71	04-13-72	214-0007
Northampton Lumber Company Historic District	Nassawadox	03-20-08	05-29-08	267-5005
Oak Grove	Franktown	12-09-92	02-04-93	065-0019
Pear Valley	Franktown	05-13-69	11-12-69	065-0052
Selma	Cheriton	03-08-06	05-10-06	065-0077
Stratton Manor	Cheriton	09-16-80	11-28-80	065-0024
Upper Ridge Site at Mockhorn Island	Townsend	06-01-05	08-23-05	065-5015
Vaucluse	Franktown	12-02-69	09-15-70	065-0028
Westerhouse House	Franktown	09-17-74	11-19-74	065-0030
Winona	Franktown	11-05-68	10-01-69	065-0032

Source: VDHR, 2010[14]

Figure 4-13: Virginia Landmark Register Sites in Northampton County



Source: Northampton Comprehensive Plan, 2009[1].

Federal and state laws also offer protection to important cultural sites of the indigenous cultures that occupied the area before the Europeans, who settled in Virginia beginning in the fifteenth century. Archeological digs have found evidence of humans on the Shore as early as 8,000 and 10,000 B.C.E. Local Indian tribes were part of either the Powhatan or Algonquian Nations. The Commonwealth of Virginia has extended official recognition to eight tribes, none of which were associated with the Planning Region. There are no federally recognized reservations within the Planning Region. However, there are numerous archaeological sites that are not currently listed but may be eligible ranging in age from a few hundred to several thousand years[15].

Development of new water supply infrastructure must include consideration for historic and cultural resources that may be present in the project footprint. DHR maintains archive documenting historic, archeological and cultural resources which can serve as an initial source of information to determine whether these resources may be impacted by a proposed project. Section 106 of the National Historic Preservation Act requires projects utilizing federal funds to consult with the DHR State Historic Preservation Office and, in most cases, with recognized tribal representatives. Projects with State funding usually have similar requirements. Site investigations including archeological or architectural surveys may be required in order to determine whether sites in the project footprint are eligible for recognition and protection under the federal or state Registers.

As all of the potable water withdrawals in the County are derived directly from groundwater sources, impacts to historic, archeological and cultural resources are usually avoided or relatively simple to mitigate.

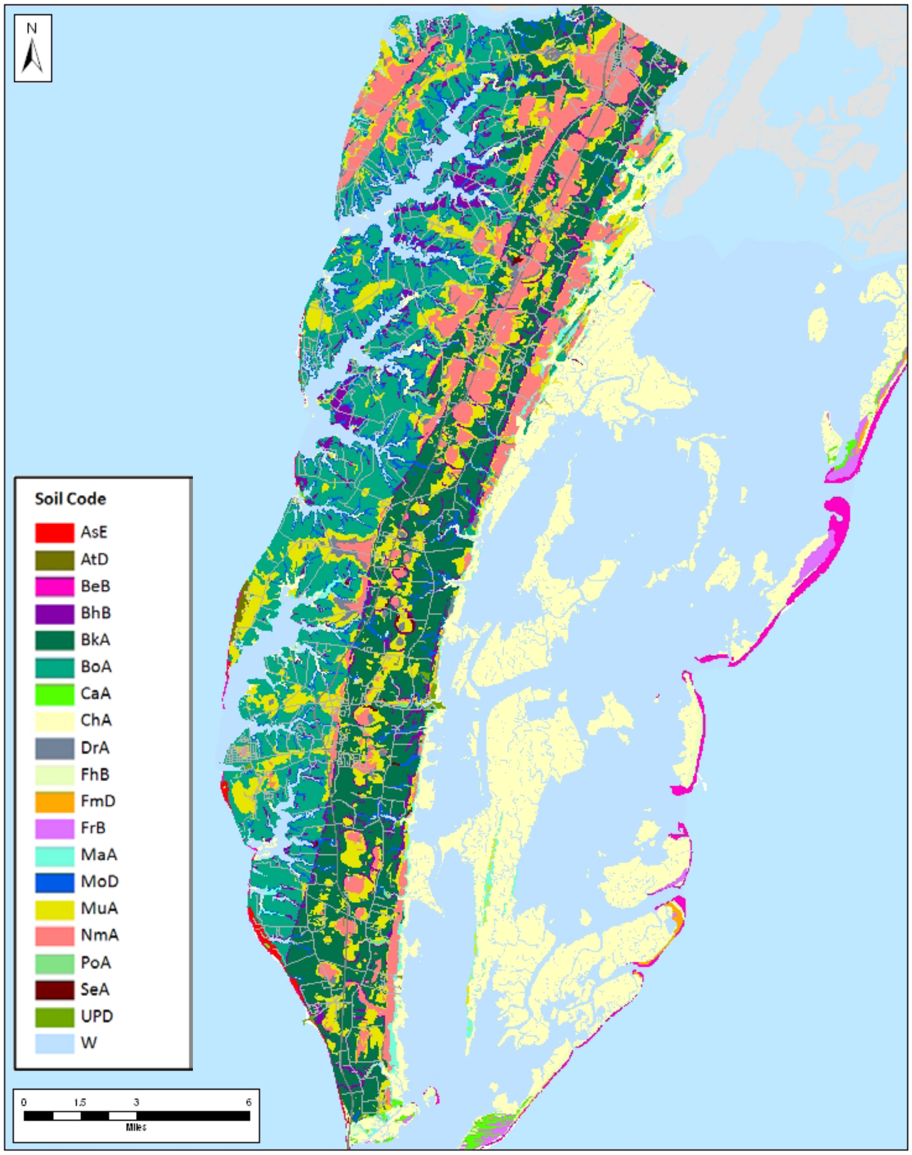
4.2.5. Geology and Soils

The geology of Northampton County consists of unconsolidated sediments on the Virginia Coastal Plain as discussed in Section 4.1.1 above. The type and distribution of soils in Northampton County is an important factor affecting land use and development, particularly for agriculture, construction, and sanitary operation of onsite disposal systems.

The soil profile of Northampton County generally consists of loam to sandy loam. A series of continuous sand strata, commonly identified with the Columbia aquifer, is present below the upper layer of soil. Existing and potential agricultural and development use of the soils is largely determined by the seasonal high elevations of the water table and the ability of the soils to support desired land uses.

A fairly comprehensive soil survey has been completed by the USDA Soil Conservation Service. The survey is useful in identifying the general distribution and types of soils present in the County; however, it does not replace the need for applicable site-specific testing of soil suitability prior to planned changes in land use or development. Soils identified in the survey have been grouped into types, which represent an area or areas of land with soils occurring in a characteristic pattern. The characteristic pattern in each soil type will have a similar soil horizon and other features which give it a distinctive landscape. There are nineteen soil types, not including open water, in Northampton which are described in Table 4-3 and shown in Figure 4-14.

Figure 4-14: Soil Types of Northampton County



Source: Northampton Comprehensive Plan, 2009[1].

Table 4-3:
Soil Types and Occurrence in Northampton County

Symbol	Soil Name	Slope	Drainage	% Occurrence
AsE	Assateague sand	2 to 50		0.3
AtD	Assateague fine sand	2 to 35	rarely flooded	0.1
BeB	Beaches	0 to 10		1.2
BhB	Bojac loamy sand	2 to 6		3.8
BkA	Bojac sandy loam	0 to 2		17.3
BoA	Bojac fine sandy loam	0 to 2		19.1
CaA	Camocca fine sand	0 to 2	frequently flooded	0.8
ChA	Chincoteague silt loam	0 to 1	frequently flooded	24.4
DrA	Dragston fine sandy loam	0 to 2		1.1
FhB	Fisherman fine sand	0 to 6	occasionally flooded	1.2
FmD	Fisherman-Assateague complex	0 to 35	rarely flooded	0.3
FrB	Fisherman-Camocca complex	0 to 6	frequently flooded	1.1
MaA	Magotha fine sandy loam	0 to 2	frequently flooded	1.3
MoD	Molena loamy sand	6 to 35		3
MuA	Munden sandy loam	0 to 2		10.4
NmA	Nimmo sandy loam	0 to 2		9.2
PoA	Polawana loamy sand	0 to 2	occasionally flooded	0.8
SeA	Seabrook loamy sand	0 to 2		0.1
UPD	Udorthents and Udipsamments soils	0 to 30		0.2
W	Water	--		4.3
			TOTAL	**100**

Source: Northampton Comprehensive Plan, 2009[1].

A significant portion of the soils in the county contain hydric component soils (9.2%), defined by the Natural Resources Conservation Service (NRCS) as soils that “formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part”. Hydric soils are typically unsuitable for conventional septic systems due to the small or non-existent separation between the septic absorption area and the high water table. The presence of hydric soils is also one of several indications of the presence of regulated wetlands, along with the presence of wetland vegetation and hydrology. The presence of (regulated) wetlands, discussed below in Section 4.2.6, must be considered as part of project planning, design, and construction.

Some soils in the region have demonstrated direct economic value and are being actively quarried. As recently as 2008, there were three quarries in Northampton County covering a total area of 61 acres, two of which were active and removed a total of 30,000 tonnes of sand (Table 4-4).

Table 4-4:
Summary of 2008 Sand Quarry Activity in Northampton County

COMPANY NAME	MINE NAME/NUMBER	PERMIT	DISTURBED ACRES	PERMITTED ACRES	TONS	Active in 2008?
BRANSCOME INC	BROWNSVILLE PIT	06085AC	8.5	10	0	N
GERALD M. MOORE & SON, INC.	#5	13447AA	23	46	29,907	Y
WAGNER BROTHERS	#1	90459AA	5	5	225	Y
		NORTHAMPTON COUNTY	**36.5**	**36.50**	**61.00**	**30,132**

Source: DMM Report PEPR.33 and TNPR.06 (2008)

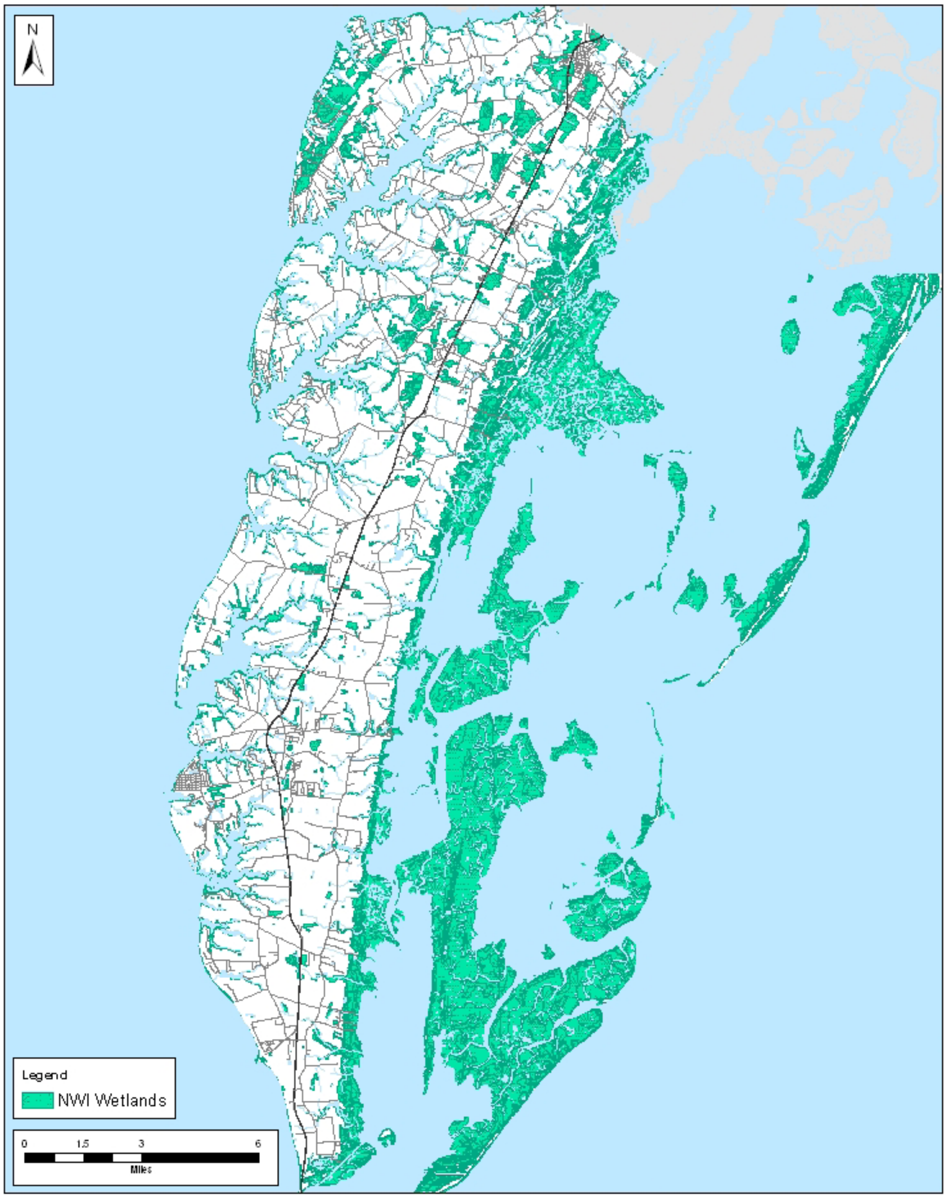
4.2.6. Wetlands

The majority of wetlands present in Northampton County are tidal or tidally influenced. Tidal wetlands have been defined in the Commonwealth of Virginia as part of the Wetlands Act (Title 62.1, Section 13.2, Code of Virginia) as “all land lying between and contiguous to mean low water and an elevation above mean low water equal to the factor 1.5 times the mean tide range at the site”. The area between the seaside shoreline of the peninsula and the barrier islands, lies a maze of pristine and ecologically productive shallow bays, salt marshes, tidal flats and beaches. The area supports a wide variety of marine, avian, and terrestrial species and is considered to be one of the most exemplary ecosystems of its kind. There are also a number of existing upland wetlands in Northampton County. These are associated with areas containing hydric soils. Wetlands in Northampton County are shown in Figure 4-15.

The Virginia Water Protection Permit (VWPP) program is the process for regulating activities in tidal and non-tidal wetlands in the Commonwealth and is run by the Virginia DEQ. Section 401 and Section 404 of the Clean Water Act, also regulate impacts to wetlands under the jurisdiction of the US Army Corps of Engineers (USACE). Typically the placement of fill and/or removal of sediments from regulated wetlands requires a permit from either or both the USACE and the DEQ. The Virginia Marine Resources Commission (VMRC) oversees the Joint Permit Application (JPA) process for projects with potential impacts to sub-aqueous bottoms in the Commonwealth and coordinates the JPA process with DEQ and USACE, in consultation with other relevant federal, state and local agencies.

The US Fish and Wildlife Service (USFWS) collects and maintains extensive data on the distribution and types of wetlands as part of the National Wetland Inventory (NWI) program. Wetlands are inventoried and mapped at a local scale, useful for project planning, as part of the program. However, NWI information must usually be supplemented with field collected, site-specific soil, hydrology, and vegetation data to determine the presence, extent and quality of wetlands in the affected area of a proposed project. The presence of wetlands within a project footprint can significantly impact the siting, design, and sometimes feasibility of some projects. Projects that would alter the wetlands must demonstrate a lack of other suitable alternatives and mitigate impacts to affected wetlands, which can significantly increase project costs.

Figure 4-15: NWI Wetlands in Northampton County



Source: Northampton Comprehensive Plan, 2009[1].

As all of the potable water withdrawals in the County are derived directly from groundwater sources, impacts to wetlands from existing and future water supply projects are usually avoided or are often simpler to mitigate than surface water projects.

4.2.7. Riparian Buffers

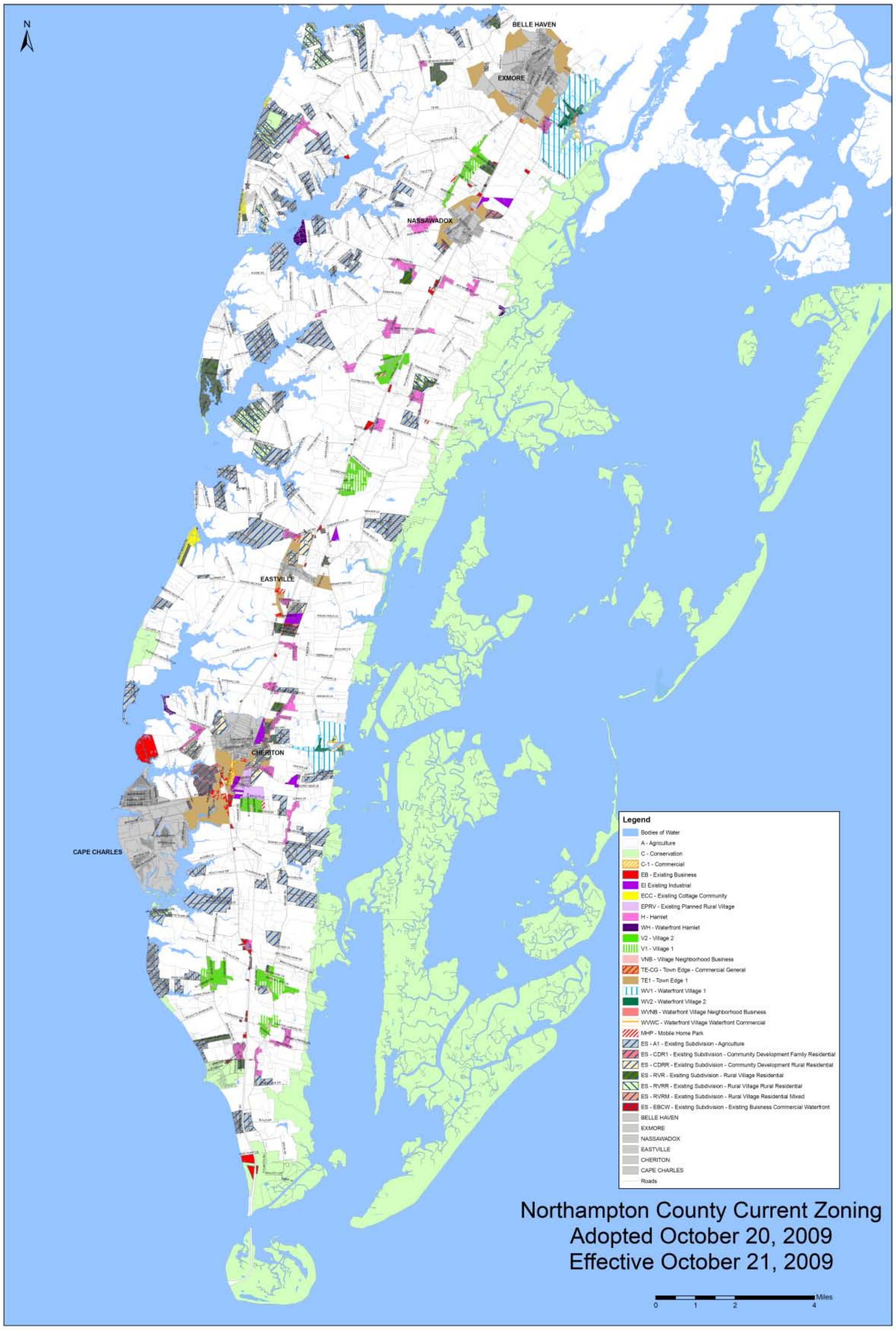
Riparian buffers are lands adjacent to water bodies, left in a natural vegetated state, used to preserve, promote, and protect water quality. Vegetation in the riparian buffers provide water quality protection by absorbing excess nitrogen and phosphorus in the stormwater runoff from adjacent fields and lawns. The level of nutrient removal is dependent on various factors such as buffer, slope, soils, and plant species. The Virginia Department of Forestry has noted that forested buffers up to 100 feet in width can remove up to 80 percent excess phosphorus and 89 percent nitrogen in the stormwater runoff from adjacent agricultural lands. In addition to nutrient removal, the riparian buffers also stabilize soils and decrease stormwater velocity and thereby reduce the amount of sediment runoff.

There are multiple government entities and programs in Virginia that fund or otherwise encourage the establishment of riparian buffers: the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) promotes the riparian buffers adjacent to agricultural lands through a cost sharing program, DCR has numerous programs promoting riparian buffer creation and preservation, the Virginia Department of Forestry (DOF) provides a tax credit in conjunction with the establishment of riparian buffers in Virginia, and the Chesapeake Bay Preservation Act promotes the establishment of riparian buffers in the Chesapeake Bay watershed.

4.2.8. Land Use and Land Coverage

Land use and land cover can have a significant impact on local and regional hydrology and should play an important role in water supply planning. Variations in land use and land cover affect the geospatial variation of water demands and can have an impact on streamflow and groundwater water recharge, both in terms of quantity and quality. Land uses such as urban developments tend to have high proportions of impermeable land cover in the form of pavement and buildings. Without compensating design and planning, these areas will decrease the amount of rainfall percolating into the soil, and runoff rapidly into nearby streams and water bodies. This rapid runoff reduces the amount of water available for groundwater recharge and can impact water supply wells, particularly wells with shallow screens. Rapid runoff can also carry a greater sediment and contaminant load which can impact water quality in adjacent and downstream bodies of water. High sediment loads can also fill in downstream reservoirs and thereby reduce their yield over time. Approved land uses in Northampton County are shown in Figure 4-16.

Figure 4-16: Land Use in Northampton County



Source: Accomack Northampton Department of Planning and Zoning, 2009[16].

This report relies on the land use/land cover data used in Northampton Counties' 2009 Comprehensive Plan. Given its largely rural setting, the County has a relatively very small percentage of impervious surfaces compared to the size of the area. As would be expected, the concentrations of impervious cover in the area are largely concentrated in the County's Towns and along the Route 13 corridor.

The Virginia DCR requires localities to adopt stormwater management regulations and/or controls to minimize the runoff effects of new development. Typically, stormwater management measures may include leaving a portion of a developed property in an undeveloped state, or adding positive controls such as stormwater detention basins when new development occurs. The Chesapeake Bay Act also requires stormwater management measures to be considered in new and re-development projects of minimum size in the Chesapeake Bay watershed, which includes the western half of Northampton County, to control and reduce the nutrient and sediment loads reaching the Bay and its tributaries.

Although the percentage of developed land within Northampton County is relatively small, the County is heavily dependent on groundwater recharge for the continued replenishment of its water supply resources, as discussed above in Section 4.1. Therefore, special care must be taken in the on-going planning, design, and construction of development projects to ensure that the rate and quality of groundwater recharge is adequately protected and promoted. This is particularly important for the County's major groundwater recharge areas which largely coincide with the Route 13 corridor.

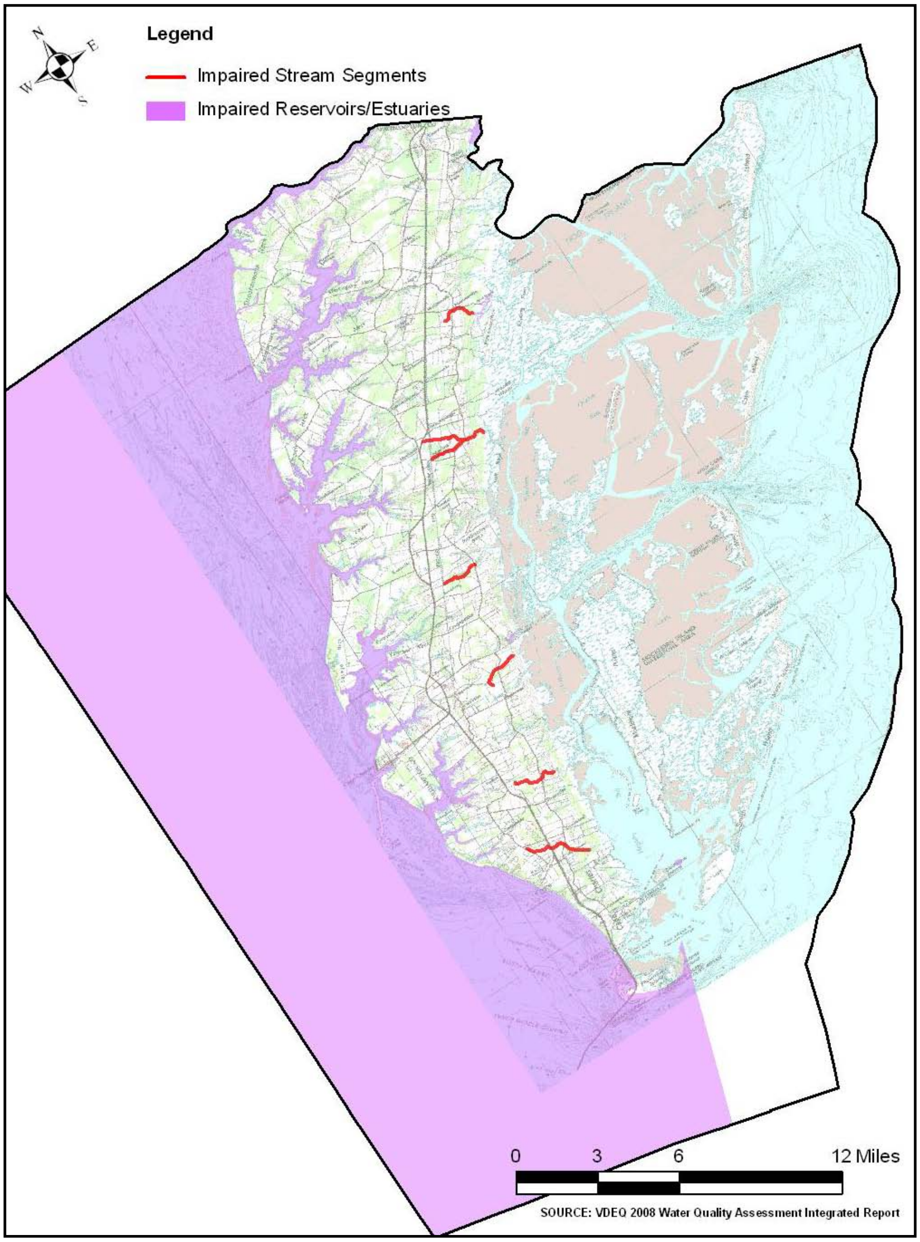
4.2.9. Impaired Streams and Rivers

In order to meet the requirements of Section 305(b) and 303(d) of the U.S. Clean Water Act, the Virginia DEQ compiles information about the Commonwealth's impaired streams, rivers, estuaries, other water bodies, and their watersheds on a biannual basis. The most recent survey of impaired waters is summarized in the 2008 Water Quality Assessment Integrated Report. The goals in the Water Quality Assessment Program are to inventory waters that do not meet water quality standards, and to design and implement a plan to restore water listed as impaired. The standards are based on the water quality required to support one or more of the six designated uses for surface waters, which include: aquatic life, fish consumptions, shellfish consumption, swimming, public water supplies (where applicable), and wildlife. A body of water with one or more parameters that do not meet applicable water quality standards are listed as "impaired" and are not considered to support the body of water's designated use. The primary mechanism for cleanup of impaired waters is to develop a total maximum daily load (TMDL) for those water quality parameters not meeting the standard. A TMDL is the site-specific planned total amount of a given contaminant associated with an impairment that can be assimilated by a 303(d) listed stream and is meant to sufficiently restore water quality to support one or more designated uses.

There are seven stream segments totaling approximately 11 miles in length and 850 square miles of estuaries that are listed as 303(d) impaired for Northampton County as part of the 2008 Integrated Report. It should be noted that the large majority of the estuarine impairments include the portions of the Chesapeake Bay located in Northampton County. Coves, inlets, and other open water areas account for only 17 square miles of the total listed estuarine water impairments in Northampton County. The most common impairments include failure to meet water quality standard for the following parameters: low dissolved oxygen (particularly in the summer months), submerged aquatic vegetation criteria, fecal coliform, enterococcus, benthic-macroinvertebrate bioassessments, PCBs in fish tissue, and pH imbalances. These impairments result in failure to meet one or more of the following designated uses: fish consumption, aquatic life, shellfishing, recreation, and wildlife for listed water bodies.

Although surface water in Northampton County is not utilized for human consumption, fecal coliform can be of concern with respect to surface water if there are high levels in areas used for recreation, shellfish harvesting, and food crop irrigation. State water quality standards require that in all surface waters, except shellfish waters, the fecal coliform bacteria shall not exceed a geometric mean of 2,000 fecal coliform bacteria per liter of water for two or more samples over a calendar month period, or a fecal coliform bacteria level of 74,000 per liter in ten percent of samples in any given month.

Figure 4-17: 303(d) Impaired Waters and NPDES Discharges in Northampton County



4.2.10. Point Source Dischargers

Large discharges to waterways of the Commonwealth are regulated by the Virginia DEQ and DCR and reported to the USEPA. Discharges into surface water are regulated through Virginia Pollutant Discharge Elimination System (VPDES) permits. Permit holders are typically required to adhere to limits on the concentration and quantities of specified pollutants, properly maintain and operate facilities, monitor discharge, keep and submit proper records to DEQ on a monthly basis, and provide open access to inspections. VPDES permits can be granted on a site-specific or general category basis. Facilities with a VPDES permit in Northumberland County are presented in Table 4-5.

Table 4-5:
Permitted Facilities in Northampton County

PERMIT#	FACILITY NAME	LOCATION	EXP. DATE
	Individual Permits, VPDES – Municipal		
VA0021288	CAPE CHARLES WWTP	Cape Charles	9/20/2009
VA0023817	NORTHAMPTON MIDDLE SCHOOL	Marchipongo	8/24/2007
VA0027537	SHORE MEMORIAL HOSPITAL	Nassawadox	11/5/2007
	Individual Permits, VPA		
VPA01058	BEST WESTERN SUNSET BEACH RESORT	Northampton	11/1/2014
VPA01022	CHERRYSTONE CAMPGROUND	Cheriton	--/19/2011
	General Permit – Concrete Ready Mix Plants and Fabricated Products		
VAG110228	BAYSHORE CONCRETE - CAPE CHARLES	Cape Charles	9/30/2008
VAG110038	T & W BLOCK - CAPE CHARLES	Cape Charles	9/30/2008
	General Permit – Nutrient Discharges		
VAN05001	CAPE CHARLES, TOWN OF (WWTP)	Cape Charles	12/31/201
VAN050003	SHORE MEMORIAL HOSPITAL	Nassawadox	12/31/201
	General Permit – Poultry Facility		
VPG250045	PERDUE FARMS, INC. [POULTRY]	Eastville	12/1/2010
	General Permit – Seafood		
VAG523000	BALLARD FISH & OYSTER CO	Cheriton	7/23/2011
VAG523010	J H WEST SEAFOOD	Oyster	7/23/2011
VAG523033	LILLISTON SEAFOOD	Wachapreague	7/23/2011
VAG523011	NANDUA SEAFOOD LLC	Hacksneck	7/23/2011
VAG523008	R & C SEAFOOD COMPANY	Oyster	7/23/2011
VAG523021	TERRY, H. M. COMPANY, INC.	Willis Wharf	7/23/2011
	General Permit - Industrial Storm Water		
VAR050335	EASTERN SHORE RAILROAD	Cape Charles	6/30/2009
VAR051449	NORTHAMPTON COUNTY LANDFILL	Cape Charles	6/30/2009

Source: Virginia DEQ (March 01, 2008)

A Virginia Pollution Abatement (VPA) Permit is required for operations that manage pollution through land application, reuse, or do not otherwise result in a point source discharge to surface waters. VPA permits are required for land application of sewage sludge, animal waste, or industrial waste and for closed systems that reuse and recycle waste water. Exclusions to the VPA permit program are discharges to permitted treatment systems, run-off from fields, return flows from irrigation, storage vessels, and land disposal of pollutants otherwise permitted. Permit requirements typically include the prohibiting of discharge to surface water, requirements regarding waste storage and disposal, best management practices (such as buffer strips, berms, and nutrient management plans) to protect adjacent surface waters, groundwater monitoring to detect possible contamination and sludge monitoring to determine the concentration of pollutants. Facilities with a VPA permit in Northampton are listed in Table 4-5.

5. Projected Water Demand (9 VAC 25-780-100)

This section consists of projections to estimate future water demands. Estimates of populations in the County and the water needed to serve them are made in ten year increments from 2010 to 2040, thirty years into the future. The projections include considerations of both public and private sources of water. As discussed below, some of the projections are based on values and/or methodologies presented in the respective groundwater withdrawal permit applications. The relevant permit applications are presented in Appendix C.

5.1. Population Projections

Population projections for Northampton County were estimated by the Virginia Employment Commission (VEC). Base year data for 1980, 1990, 2000 and population estimates for 2004 through 2006 were compiled by the U.S. Census Bureau. Based on the period between 1980 and 2006 (the most recently available population estimate by the US Census Bureau) there was a population decrease of approximately 0.27% percent per year. However, in the period between 1990 and 2006, the population actually increased by almost the same rate (0.26 percent per year). Projections for 2010 through 2030 were estimated by VEC using the component cohort method. VEC predicted a population decline of 0.16 percent per year (or a net loss of 20 inhabitants per year) until 2030. However, as part of its Comprehensive Plan, the County projected a 0.4 percent per year increase until at least 2016 (or a net increase of 55 inhabitants per year). The VEC data incorporates data going as far back as the 1980's following the relocation of two large industries. Projections for 2040 were not available and the growth rates predicted by the VEC and the County were linear, therefore a straight line interpolation was used to extrapolate the Northampton County population projections to 2040. Population projections for Northampton County are shown in Table 5-1 and in Figure 5-1. Based on the recent growth trend and the fact that the County's estimates will lead to greater water requirements, it is assumed that the County's estimates will be the more prudent estimates to use when prepare for water demands through the 2040 planning horizon. Furthermore, the County's estimates are in line with State-wide projections and represent a small population increase over that of the 1980's.

Figure 5-1: Projected Northampton County Population

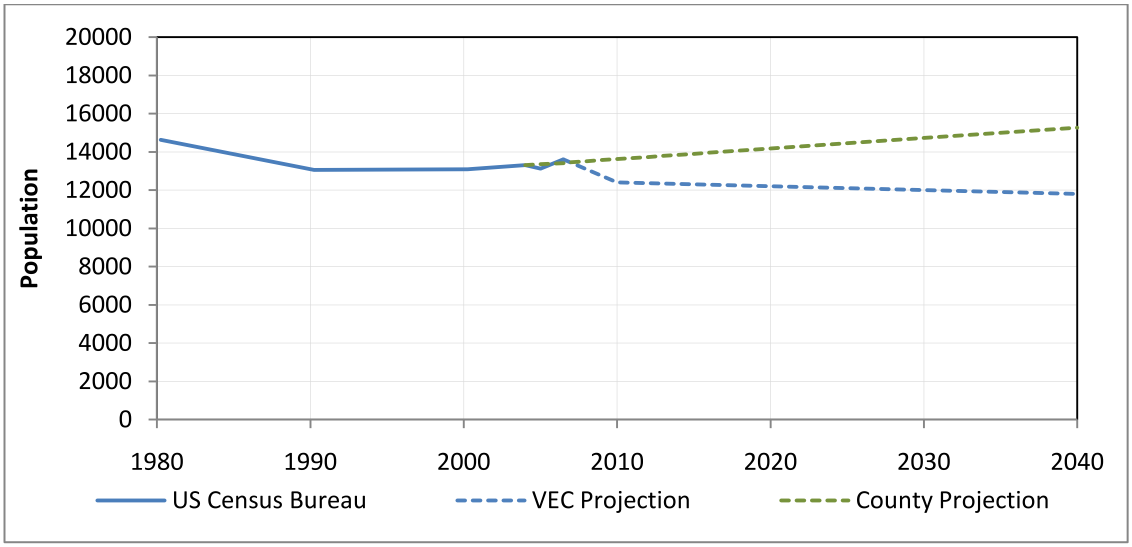


Table 5-1:
Northampton County Population Projections

YEAR \ SOURCE	US CENSUS BUREAU	VEC PROJECTION	COUNTY PROJECTION
1980	14,625		
1990	13,061		
2000	13,093		
2004	13,303		13,303
2005	13,120		13,356
2006	13,609	13,609	13,410
2007		--	13,463
2008		--	13,517
2009		--	13,571
2010		12,400	13,625
2011		--	13,680
2012		--	13,735
2013		--	13,790
2014		--	13,845
2015		--	13,900
2016		--	13,956
2020		12,200	14,174
2030		12,000	14,724
2040†		11,800	15,274
Average Annual Growth Rate	-0.267%* 0.262%**	-0.16%	0.4%

* based on 1980-2006 growth rate
** based on 1990-2006 growth rate
† Malcolm Pirnie, Inc. estimate

5.2. Public Water Sources

Future water demands and service area populations were projected for each of the public water systems in Northampton County based extrapolations of recent historical data.

5.2.1. Arlington Plantation

Arlington Plantation (Figure 5-2) is a 112 acre development that is located south of Cape Charles on the Cheasapeake Bay coast and permitted for 19,600 gpd. Currently, there are 16 homes connected to the service area, according to VDH records. Based on an analysis of available 2010 aerial photography, the constructed homes take up approximately 31 percent of the development, with approximately 6 percent assumed green space and the remaining 63 percent of the development available for new homes. Assuming a similar lot size in future development, 32 new lots could be developed for a total of 48. Assuming the current occupancy of 2 people per home will be accurate at buildout, the total population of Arlington Plantation is projected to be 96 people. The buildout date is uncertain as it is assumed that new homes will be constructed on an as needed/demanded basis.

Water demands at Arlington Plantation are estimated to grow proportionately to the number of connected units and to the average annual and maximum month demands, as shown in Table 5-2and Figure 5-3. Therefore, the reported maximum annual average and maximum month demands (6,230 and 8,996 gpd, respectively) were assumed to be representative of the maximum likely demands over the planning horizon. Demands are assumed to be mostly residential in nature.

Figure 5-2: Arlington Plantation Service Area

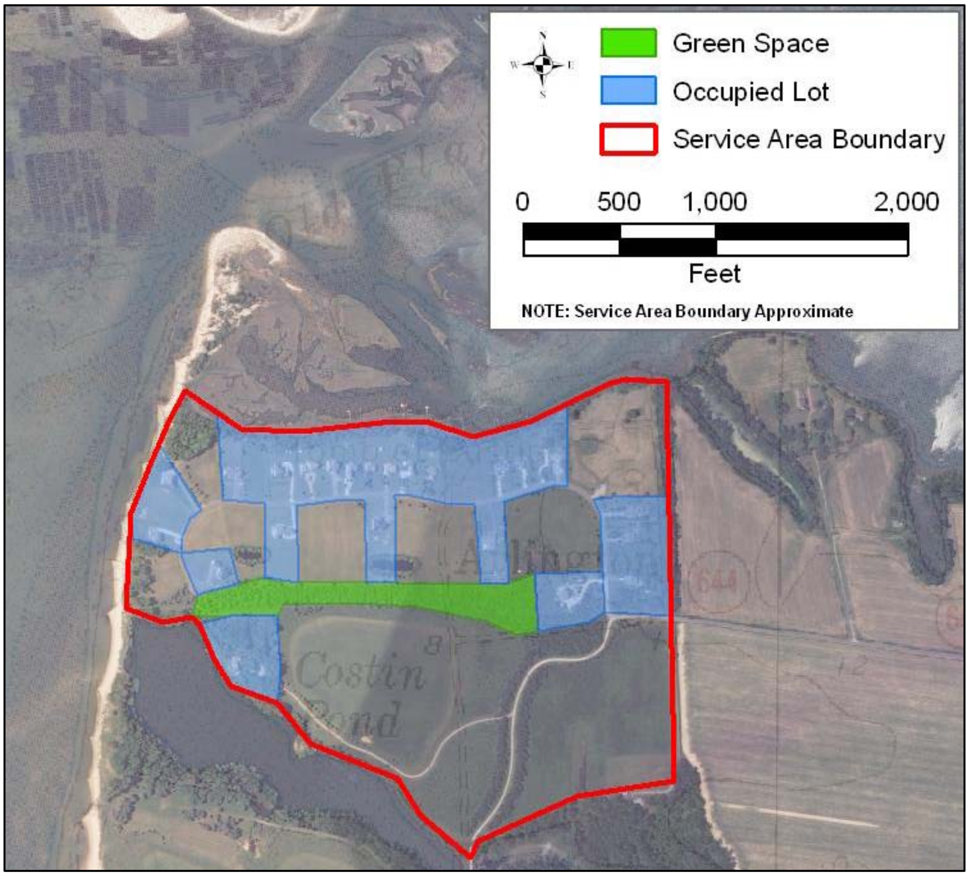


Figure 5-3: Arlington Plantation Population and Demand Projections

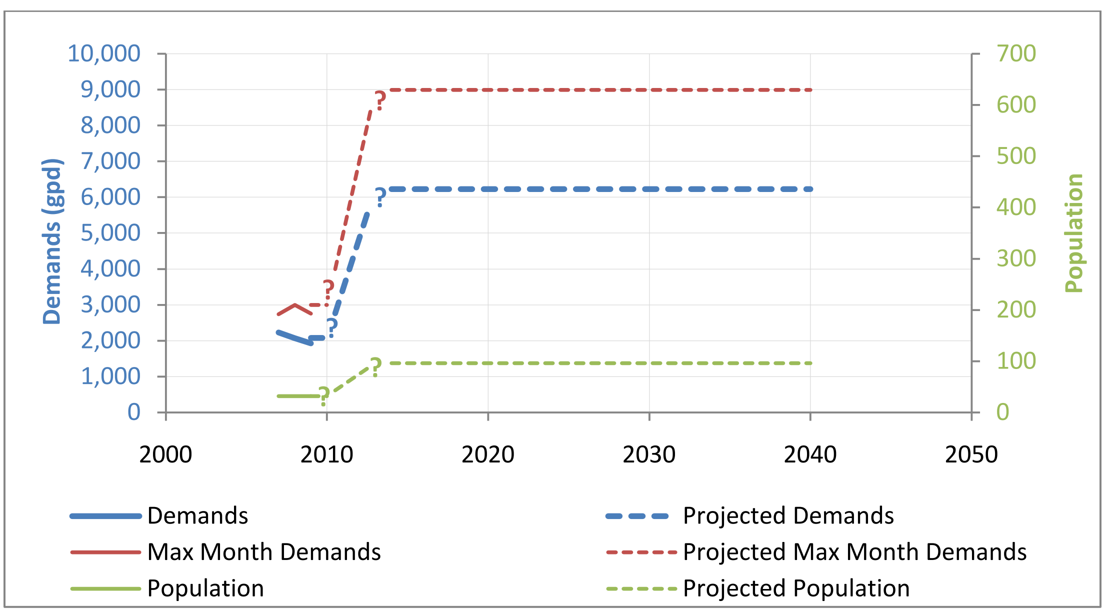


Table 5-2:
Arlington Plantation Population and Demand Projections

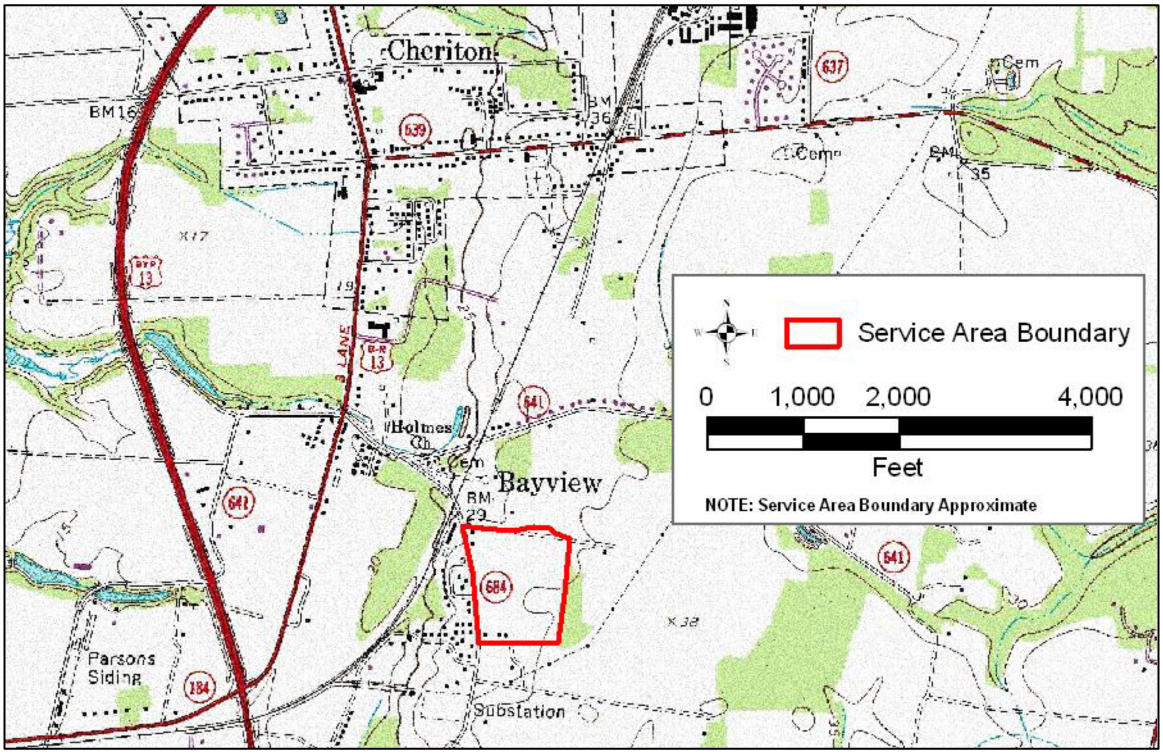
YEAR	POPULATION	CONNECTIONS	AVERAGE DEMANDS (GPD)	PER CAPITA DEMANDS	MAX MONTH DEMANDS (GPD)
VDH Reported Data					
2007	32	16	2,231	69.71	2,738
2008	32	16	2,071	64.71	2,999
2009	32	16	1,928	60.25	2,759
Average	32	16	*2,077	64.89	**2,999
Projected Data					
2010	32	16	2,077	64.89	2,999
2020	96	48	6,230	64.89	8,996
2030	96	48	6,230	64.89	8,996
2040	96	48	6,230	64.89	8,996

* based on 2009 population times average per capita demands
** reported maximum value

5.2.2. Bayview

Bayview (Figure 5-4) is a planned community located south of Cheriton and will consist of 136 dwelling units once completed[17]. According to VDH records, only 65 homes have been constructed and/or connected to the service area as of Oct, 2009. It is expected that all 136 units in the development will be completed within the 2040 planning horizon, however, the date of completion is unknown. Bayview currently has a population of 288 inhabitants which will increase until full buildout. Assuming a proportional increase in population to the current occupancy rate (4.43 occupants per dwelling), the buildout population is estimated to be approximately 603 inhabitants (4.43 occupants per dwelling x 136 dwellings).

Figure 5-4: Bayview Service Area



Water demands at Bayview are estimated to grow proportionately to the number of connected units and to the average annual and maximum month demands, as shown in Table 5-3 and Figure 5-5 . Therefore, the reported maximum annual average and maximum month demands (24,442 and 37,481 gpd, respectively) were assumed to be representative of the maximum likely demands over the planning horizon. Demands are assumed to be mostly residential in nature with a nominal amount of demand associated with Bayview's community center and a few small businesses; however, there is insufficient information to provide an accurate disaggregation of demands.

Figure 5-5: Bayview Population and Demand Projections

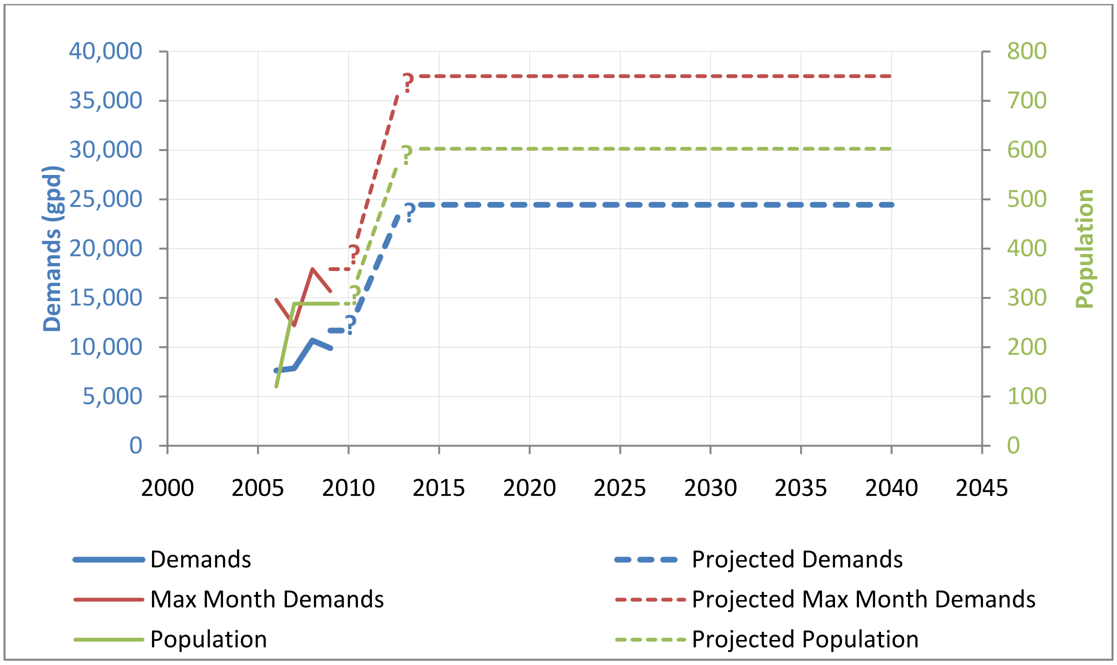


Table 5-3:
Bayview Population and Demand Projections

YEAR	POPULATION	CONNECTIONS	AVERAGE DEMANDS (GPD)	PER CAPITA DEMANDS	MAX MONTH DEMANDS (GPD)
VDH Reported Data					
2006	--	65	7,630	63.58	14,792
2007	288	65	7,862	27.30	12,213
2008	288	65	10,668	37.04	17,914
2009	288	65	9,884	34.32	15,670
Average	288	65	[*]11,682	40.56	[**]17,914
Projected Data					
2010	288	65	11,682	40.56	17,914
2020	603	136	24,442	40.56	37,481
2030	603	136	24,442	40.56	37,481
2040	603	136	24,442	40.56	37,481

[*] based on 2009 population times average per capita demands
[**] reported maximum value

5.2.3. Town of Cape Charles

The Town of Cape Charles (Figure 5-6)currently has a total of 1,574 residents, 972 of which are full time residents, while 602 are part time residents and occupy dwellings seasonally and on weekends. Over the past two decades, the number of full time residents has declined between 14 and 19 percent, while the number of part time residents has increased significantly over the last decade. The major cause of population growth over the next few decades will most likely be associated with the Bay Creek Resort and Club, a planned unit development to both the north and south of the historic Cape Charles center. Bay Creek has a potential for over 3,000 home sites. Over the past decade, 300 residential dwellings have been constructed in addition to several amenities including two golf courses, a marina, two restaurants, and some commercial space.

Other areas of planned development and service expansion are the South Port Yacht Center and Marine Industrial Park and the Harbor Area. The Harbor Area, immediately south of the historic center of Cape Charles, is expected to have over 360 residential units, restaurants, retail space, a boat storage facility with a capacity of 460, and marina, a hotel with 125 units and 425 condominiums. The anticipated growth in the number of equivalent residential connections (ERC) in the Cape Charles service area is shown in Table 5-4 and Figure 5-7. The estimates are based on projections included in the most recent update to the permit application, dated September 10, 2010 (Appendix C). Average annual demand projections are based on a use of 100 gpd per ERC, which reflects the Service Area’s continuing efforts to improve the efficiency of its system, promote conservation, and the increase in part time residency. Maximum month demand projections were estimated by multiplying the average annual demand by a factor of 1.5, which is higher than the historical ratio due to the continued increase in part time residency, particularly in the summer months.

Figure 5-6: Town of Cape Charles Service Area

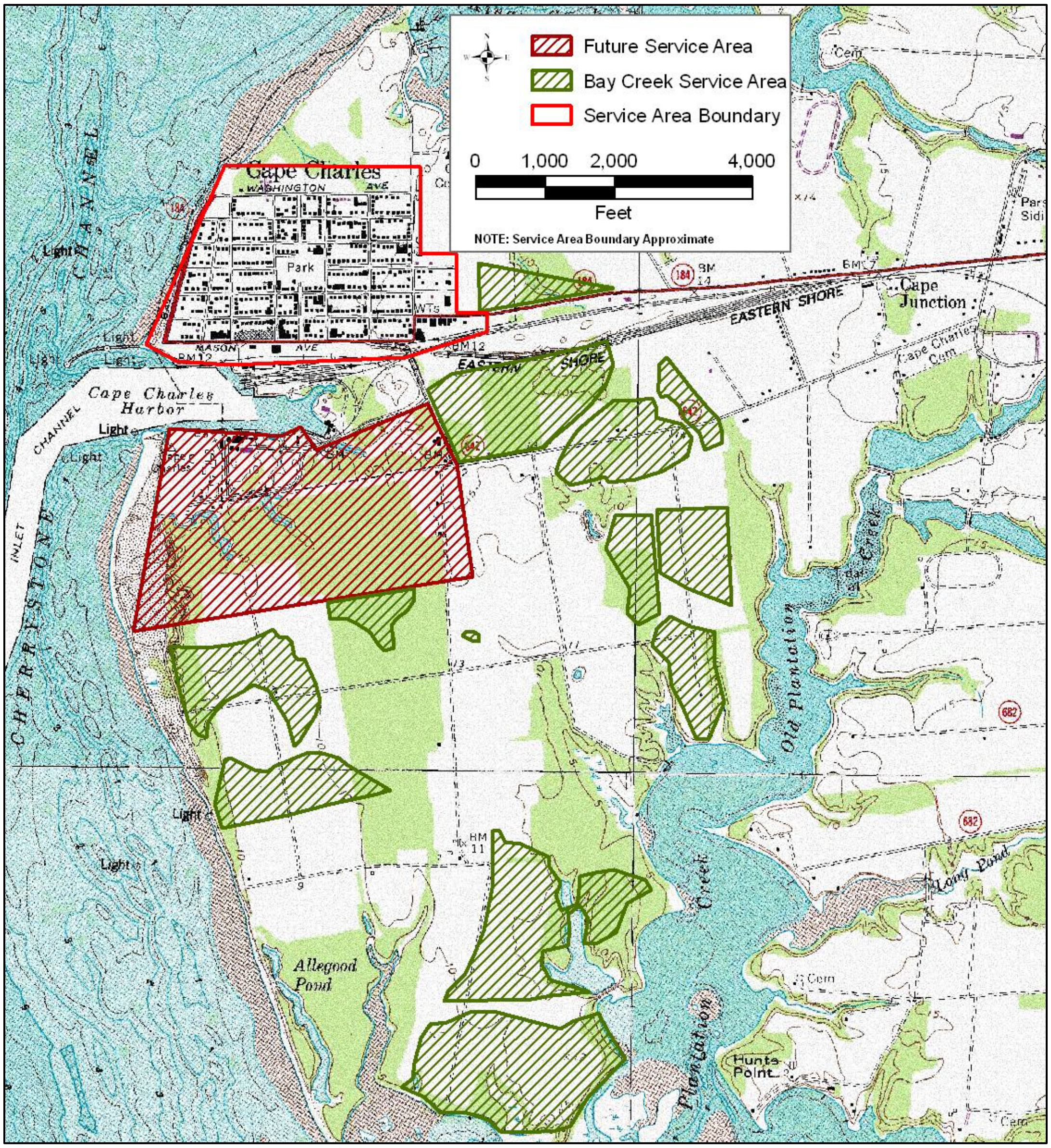


Figure 5-7: Town of Cape Charles Population and Demand Projections

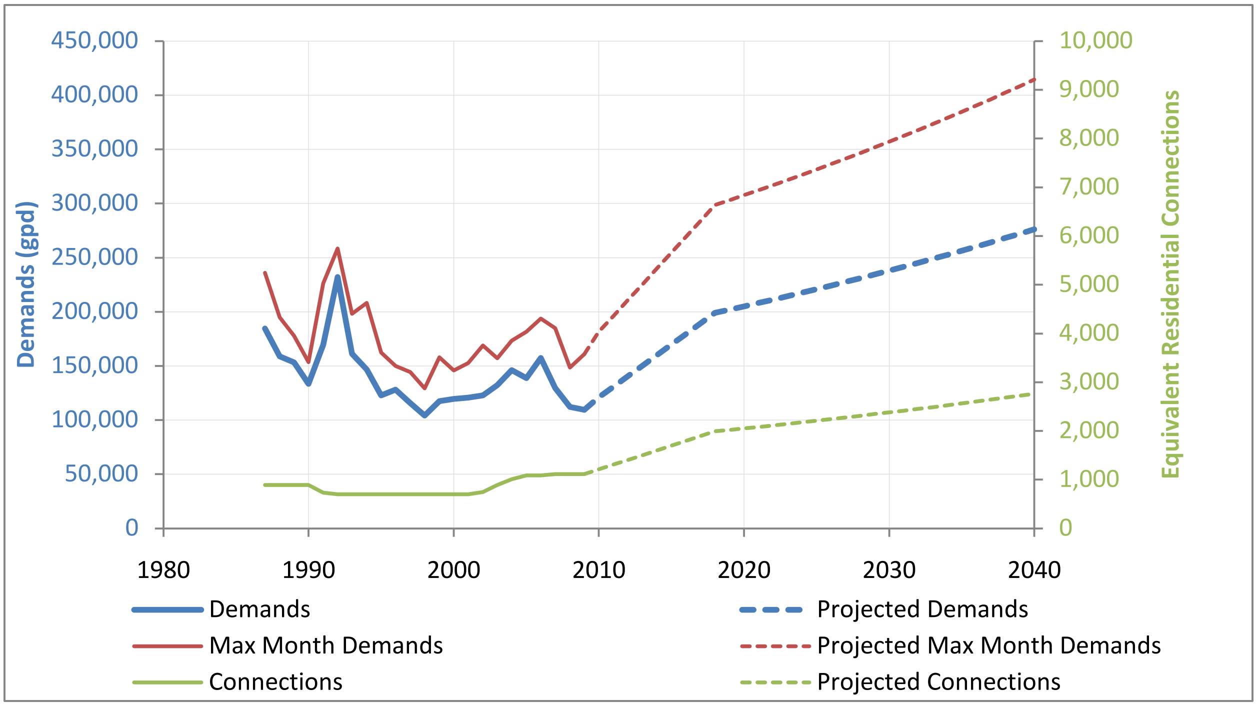


Table 5-4:
Town of Cape Charles Population and Demand Projections

YEAR	ERC	AVERAGE DEMANDS (GPD)	MAX MONTH DEMANDS (GPD)
Projected Data			
2011	1,293	129,300	193,950
2020	2,050	205,000	307,500
2030	2,380	238,000	357,000
2040	2,760	276,000	414,000

Disaggregated demand ratios for Cape Charles are presented in Table 5-5 below and are based on 2007 water usage.

Table 5-5:
Cape Charles Disaggregated Demand Ratios

CATEGORY	PERCENT USE
Well Production	**100.0**
Backwash[1]	**7.6**
Plant Production	**92.4**
Metered Sales[2]	**86.2**
Residential	*71.9*
Condo	*1.2*
Commercial	*10.5*
Municipal	*0.6*
Mixed Use	*1.9*
Unaccounted For[3]	6.1
System Flushing	*0.9*
Fire Protection	*0.2*
VDOT	*0.5*
Leaks/Other	*4.5*

Source:
Town of Cape Charles Condensed Meter Reading Report by Accounty ID for the period between January through December 2007. Some discrepancies exist in the data.
Notes:

1. *Well Production and backwash waste values are metered. Plant production is calculated by subtracting backwater waste from total well withdrawals*
2. *Meter sales provide by the Town of Cape Charles by metered account type. Metered account types include residential, condo, commercial/industrial, municipal, and mixed use.*
3. *Unaccounted for water is the difference between total water produced from the treatment plant and the metered use. Unaccounted for water included unmetered uses, such as fire fighting, flushing pipes, VDOT uses which are estimated, illegal hookups or inaccurate meters; or actual physical losses from leaky pipes.*

5.2.4. Town of Eastville

The Town of Eastville (Figure 5-8) currently has a population of 210 inhabitants. According the VDH records, the population of the Eastville has been effectively flat at 210 residents between 2001 and 2009. In the absence of additional data, it was assumed that the population of Eastville would remain constant through to the 2040 planning horizon. Similarly, average and maximum monthly demands show a level or slight decreasing trend over the same period; therefore, it was assumed that demands would likely remain relatively constant, subject to annual variations in climate. Therefore, the reported maximum annual average and maximum month demands (62,367 and 97,853 gpd, respectively) were assumed to be representative of the maximum likely demands over the planning horizon (Table 5-6 and Figure 5-9). Demands are assumed to be entirely residential in nature.

Figure 5-8: Town of Eastville Service Area

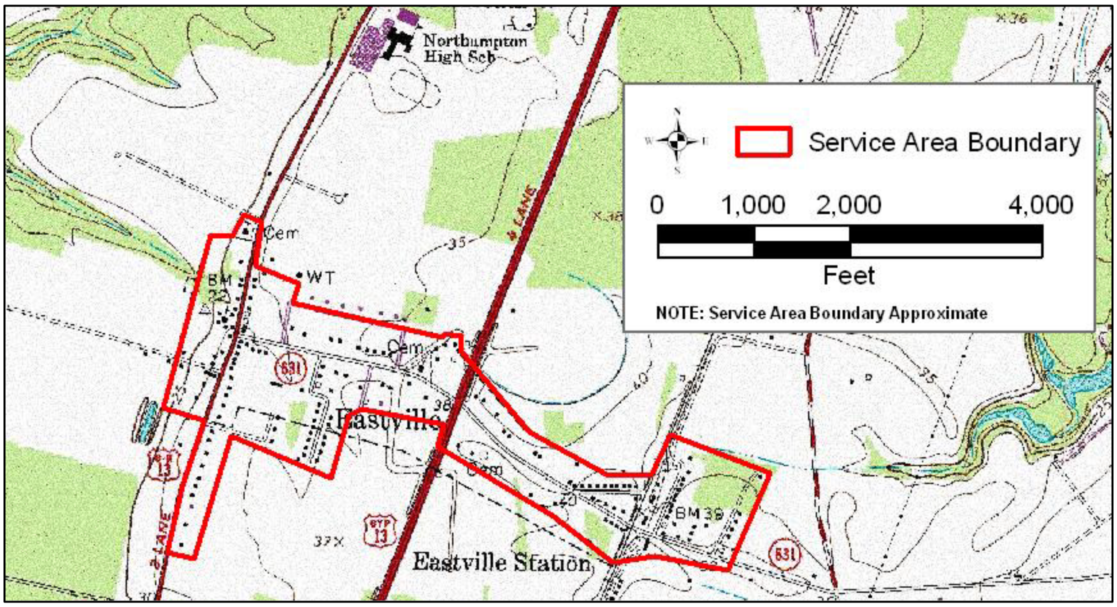


Figure 5-9: Town of Eastville Population and Demand Projections

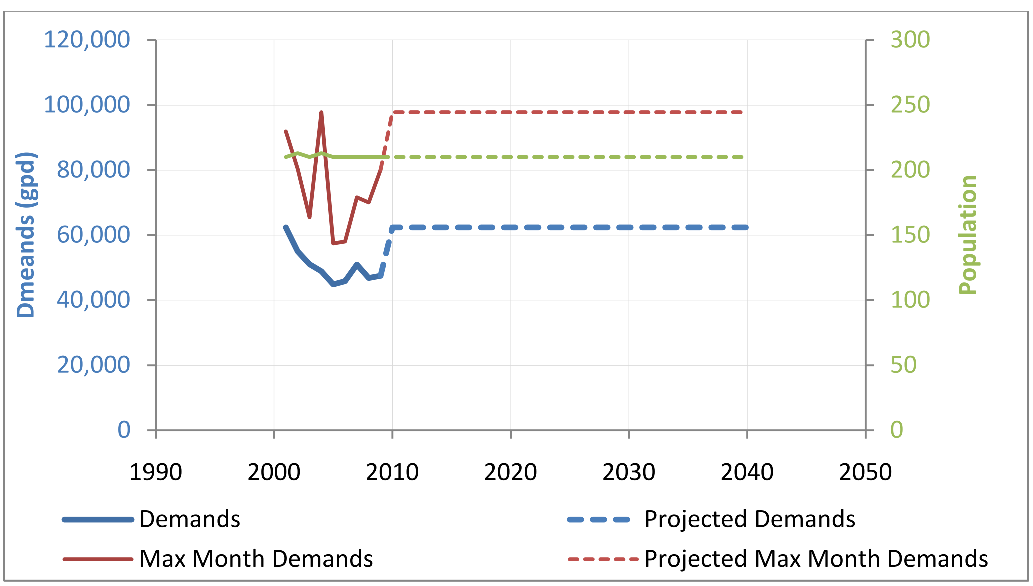


Table 5-6:
Town of Eastville Population and Demand Projections

YEAR	POPULATION	AVERAGE DEMANDS (GPD)	MAX MONTH DEMANDS (GPD)
Projected Data			
2010	210	62,367	97,853
2020	210	62,367	97,853
2030	210	62,367	97,853
2040	210	62,367	97,853

5.2.5. Town of Exmore

The Town of Exmore (Figure 5-10) currently has a population of approximately 1,355 inhabitants. According to U.S. Census Bureau, as cited in the most recent groundwater withdrawal permit application dated July 2009 (Appendix C), the population of Exmore grew by 2 percent per year in the period between 2000 and 2009. The majority of this growth occurred over the period between 2007 and 2009, when the population increased by 8 percent per year. Moving forward, growth is expected to slow over the short term (2009 to 2011) due to current economic conditions, and increase thereafter by approximately 5 percent assuming an improved economy, the addition of broadband access, and an increase in wastewater treatment plant capacity. Based on a continued growth rate of 5 percent through to 2040, the total population of Exmore is projected to be approximately, 3,374 inhabitants (Table 5-7 and Figure 5-11).

Water demands in Exmore are expected to grow with the increase in population, particularly associated with a planned 300 lot subdivision as well as with the planned addition of a new hotel and a biodiesel facility. Detailed projections to 2019 can be found in the permit application (Appendix C). Beyond 2019, annual average water demand projections were estimated by using a straight line extrapolation to a value of approximately 474,000 gpd by 2040. Maximum day demands were projected using the historical ratio of maximum month demand to average annual demand (1.42), resulting in an estimated maximum month demand of approximately 671,000 gpd by 2040.

Table 5-7:
Town of Exmore Population and Demand Projections

YEAR	POPULATION	AVERAGE DEMANDS (GPD)	MAX MONTH DEMANDS (GPD)
Projected Data			
2010	1,382	156,167	220,994
2020	2,019	266,498	377,124
2030	2,696	370,402	524,159

2040	3,374	474,306	671,195

Figure 5-10: Town of Exmore Service Area

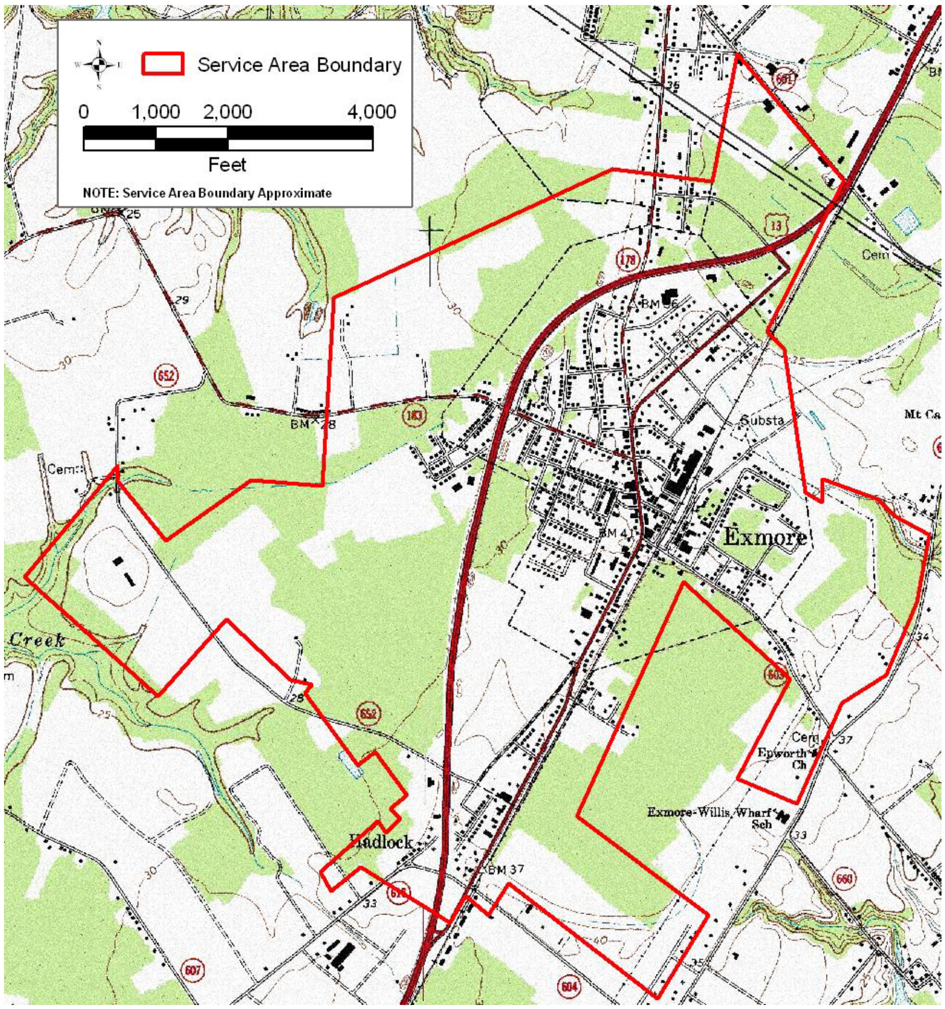
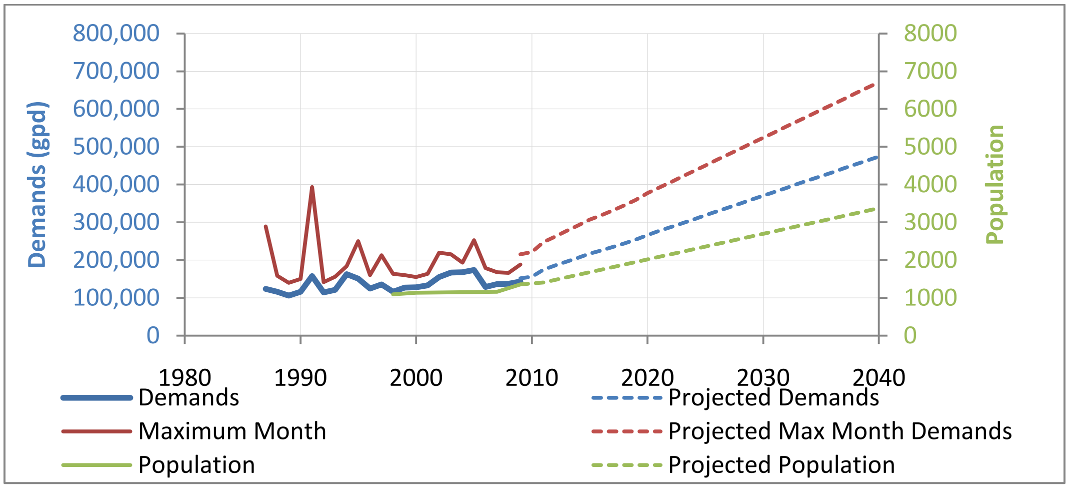


Figure 5-11: Town of Exmore Population and Demand Projections



Disaggregated demand ratios for Exmore are presented in Table 5-5 below and are based on July and August 2008 meter readings reported in the July 2009 Exmore groundwater withdrawal permit application.

Table 5-8:
Exmore Disaggregated Demand Ratios

CATEGORY	JUL 2008		AUG 2008		JUL-AUG 2008 AVERAGE	
	Demands	Percent	Demands	Percent	Demands	Percent
Metered						
Residential	922,897	18.2	989,089	19.2	955,993	**18.7**
Business	2,749,314	54.3	2,330,088	45.3	2,539,701	**49.8**
Other	1,388,689	27.4	1,828,923	35.5	1,608,806	**31.5**
Total	5,060,900	100.0	5,148,100	100.0	5,104,500	**100.0**

Source: Exmore Groundwater Withdrawal Permit Application (July 2009)
Notes: Other category estimated by subtracting total VDH reported withdrawal from metered residential and commercial uses. Other uses are assumed to include unmetered uses, such as fire fighting, flushing pipes, illegal hookups or inaccurate meters; or actual physical losses from leaky pipes.

5.2.6. Holiday Acres Mobile Home Park

Holiday Acres Mobile Home Park is located approximately two miles south of Nassawadox on Route 13 (Figure 5-12). There were an average of 84 residents at the park in 2009 and a historical maximum of 94 people in September 2001. In the absence of additional information, it was assumed that the historical maximum is representative of the maximum likely occupancy of the facility through to the 2040 planning horizon. Since 1998, average annual demands at the park have varied between 4,993 gpd (59 gallons per capita, per day) and 9,401 gpd (129 gallons per capita, per day) and averaged

6,943 gpd), according to VDH reported values. Average annual and maximum month demands have shown a level or decreasing trend over the same period; therefore, it was assumed that demands would likely remain relatively constant, subject to annual variations in climate. Therefore, the reported maximum annual average and maximum month demands (9,854 and 15,999* gpd, respectively) were assumed to be representative of the maximum likely demands over the planning horizon (Table 5-9 and

Figure 5-13). Demands are assumed to be entirely residential in nature.

Figure 5-12: Holiday Acres Mobile Home Park Service Area

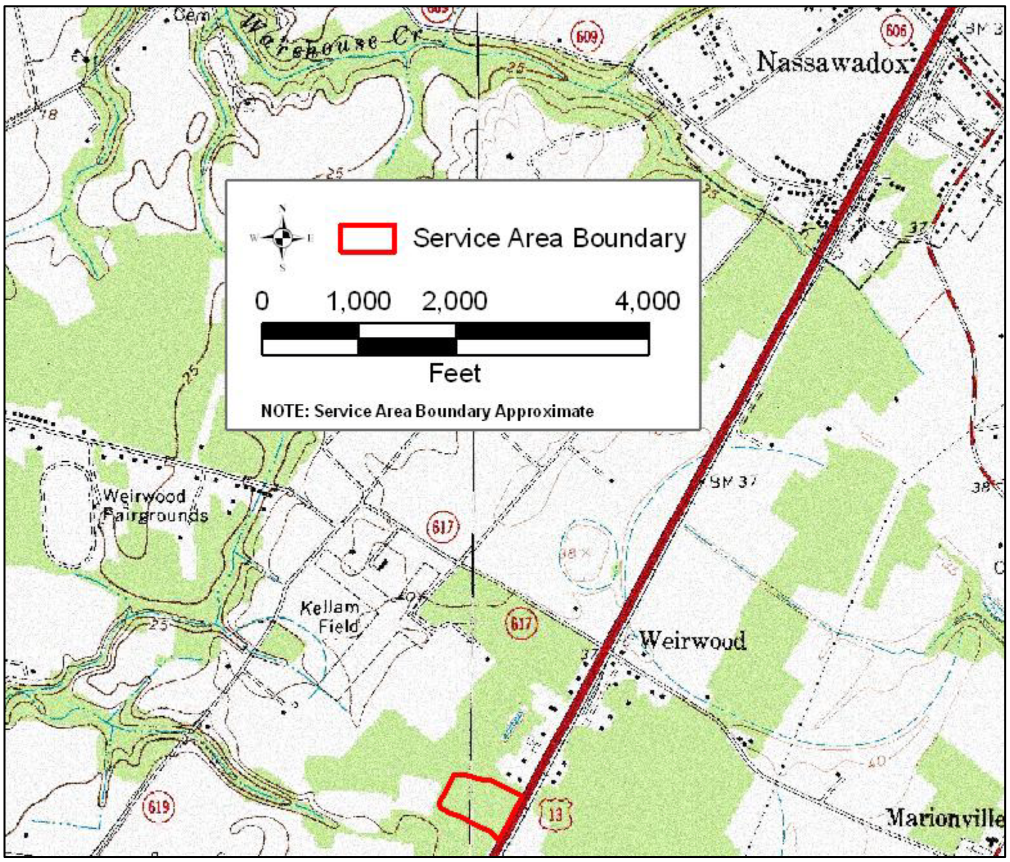


Figure 5-13: Holiday Acres Mobile Home Park Population and Demand Projections

* The estimated maximum month estimate excludes the actual reported historical maximum month demand of 21,716 gpd (239 gallons per capita per day) under the assumption that this demand includes a pipe leak or other unintended use as the next highest demand of 15,999 gpd (the maximum month assumed) was only 150 gallons per capita per day.

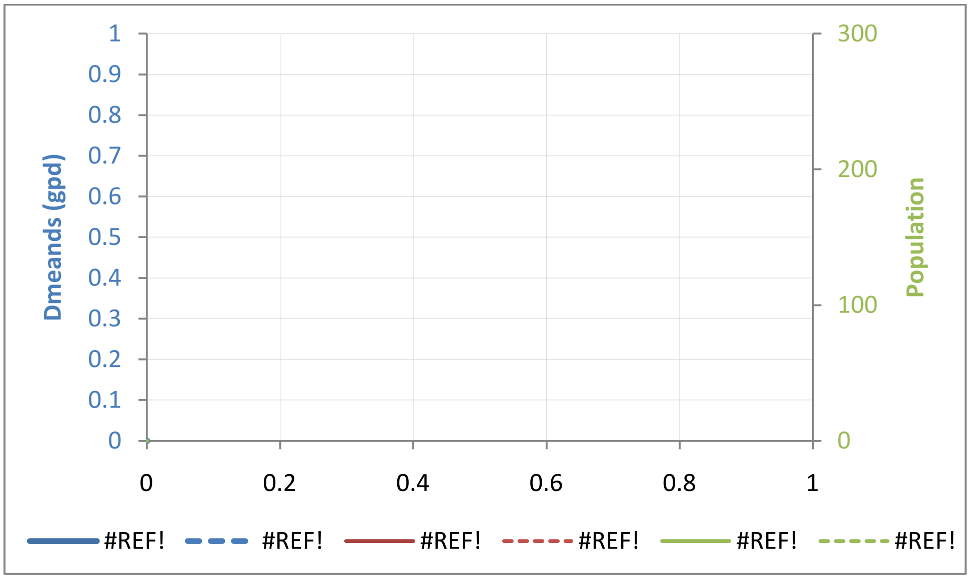


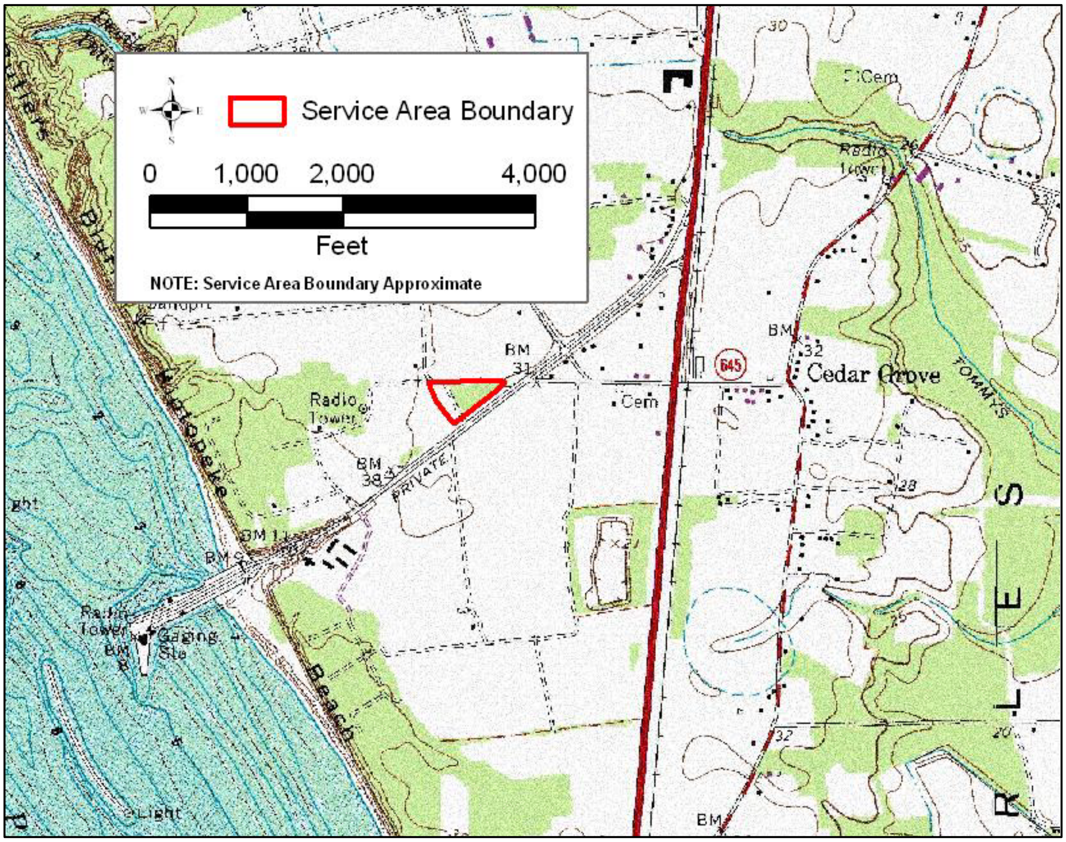
Table 5-9:
Holiday Acres Mobile Home Park Population and Demand Projections

YEAR	POPULATION	AVERAGE DEMANDS (GPD)	MAX MONTH DEMANDS (GPD)
Projected Data			
2010	94	9,854	15,999
2020	94	9,854	15,999
2030	94	9,854	15,999
2040	94	9,854	15,999

5.2.7. Kiptopeake Condominiums

The Kiptopeake Condominiums are located immediately north of Kiptopeake State Park (Figure 5-14). Water usage data for Kiptopeake Condominiums was not available at the time of writing of this report.

Figure 5-14: Kiptopeake Condominiums Service Area



5.2.8. Northampton County Buildings Complex

The Northampton County Buildings Complex is a collection of buildings located in Eastville, including a 325 inmate regional jail facility, a social services building (55 employees and approximately 70 clients per day), a Court Building, a Sheriff's Office with 24 officers, and ancillary offices (Registrar, Commonwealth's Attorney, Juvenile Probation, Court Clerk, Clerk of the Works, Public Services Director, ect.).

Water demand projections were prepared for the Complex as part of its groundwater permit application in 2005 and based on similar facilities in the state. The projections represent the completed facility and are currently expected to represent water demands for the indefinite future, therefore the average annual and maximum month demands at 2040 are anticipated to reach 44,440 gpd and 67,525 gpd, respectively (Table 5-10).

Table 5-10:
Northampton County Buildings Demand Projections

	STAFF			VISITOR			STAFF + VISITOR
Building/Office	# people	Unit demand (gpd)	Demand (gpd)	# people	Unit demand (gpd)	Demand (gpd)	Demand (gpd)
County Administration	48	35	1,680	30	5	150	1,830
Dept. of Social Services	55	15	825	70	3	210	1,035
Clerk of Court	7	15	105	3	3	9	114
Circuit Court	4	15	60	100	3	300	360
Gereral District Court	8	15	120	100	3	300	420
J&DR Court	4	15	60	80	3	240	300
Juvenile Probation	10	15	150	5	3	15	165
Commonwealth's Attorney	4	15	60	0	3	0	60
Registrar	4	15	60	5	3	15	75
Sheriff's Office	24	15	360	5	3	15	375
Jail	40	15	600	20	3	60	660
Jail (inmates)	325	120	39,000			0	39,000
TOTAL			43,080			1,314	**44,394**

Average daily demand =	**44,400**	**gal/day**
Average monthly demand =	**1,350,500**	**gal/month**
Average yearly demand =	**16,206,000**	**gal/year**
Peak monthly demand =	**2,025,750**	**gal/month**
Yearly demand w/ 2 months peak =	**17,556,500**	**gal/year**
Domestic Storage =	**22,200**	**gallons**
Fire reserve storage =	**48,000**	**gallons**
Total Storage Required =	**70,200**	**gallons**
Elevated Storage Provided =	**75,000**	**gallons**

Fire reserve storage is for onsite fire hydrants and sprinkler systems and routine use is not anticipated.

Water Demand Projections

Construction of the Northampton County Government Complex will be phased over the next few years. The demand calculations are for the complex at full buildout and no further expansion is planned.

5.2.9. Shore Memorial Hospital

Shore Memorial Hospital (Figure 5-15) is located in Nassawaddox and currently is licensed for 143 beds[18]. According to VDH records, the facility has an average population of 615, which includes in-patients, out-patients, staff and visitors. Currently, there are no know plans to expand the facility, therefore, in the absence of additional data, it was assumed that the historical maximum annual average and maximum monthly usage rates of 103,222 gpd and 117,378 gpd, respectively are representative of future demands through the 2040 planning horizon (Table 5-11 and Figure 5-16).

Figure 5-15: Shore Memorial Hospital Service Area

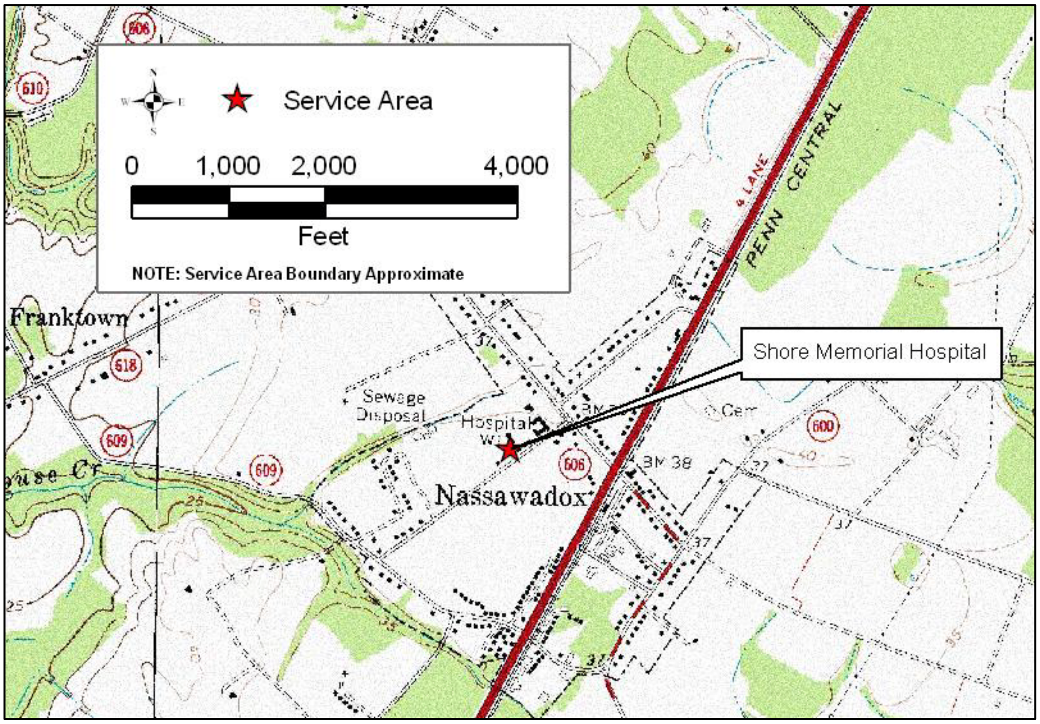


Figure 5-16: Shore Memorial Hospital Population and Demand Projections

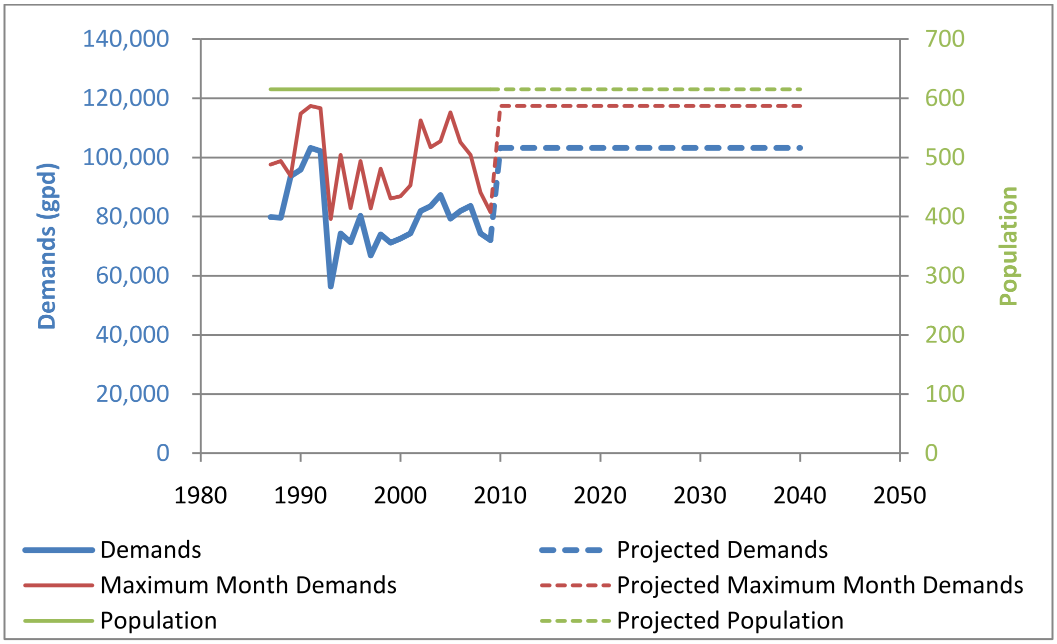


Table 5-11:
Shore Memorial Hospital Population and Demand Projections

YEAR	POPULATION	AVERAGE DEMANDS (GPD)	MAX MONTH DEMANDS (GPD)
Projected Data			
2010	615	72,088	81,567
2020	615	103,222	117,378
2030	615	103,222	117,378
2040	615	103,222	117,378

5.3. Large Self-Supplied Non-Agricultural Users

5.3.1. Bayshore Concrete Products of Cape Charles

Bayshore Concrete produces a variable amount of concrete per year, which has caused water demands to range between 11.5 million gallons in 2002 and 18.5 million gallons. According to the most recent groundwater withdrawal permit, the facility is first and foremost limited by its Air Permit, which limits production to 270,000 tons of concrete per year, consequently, the facility is not currently likely to expand beyond its permitted annual and maximum month withdrawal volumes of 27 million gallons per year and 3.0 million gallons per month for the foreseeable future (Bayshore Concrete groundwater water withdrawal permit application, Appendix C).

5.3.2. Best Western Sunset Beach Resort

The Best Western Sunset Beach Resort consists of an RV park, motel, restaurant and pub. Water demand projections were prepared as part of the facility groundwater withdrawal permit (Appendix C) and were based on usage from the period between 2003 and 2005. Using recorded water withdrawals for the period, an average usage rate for the motel and RV park was determined by subtracting estimated restaurant and pub related water demands based on ticket sales, an assumed $17.5/patron, and a 5 gpd per patron use rate. The average use rates were found to be 224 gpd per RV connection and 290 gpd per motel room. Assuming complete occupancy at the facility, the maximum month demands were projected to be 1,077,560 gallons per month. The ten year goal for the facility was set at annual occupancy rates of 65 percent for the motel and 55 percent for the RV park and ticket sales of $325,000 for the restaurant and pub, resulting in an average annual use of 7,646,624 million gallons per year. There are currently no known plans to expand the facility and as such, it is assumed that the existing ten year targets will be representative of future water demands through the 2040 planning horizon.

5.3.3. Cherrystone Family Camping Resort

According to the most recent groundwater withdrawal permit (Appendix C), the Cherrystone Family Camping Resort had 732 campsites as of 2002 and was anticipating the addition of 200 additional sites in the following years. The 2002 projection reflected anticipated demands for 2012 as presented in Table 5-12.

Table 5-12:
Cherrystone Family Camping Resort Demand Projections

CATEGORY	AVERAGE ANNUAL USAGE (gallons per year)	MAX MONTH DEMANDS (gallons per month)
Projected Data		
Historic Usage	8,057,000	2,347,000
Unmetered Usage	169,000	68,000
Assumed 5 percent occupancy increase	402,850	117,350
200 new campsites	2,130,000	673,200
New Swimming Pool	100,000	100,000
Total	11,038,850	3,505,550

In the absence of updated information and no known plans for expansion, it is assumed that the projection is representative of demands for the foreseeable future, up to and including, the 2040 planning horizon.

5.3.4. YMCA Silver Beach Family Campground

The YMCA Silver Beach Family Campground, opened in 2001 was designed, staffed and equipped to handle up to 450 total persons every day during the months of June through August. During the off-peak season months of September through May, the facility plans occupancy up to 450 person per weekend or approximately 2.5 days per week. The off-peak occupancy rates also reflect retreats and conferences that also occur during these months. Based on the historical usage at the facility, water demands average 77 gallons per person per day. Given historical average usage and the facility's current capacity, the average annual and maximum month demands at full occupancy are estimated to be 17,434 gpd and 32,382 gpd, respectively. The facility's occupancy rates are anticipated to grow linearly until maximum capacity is reached around 2016 and, assuming no expansion of the facility, level off at capacity until the 2040 planning horizon (Table 5-13 and Figure 5-17).

Figure 5-17: YMCA Silver Beach Campground Demand Projections

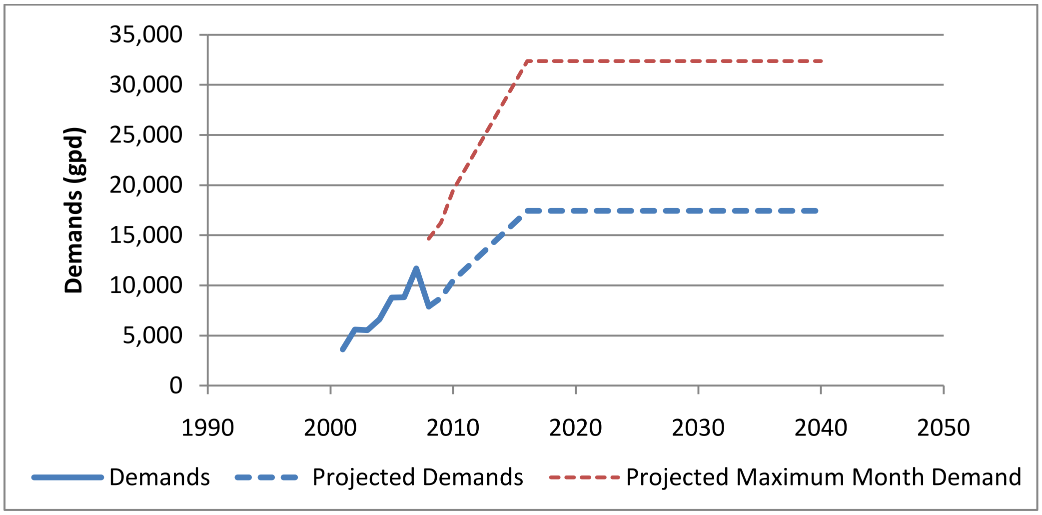


Table 5-13:
YMCA Silver Beach Demand Projections

YEAR	AVERAGE DEMANDS (GPD)	MAX MONTH DEMANDS (GPD)
Projected Data		
2010	10,482	19,469
2020	17,434	32,382
2030	17,434	32,382
2040	17,434	32,382

5.4. Large Self-Supplied Agricultural Users

No detailed historical usage was available upon which to base a series of projections for large agricultural demands at individual facilities and available groundwater permit applications indicated that requested amounts would be sufficient for the foreseeable future. Furthermore, the USGS estimates of water usage for the County for the period between 1985 and 2005 indicate a level or declining trend in agricultural demands (Figure 5-18)[19]. Therefore, it was assumed that, on average, the current permitted amounts for each facility will likely be sufficient to meet demands within the 2040 planning horizon (Table 5-14 and Table 5-15).

Table 5-14.
Projected Large Self-Supplied Agricultural Groundwater Demands

	Annual Permitted Withdrawal (gallons)	Monthly Permitted Withdrawal (gallons)
FACILITY/SYSTEM NAME	*Assumed 2010-2040 Demands*	*Assumed 2010-2040 Demands*
AL Mathews	41,904,000	14,142,000
Ames Farm	65,000,000	16,250,000
Bethel Church	32,400,000	16,200,000
Bobtown Nursery	10,900,000	4,000,000
Bowen Farm	42,620,000	16,000,000
Broadleaf Farms	3,700,000	1,000,000
Byrd Farm	22,650,000	9,910,000
Christian/Ames Farm	56,091,000	21,034,125
David Van Dessel Farm	4,500,000	1,200,000
Dennis Azaleas	2,700,000	500,000
Dennis Nursery	5,000,000	900,000
Drummond Farm	31,000,000	11,000,000
East Coast Brokers and Packers	13,500,000	2,400,000
Ed Goin	34,320,000	11,583,000
Evans or Oaks Farm	120,072,000	26,568,000
Gillespe Farm	28,000,000	12,500,000
Gunter Farm	12,500,000	6,300,000
Hagan Farm	17,000,000	5,700,000
Hickory Hill	34,560,000	17,280,000
Hogneck Farm	13,000,000	5,500,000
Home Farm	8,400,000	6,500,000
James Farm	54,000,000	7,900,000
Kelley Farm	30,124,000	14,300,000
Lang	51,840,000	12,960,000
Lewis Farm	24,300,000	11,500,000
Liberty Hall Farm	4,400,000	1,000,000
Mathews Farm	10,900,000	3,114,290
Melfa Farm	30,360,000	11,400,000
Middleton Farm	185,000,000	37,000,000
Mutton Hunk Fen Natural Area Preserve	40,340,000	19,100,000
Northam Somers	37,800,000	11,812,500
Painter Farm	18,400,000	8,520,000
Peach Orchard	42,600,000	8,520,000
Rew Farm	49,000,000	16,300,000
Robert Van Dessel Farm	3,400,000	900,000
Simpson Farm	21,517,000	10,193,000
Sommers Farm	24,300,000	11,500,000
Sterling	93,060,000	44,080,000
Tidewater Growers	1,800,000	600,000
Weaver Farm	32,900,000	11,000,000
Wes Powers	20,160,000	5,040,000
Wessells Farm	21,517,000	10,193,000
Wessells/ Watkinson Farm	13,500,000	3,375,000
Total Permitted Withdrawals (MG)	**1,411.04**	**466.77**

Figure 5-18: USGS Historical Trend in Agricultural Water Demands in Northampton

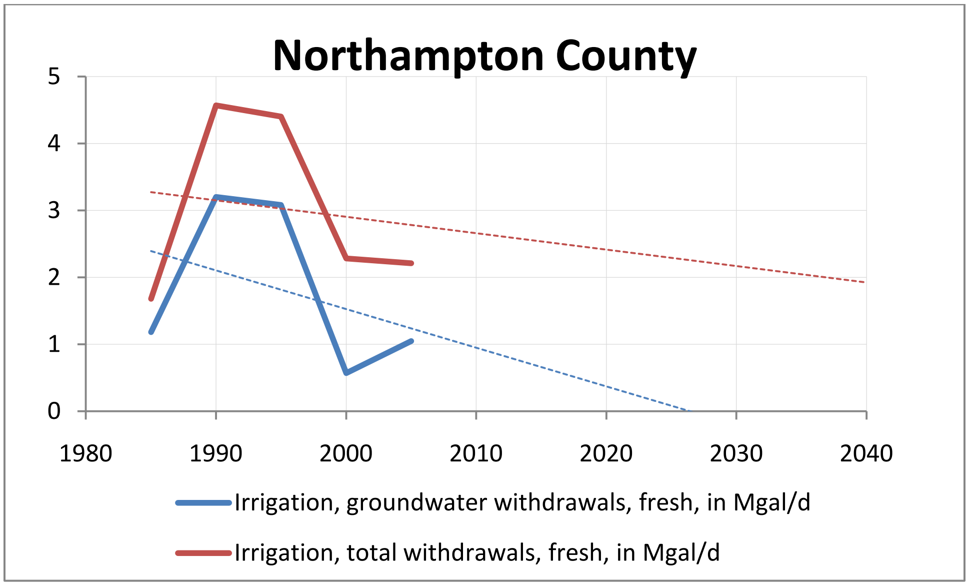


Table 5-15.
Projected Large Self-Supplied Agricultural Surface Water Demands

User Name	Average Annual Use (MG) *Assumed 2010-2040 Demands*
BLACK FARMS	35.20
CHERITON FARMS	2.85
CHEROKEE POINT FARMS	4.32
DAVIDS NURSERY	7.03
HERMITAGE FARMS NURSERY	16.69
KELLAM FARM	12.00
MIDWOOD FARM	4.99
NOTTINGHAM ENTERPRISES INC	16.50
WAYNE T HEATH FARMS INC	16.20
YAROS FARMS INC	289.83

5.5. Small Self-Supplied Use Outside of the Community Service Areas

Based on USGS estimates of small self-supplied population and water demands outside of the community service area, the County-wide trends for the period between 1985 and 2005 are decreasing[19]. The USGS data were extrapolated to 2040 using a linear interpolation for population and water demands (Table 5-16 and Figure 5-19).

Figure 5-19: Small Self-Supplied Water Demands Outside of the Community Service Areas

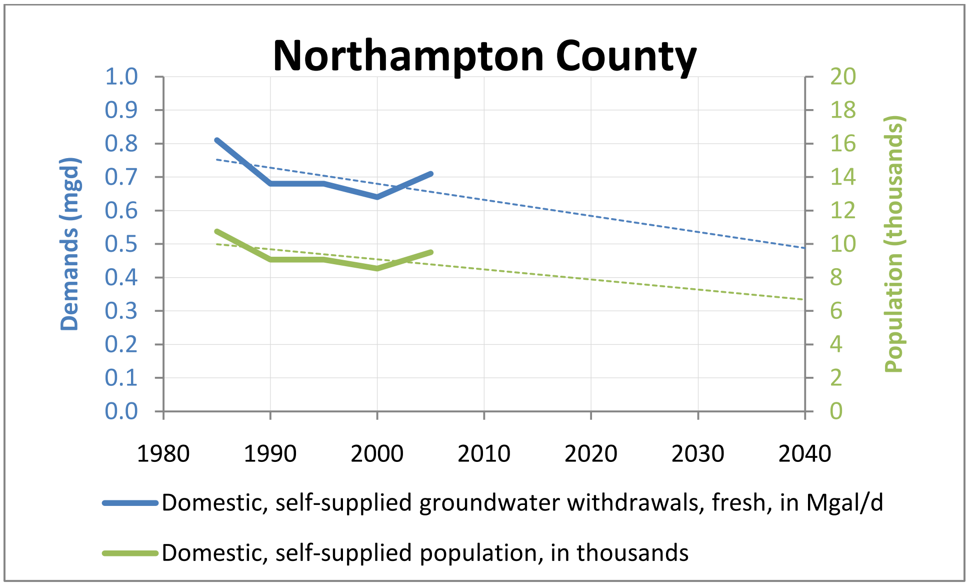


Table 5-16:
Small Self-Supplied Water Demand Projections

YEAR	POPULATION	AVERAGE DEMAND (GPD)
Projected Data		
2010	8,487	632,000
2020	7,883	584,000
2030	7,278	536,000
2040	6,674	488,000

6. Water Demand Management (9 VAC 25-780-110)

Water demand management involves both an increase in efficiency of water use and a reduction of water losses. The net result is a decrease in demand for treated water that can defer development of new resources and reduce the cost of future water service. Each gallon of water conserved is one less requiring storage, treatment, and distribution. It may also represent one less gallon that has to be heated for washing or bathing, thus saving energy costs, or that must pass through a wastewater conveyance system and treatment before it is returned to the environment.

Conservation is an important complement to new supply sources. In some cases, conservation may eliminate the need for new sources of supply. Fresh water, like other natural resources, is a limited commodity which must be managed wisely to preserve the well-being of future generations. Efforts to conserve existing supplies and efficient allocation of water resources are important during each stage of the water supply planning process.

The Groundwater Management Act of 1992 requires a Groundwater Withdrawal Permit for all groundwater withdrawals greater than or equal to 300,000 gallons per month within declared Groundwater Management Areas, including the Eastern Shore Groundwater Management Area (ESGWMA). The Groundwater Withdrawal Regulations require that applications for new Groundwater Withdrawal Permits within the ESGWMA include a Water Conservation and Management Plan (WCMP) approved by the Virginia Department of Environmental Quality, Water Resources Division. The WCMP is included as an enforceable part of the permit to withdraw groundwater. Because groundwater is the sole source of water for public, commercial, and a majority of the industrial water supplies in Northampton County, the WCMPs that are part of the Groundwater Withdrawal Permit fulfill the Water Demand Management requirement under this section. Most agricultural uses that require irrigation also withdrawal groundwater at quantities requiring a permit, and will require a WCMP as part of the permit.

An approved WCMP must include:

- Use of water-saving plumbing and processes including, where appropriate, the use of water-saving fixtures in new and renovated plumbing as provided under the Uniform Statewide Building Code (USBC).
- A water loss reduction program.
- A water use education program.

- An evaluation of potential water reuse options.

There are also requirements for mandatory use reductions during water shortage emergencies, including, where appropriate, ordinances prohibiting the waste of water generally.

6.1. Public Water Supplies

The following are components associated with Water Demand Management common to public water supplies. Individual water systems will have their own WCMPs as part of their Groundwater Withdrawal Permits. These plans are provided in Appendix C.

6.1.1. Water Saving Equipment and Processes

The Building Officials and Code Administrators (BOCA) organization is a nonprofit organization which develops a series of performance-oriented model codes (BOCA, 1990). These codes were adopted by the Commonwealth of Virginia as part of the Virginia Uniform Statewide Building Code (USBC, 2006). These codes directly specify the use of water conservation fixtures in commercial and residential applications.

The USBC applies to all new construction and some remodeling of existing structures. The USBC requires that:

> *When reconstruction, renovation, or repair of existing buildings is undertaken, existing materials and equipment may be replaced with materials and equipment of similar kind or replaced with greater capacity equipment in the same location when not considered a hazard; however, when new systems, materials, and equipment that were not part of the original existing building are added, the new systems, materials, and equipment shall be subject to the edition of the USBC in effect at the time of their installation. Existing parts of such buildings not being reconstructed, renovated, or repaired need not be brought into compliance with the current edition of the USBC.*

The International Plumbing Code (IPC) sets maximum flow standards (Section 605.4) for a variety of fixtures and appliances. These standards are presented in the following table.

Plumbing Fixture or Fixture Setting	Maximum Flow Rate or Quantity [1]
Water Closet	1.6 gallons per flushing cycle
Urinal	1.0 gallon per flushing cycle

Shower head	2.5 gpm at 80 psi
Lavatory, private	2.2 gpm at 60 psi
Lavatory, public	0.5 gpm at 80 psi
Lavatory, public, metering or self-closing	0.25 gallon per metering cycle
Sink faucet	2.2 gpm at 60 psi

[1] gpm - gallons per minute

The current standards set a maximum limit of 2.2 gallons per minute (gpm) at 80 pounds per square inch (psi) for showers and private lavatories. Water closets are limited to 1.6 gallons per flushing cycle, and urinals are limited to 1.0 gallons per cycle. In addition, lavatories in public facilities are limited to 0.5 gpm for those with standard valve or spring faucets and 0.25 gallons per cycle for self-closing metering valves (IPC, 2006).

The USBC in Virginia was adopted from the International Plumbing Code. States are permitted to develop plumbing codes that implement stricter measures than those imposed by the National Plumbing Code. However, localities in Virginia must obtain State authorization to develop a stricter code.

6.1.2. Water Loss Reduction Program

6.1.2.1. Water Loss Audit

Annually a water loss audit will be conducted to determine the volume and nature of lost and unaccounted-for water within the water supply system. The purpose of this audit is to identify sources of demand that would normally escape detection by the metering system. This type of demand includes:

1. Fire Fighting. The Fire Department will submit an estimate of all water used on a monthly basis including water used for fire-fighting and for hydrant flushing.

2. Main Flushing. All main flushing performed by the PWS will require the submittal of a water consumption estimate.

3. Theft. Any observed theft will be reported to the PWS and the appropriate action will be taken. An estimate of the volume of water stolen will be submitted as part of the annual water loss audit.

4. Main Breaks. All main breaks will require the reporting by PWS personnel of the estimated volume of water lost.

5. Tank Drainage. All draining of storage tanks in the main distribution system will be reported.

6. Unmetered Services. Every effort will be made to install meters on any portion of the system that is not yet metered as soon as funding becomes available. Grants will be solicited to provide funding.

7. Leaks. Upon completion of the first water loss audit, the PWS will develop a leak detection program which will have as its goal the complete survey of all distribution pipes and mains within the system, to be phased in over the next five years.

8. Meter Errors. The PWS will replace meters at a rate such that a complete system-wide meter turnover takes place every fifteen years, which is the typical warranty period for water meters. The size of meters requested by commercial and industrial customers will be evaluated and the developer will be consulted to help in determining the appropriate meter size for a particular site based on water use and the anticipated demand. Preventing the installation of oversized meters minimizes unwarranted waste of water.

9. Equipment Calibration. All meters at the well heads will be calibrated on an annual basis. There will be service to check and replace inaccurate meters. Large customer meters that are accessible will be field calibrated yearly. An on-going maintenance program will be implemented to locate and repair plant pipe leaks at the water treatment facilities.

All forms for reporting leaks and unaccounted-for water loss will be maintained by the PWS. These forms will be reviewed by PWS personnel on a daily basis so that measures can be taken to reduce unaccounted-for water loss.

6.1.2.2. Leak Repair Program

The owner of any residential unit, commercial establishment, or industrial establishment who is found, based on the water loss audit or by other methods, to be an excessive user of water due to leakage from water lines or plumbing fixtures on the premises will be notified by the PWS. These owners will be required to repair and stop such leakage within a reasonable period of time or will be subject to financial penalties.

6.1.3. Water Use Education Program

Public education concerning the importance of water conservation is a key factor in reducing excessive water use. Education programs should include information about how drinking water is produced and why it is important to conserve. Providing consumers with a better understanding of the reasons conservation is necessary allows them to better appreciate and participate in conservation activities.

The public education program planned by the PWS will include the following components:

1. Billing Inserts. Inserts will be included with water bills. The inserts will include information concerning water conservation techniques and leak detection strategies.

2. Brochures. Water conservation brochures and pamphlets will be made available to the public and at exhibits set up during public events.

3. Video Tapes. A variety of water conservation video tapes will be available from the PWS free of charge. They will be available to the general public, to schools for classroom instruction, and for public meetings. The videos will also be provided to cable television companies for showing on government channels.

4. Water Conservation Hot Line. A telephone number will be available through which residents can have their conservation questions answered by a knowledgeable Town employee. In addition, requests for information on various water conservation topics, speakers, or other personal contacts will be coordinated through this telephone line.

5. News Releases. News releases to the print media, radio, and television will keep the public informed. This process will be used not only during emergencies but also on a regular basis to keep the public informed about conservation-related issues.

6. School Education. Programs will be available for presentation by PWS staff at local schools. Programs will be targeted to specific age groups. Assistance will be made available for teachers who wish to develop their own water awareness programs.

7. Speakers. PWS staff will be available for speaking engagements or personal contacts. These individuals will work with local clubs and organizations to develop public awareness concerning the need to conserve water along with other topics related to the water supply industry.

8. Support of water table groundwater wells for irrigation of lawns and landscaping by residents, businesses and industries within the service area. The use of wells screened in the water table aquifer for these activities helps to minimize the use of the confined Yorktown-Eastover aquifer.

6.1.4. Economic Incentives

Block rate schedules provide a mechanism for his schedule encourages conservation by not providing a lower rate to high volume water users. By charging large and small water users the same rate, large users have a greater incentive to conserve.

The Town will analyze its water rates annually. Rate setting goals will be as follows:

- Perpetuating Public Utilities self-sufficiency while maintaining the highest water quality standards.
- Recommending appropriate rates for water usage and special service charges that are equitable to all customers.
- Continuing a comprehensive water conservation policy by using public information and charges which will discourage nonessential use of water.

6.1.5. Water Reuse

Water reuse may be either direct or indirect and for potable or non-potable uses. Direct reuse involves introducing highly treated, reclaimed water directly to a potable water distribution system, while indirect reuse involves returning treated wastewater to the environment for dilution and natural purification, and subsequent withdrawal for water supply. Potable reuse (which is referred to as recycle by the Virginia Department of Health (VDH)) is the specific use of treated wastewater as a drinking water source.

Indirect potable reuse occurs widely in the United States, each time treated wastewater effluent is discharged to a natural waterway upstream of a water supply intake. In most cases, it is unintentional. Past experience indicates that indirect reuse was acceptable because the application of water and wastewater treatment techniques, the near-universal use of some form of disinfectant, and the natural dilution and purification that occurs in natural waterways adequately treated the water. However, in recent years the effectiveness of these measures in protecting against viral and trace organic contaminants has come under increasing scrutiny.

Unplanned and unintentional reuse of this type is classified as uncontrolled potable reuse, and represents the overwhelming majority of cases of indirect potable reuse.

6.1.5.1. Potable Reuse

The Virginia Department of Health has prepared a Recycle Issues paper dated November 24, 1992. The VDH stated its opposition to both direct and indirect potable reuse projects when naturally occurring sources of water are available. The VDH insists that the highest quality, best source of water be selected when alternatives are available. The VDH also listed several other requirements which would apply to a potable reuse project, pertaining to independent monitoring, dilution, liability, removal of biological hazards and toxics, and utilization of natural purification processes. Given the current position of the VDH, reuse of wastewater treatment plant effluent for potable purposes is not deemed a practicable reuse alternative to conserve water.

6.1.5.2. Non-Potable Reuse

Many industrial water demands are for non-potable uses. One method of reducing demands on potable water sources is to supply non-potable demands using treated wastewater plant effluent. Detailed regulations for implementation of a water reuse project do not exist in the Commonwealth of Virginia. Permitting of a water reuse project would most likely involve both the VDH and the Virginia Department of Environmental Quality (VDEQ). In addition, a Virginia Pollution Discharge Elimination System (VPDES) Permit would be required for discharge to State waters if the flow is not contaminated during its use; if it is contaminated, the approval of VDH and/or VDEQ would be required.

Several states including California, Arizona, Texas, Utah, and Florida have developed regulations and state statutes that specify the required minimum quality of reclaimed water, depending on the intended use of the water. In general, the requirements become more stringent as the likelihood of public contact increases. In California, if treated reclaimed water for industrial use meets the state's standards for full body contact recreation, workers are not required to avoid contact with the water or to wear protective clothing. However, precautions are required should the treated reclaimed water fail to meet these criteria. With the approval of State and local health departments, reclaimed water can be used for soil compaction, dust control, and other construction purposes.

As mentioned previously, recycling will be required in all new car washes and existing car washes will be required to be retrofitted. In addition, required recycling systems are being considered for all new construction and all repair or replacement of continuous flow devices, including any water connector, device, or appliance which requires a continuous flow of 5 gallons per minute or more.

Typically, non-potable markets for reused water include irrigation uses, industrial uses, and creation of recreational lakes. Many factors affect the market for reused water, including:

- Size and location of demand.
- Water quality requirements.
- Degree of treatment required for discharge.
- Cost of reclaimed water.
- Cost and availability of alternative supplies.

It is likely that additional reuse methodologies will be evaluated in the future. Industries within the service area that use large quantities of water are continually evaluating their processes and looking for ways to lower production costs. For these industries, water represents one of their greatest operating expenses. It is in the best interest of these industries to stay abreast of the latest reuse technologies and employ them whenever feasible.

6.2. Commercial and Industrial Supplies

The following are components associated with Water Demand Management common to commercial and industrial water supplies. Individual water systems will have their own WCMPs as part of their Groundwater Withdrawal Permits. These plans are provided in Appendix C.

6.2.1. Water Saving Equipment and Processes

The Building Officials and Code Administrators (BOCA) organization is a nonprofit organization which develops a series of performance-oriented model codes (BOCA, 1990). These codes were adopted by the Commonwealth of Virginia as part of the Virginia Uniform Statewide Building Code (USBC, 2006). These codes directly specify the use of water conservation fixtures in commercial and residential applications.

The USBC applies to all new construction and some remodeling of existing structures. The USBC requires that:

> *When reconstruction, renovation, or repair of existing buildings is undertaken, existing materials and equipment may be replaced with materials and equipment of similar kind or replaced with greater capacity equipment in the same location when not considered a hazard; however, when new systems, materials, and equipment that were not part of the original existing building are added, the new systems, materials, and equipment shall be subject to the edition of the USBC in effect at the time of their installation. Existing parts of such buildings not being reconstructed, renovated, or repaired need not be brought into compliance with the current edition of the USBC.*

The International Plumbing Code (IPC) sets maximum flow standards (Section 605.4) for a variety of fixtures and appliances. These standards are presented in the following table.

Plumbing Fixture or Fixture Setting	Maximum Flow Rate or Quantity [1]
Water Closet	1.6 gallons per flushing cycle
Urinal	1.0 gallon per flushing cycle

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Lavatory, private	2.5 gpm at 80 psi
Lavatory, public	0.5 gpm at 80 psi
Lavatory, public, metering or self-closing	0.25 gallon per metering cycle
Sink faucet	2.5 gpm at 60 psi

1 gpm - gallons per minute

The current standards set a maximum limit of 2.5 gallons per minute (gpm) at 80 pounds per square inch (psi) for showers and private lavatories. Water closets are limited to 1.6 gallons per flushing cycle, and urinals are limited to 1.0 gallons per cycle. In addition, lavatories in public facilities are limited to 0.5 gpm for those with standard valve or spring faucets and 0.25 gallons per cycle for self-closing metering valves (IPC, 1996).

The USBC in Virginia was adopted from the International Plumbing Code. States are permitted to develop plumbing codes that implement stricter measures than those imposed by the National Plumbing Code. However, localities in Virginia must obtain State authorization to develop a stricter code.

6.2.2. Water Loss Reduction Program

There are a wide variety of commercial and industrial uses of water and water loss reduction programs specific to that enterprise are included in the WCMPs provided in Appendix C. However, there are common components that apply to most commercial and industrial uses:

- Routinely record water meter readings. Review use to identify changes that might indicate a leak. Use of historical tables, time-trend graphs, and/or process limits as applicable will be used to identify abnormal use patterns.
- Routinely inspect piping and tanks for any indication of leaks.
- Implement written procedures to address leaks that will include means for a rapid repair and/or leak bypass to minimize water loss.
- Replace meters at a rate such that a complete system-wide meter turnover takes place every fifteen years, which is the typical warranty period for water meters.
- All meters at the well heads will be calibrated on an annual basis. There will be service to check and replace inaccurate meters.

6.2.3. Water Use Education Program

Water use education is highly specific to the commercial and/or industrial use. Education programs for individual commercial and industrial users are described in the WCMPs included in Appendix C.

6.2.4. Water Reuse

Water reuse may be either direct or indirect and for potable or non-potable uses. Direct reuse involves introducing highly treated, reclaimed water directly to a potable water distribution system, while indirect reuse involves returning treated wastewater to the environment for dilution and natural purification, and subsequent withdrawal for water supply. Potable reuse (which is referred to as recycle by the Virginia Department of Health (VDH)) is the specific use of treated wastewater as a drinking water source.

Indirect potable reuse occurs widely in the United States, each time treated wastewater effluent is discharged to a natural waterway upstream of a water supply intake. In most cases, it is unintentional. Past experience indicates that indirect reuse was acceptable because the application of water and wastewater treatment techniques, the near-universal use of some form of disinfectant, and the natural dilution and purification that occurs in natural waterways adequately treated the water. However, in recent years the effectiveness of these measures in protecting against viral and trace organic contaminants has come under increasing scrutiny.

Unplanned and unintentional reuse of this type is classified as uncontrolled potable reuse, and represents the overwhelming majority of cases of indirect potable reuse.

6.2.4.1. Potable Reuse

The Virginia Department of Health has prepared a Recycle Issues paper dated November 24, 1992. The VDH stated its opposition to both direct and indirect potable reuse projects when naturally occurring sources of water are available. The VDH insists that the highest quality, best source of water be selected when alternatives are available. The VDH also listed several other requirements which would apply to a potable reuse project, pertaining to independent monitoring, dilution, liability, removal of biological hazards and toxics, and utilization of natural purification processes. Given the current position of the VDH, reuse of wastewater treatment plant effluent for potable purposes is not deemed a practicable reuse alternative to conserve water.

6.2.4.2. Non-Potable Reuse

Many industrial water demands are for non-potable uses. One method of reducing demands on potable water sources is to supply non-potable demands using treated wastewater plant effluent. Detailed regulations for implementation of a water reuse project do not exist in the Commonwealth of Virginia. Permitting of a water reuse project would most likely involve both the VDH and the Virginia Department of

Environmental Quality (VDEQ). In addition, a Virginia Pollution Discharge Elimination System (VPDES) Permit would be required for discharge to State waters if the flow is not contaminated during its use; if it is contaminated, the approval of VDH and/or VDEQ would be required.

Several states including California, Arizona, Texas, Utah, and Florida have developed regulations and state statutes that specify the required minimum quality of reclaimed water, depending on the intended use of the water. In general, the requirements become more stringent as the likelihood of public contact increases. In California, if treated reclaimed water for industrial use meets the state's standards for full body contact recreation, workers are not required to avoid contact with the water or to wear protective clothing. However, precautions are required should the treated reclaimed water fail to meet these criteria. With the approval of State and local health departments, reclaimed water can be used for soil compaction, dust control, and other construction purposes.

As mentioned previously, recycling will be required in all new car washes and existing car washes will be required to be retrofitted. In addition, required recycling systems are being considered for all new construction and all repair or replacement of continuous flow devices, including any water connector, device, or appliance which requires a continuous flow of 5 gallons per minute or more.

Typically, non-potable markets for reused water include irrigation uses, industrial uses, and creation of recreational lakes. Many factors affect the market for reused water, including:

- Size and location of demand.
- Water quality requirements.
- Degree of treatment required for discharge.
- Cost of reclaimed water.
- Cost and availability of alternative supplies.

It is likely that additional reuse methodologies will be evaluated in the future. Industries within the service area that use large quantities of water are continually evaluating their processes and looking for ways to lower production costs. For these industries, water represents one of their greatest operating expenses. It is in the best interest of these industries to stay abreast of the latest reuse technologies and employ them whenever feasible.

6.3. Agricultural Supplies

The following are components associated with Water Demand Management common to agricultural irrigation systems. Agricultural irrigation systems that use greater or equal to 300,000 gallons per month will have their own WCMPs as part of their Groundwater Withdrawal Permits. These plans are provided in Appendix C. In addition to the WCMPs, the Natural Resources Conservation Service (NRCS) provides significant technical and financial assistance to the agricultural community in implementing measures that directly conserves water. The program that has the greatest impact is the Environmental Quality Incentive Program (EQIP) that provides irrigation efficiency upgrades, irrigation pond and pond expansions, Irrigation Water Management Plans, and tailwater recovery systems.

6.3.1. Water Saving Equipment and Processes

The primary water savings for agricultural supplies rely on methods for irrigation scheduling and use of high efficiency irrigation systems, including use of computerized irrigation systems. Irrigation scheduling includes:

- Assessing soil moisture levels (e.g.; tensiometers)
- Morning and evening irrigation
- Low wind conditions

High efficiency irrigation systems generally refer to systems that achieve 80% or better efficiency. While the most efficient systems are drip irrigation systems, and micro-irrigation systems, there are some overhead systems such as center-pivot that, if equipped with high efficiency heads (low pressure sprinklers and end guns) and operated at times to minimize loss, can achieve high levels of efficiency. The NRCS, through the EQIP program assists the agricultural community in implementing irrigation efficiency upgrades to the systems. Some of the significant system upgrades funded through the EQIP program include:

- Converting overhead impact sprinklers to drops
- Converting overhead sprays to drops
- Updating nozzles and pressure regulators on existing drops
- Updating nozzles and pressure regulators on existing overhead
- Providing end guns, valves, shut-off devices, and booster pumps

Continued support for the EQIP program is critical for continued improvement in these systems.

6.3.2. Water Loss Reduction Program

Water and water loss reduction programs specific to a agricultural user are included in the individual WCMPs provided in Appendix C. However, there are common components that apply to most agricultural uses:

- Routinely record use. Review use to identify changes that might indicate a leak. Use of historical tables, time-trend graphs, and/or process limits as applicable will be used to identify abnormal use patterns.
- Routinely inspect piping and tanks for any indication of leaks.
- Implement written procedures to address leaks that will include means for a rapid repair and/or leak bypass to minimize water loss.

While also directly related to re-use, irrigation ponds, and expansion of irrigation ponds assist in reducing water loss by capturing storm water runoff. When an irrigation pond is sited, and when agricultural land is re-graded, directing storm water to the irrigation pond significantly increases the storage capacity of these systems.

6.3.3. Water Use Education Program

Water use education is accomplished primarily through NRCS programs, such as the EQIP programs and agricultural extension programs through the local co-op agencies and Farm Bureau.

6.3.4. Water Reuse

Reuse consists principally of recapturing two types of flow:

- Tailwater Recovery
- Wastewater Reuse

Tailwater recovery systems have the potential to significantly capture any excess irrigation water and storm water for reuse as irrigation water. These systems are widely promoted by the NRCS as a conservation practice standard and, through the EQIP program have implemented several tailwater recovery systems on the Eastern Shore. Expansion of these systems should be encouraged.

Wastewater reuse somewhat restricted by FDA requirements for certain agricultural products. However, reuse has been implemented for number agricultural systems, most noticeably for some nursery operations.

7. Drought Response and Contingency Plan (9 VAC 25-780-120)

In accordance with Water Supply Planning Regulations, Section 9 VAC 25-780-120, the following discussion presents a Drought Response and Contingency Plan (DRCP) as a component of the WSP.

A drought is a period of unusually dry weather, including lower than normal levels of precipitation, which persists long enough to cause serious problems such as water supply shortages and/or crop damage. The present DRCP is focused on identifying drought conditions and implementing appropriate responses in order to maintain adequate water supplies in Northampton County. The successful response to drought conditions in the Planning Region largely depends upon public education and involvement.

The DRCP outlines a regional approach to responding to drought, while recognizing that drought conditions will vary across the County, and specific response and contingency actions will be made based on local conditions. The plan recognizes the unique characteristics of water sources within the region, as well as the beneficial uses of the water.

The DRCP includes four graduated stages of responses to the onset of drought conditions within the Planning Area:

DRCP STAGE	VDEQ DROUGHT MONITOR CONDITIONS	CONDITIONS	MAJOR RESPONSE
Normal Conditions	--	Normal Conditions	--
	D0	Abnormally dry (short-term)	
Drought Watch	D1	Moderate Drought	Public awareness campaign
Drought Warning	D2	Severe Drought	Voluntary restrictions
Drought Emergency	D3	Extreme Drought	Mandatory restrictions
	D4	Exceptional Drought	

The plan is based on procedures for the implementation and enforcement of the plan, in accordance with 9 VAC 25-780-120.3. Furthermore, the DRCP acknowledges the role of the Commonwealth in monitoring and responding to drought conditions as outlined in the Virginia Drought Assessment and Response Plan, dated March 28, 2003 (Appendix D), while reserving the right to respond to those conditions and enforce the actions presented in this plan based on local conditions and local procedures.

7.1. Purpose

The purpose of this DRCP is to provide a contingency plan to:

- Manage the use of water resources in Northampton County in the event of drought conditions or other water supply emergencies,
- Establish an enforceable programmed response for each drought stage that will reduce water consumption with the least adverse impact on the residents and businesses of Northampton County
- Respond to non-climate related water supply emergencies, such as contamination or equipment failure, which may result in the need to restrict water use until water service can be restored.

7.2. Drought Indicators

The process of determining the presence or severity of a drought is complex and can be based on numerous indicators. In the Commonwealth of Virginia, drought evaluations are made by the Virginia Drought Monitoring Task Force (VDMTF), an interagency group of technical representatives from state and federal agencies responsible for monitoring natural resource conditions and the effects of drought on various segments of society. During periods of normal moisture conditions, the VDEQ monitors the NOAA U.S. Drought Monitor and prepares a monthly report and drought map specific to Virginia. The VDMTF is activated following an occurrence of moderate drought conditions (D1) as reported by the U.S. Drought Monitor program. The VDMTF may also active following the occurrence of smaller scale drought conditions that occur below the resolution of the Drought Monitor. The VDMTF monitors the progression of drought conditions (using typical drought indicators including precipitation deficits, groundwater levels, streamflows, and reservoir storage) and their effects on various sectors of society including water supply, agriculture, forestry and recreation. The VDMTF remains active until drought conditions have receded to unusually dry levels (D0) as reported by the U.S. Drought Monitor on a state wide level and may remain active longer if small areas beneath the resolution of the Drought Monitor continue to experience drought impacts. The VDMTF also provides recommendations for the declaration of the various drought stages. Virginia is currently divided into thirteen drought evaluation regions, including the Eastern Shore Drought Evaluation Region to which Northampton County belongs.

7.2.1. Precipitation Deficits

Precipitation deficits are monitored by the VDMTF which compares current local precipitation amounts (compiled by the Office of the State Climatologist) with 30-year local precipitation normals (developed by NOAA). Deficits are evaluated as running averages from the start of a water year (which begins on October 1), or on a trailing 12-month average for more extended events (Table 7-1 and Figure 7-1).

Figure 7-1: Seasonal drought triggers relative to precipitation normals

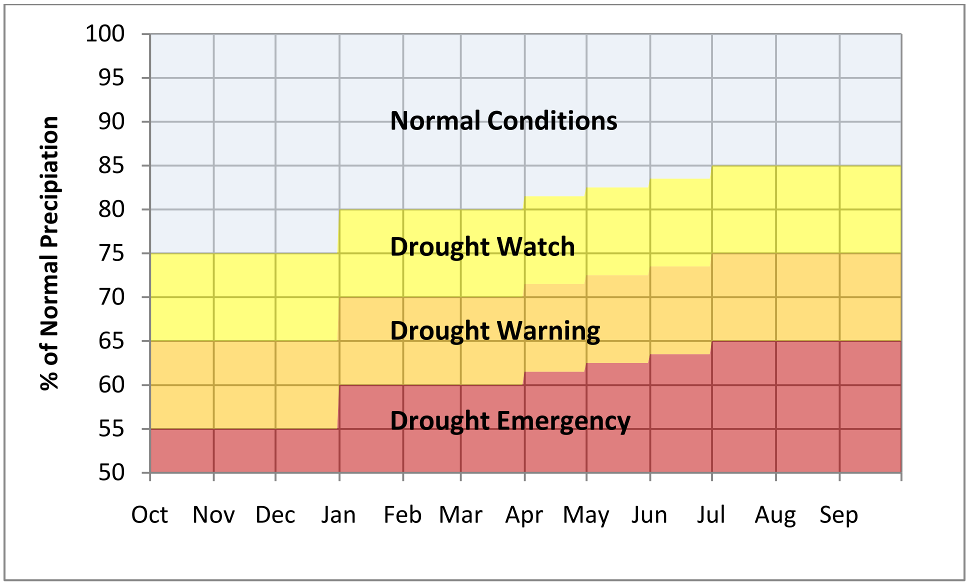


Table 7-1:
Seasonal drought triggers relative to precipitation normals

Months Analyzed	DROUGHT STAGE: Normal Conditions	Drought Watch	Drought Warning	Drought Emergency
	(% of Normal Precipitation)			
October-December	>75.0	<75.0	<65.0	<55.0
October-January	>80.0	<80.0	<70.0	<60.0
October-February	>80.0	<80.0	<70.0	<60.0
October-March	>80.0	<80.0	<70.0	<60.0
October-April	>81.5	<81.5	<71.5	<61.5
October-May	>82.5	<82.5	<72.5	<62.5
October-June	>83.5	<83.5	<73.5	<63.5
October-July	>85.0	<85.0	<75.0	<65.0
October-August	>85.0	<85.0	<75.0	<65.0
October – September (and previous 12 months)	>85.0	<85.0	<75.0	<65.0

7.2.2. Groundwater Levels

Groundwater monitoring wells located in the water table aquifer representing drought evaluation regions are used by the VDMTF to monitor shallow groundwater responses to drought conditions. Measured water levels are compared to the historic water level statistics for the entire period of record of a given monitoring well. Measured groundwater levels within the ranges shown in Table 7-2 have been recommended by the Drought Response Technical Advisory Committee to be indicative one of the four drought conditions.

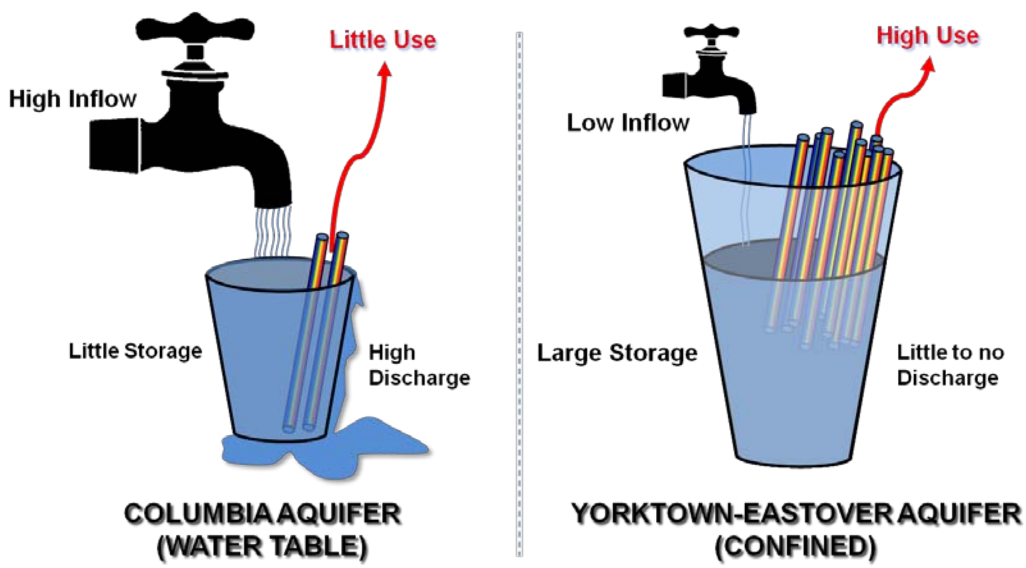
Table 7-2:
Measured groundwater level relative to statistical occurrence

	DROUGHT STAGE			
	Normal Conditions	**Drought Watch**	**Drought Warning**	**Drought Emergency**
	(% occurrence relative to all historical measured groundwater levels)			
Measured Groundwater Level	>25 %	10-25 %	5-10 %	<5 %

Representative monitoring wells were selected by the Drought Response Technical Advisory Committee as part of the Drought Assessment and Response Plan process on the basis of period of record and relative location within the drought evaluation region. The P.C. Kellam Observation Well (USGS local number 63H 6 SOW 103A) was selected as the monitoring well most representative of conditions in Northampton County.

Information from the USGS well wells will be used only to provide general insights into regional conditions, which will then be shared with the public, but will not represent a primary criterion for drought evaluation in Northampton County. This is because despite the Northampton County's nearly complete reliance on groundwater, at current usage rates, the effects of droughts occurring over time frames of less than a few years have little *direct* impact on the availability of water, provided water usage does not significantly increase during the drought. In the water table aquifer, the average recharge rate typically far exceeds water usage (625 MGD vs. less than 1 MGD, respectively) and the large majority of recharge is returned to the hypergean environment through evapotranspiration and discharge to surface water bodies. In the confined aquifers, the recharge rate is much lower and is on the same order of magnitude as withdrawals (9 MGD, vs. approximately 10 MGD) with little discharge to overlying aquifers and surface water bodies; however the storage in the confined aquifers is far greater than in the water table aquifer and temporary recharge deficits have a small impact on the total storage. Furthermore, increased usage in the confined aquifer(s) will be somewhat offset by a lesser yet proportional increase in leakage from the overlying aquifer(s). A conceptual representation of the relative differences in water budgets between the water table and confined aquifers is shown in Figure 7-2. Furthermore, variations in water availability occur on a scale that can be fairly localized and measured water levels in a single well are not likely to be representative may not representative of conditions across the entire County.

Figure 7-2: Conceptual differences in water budgets between the water table and confined aquifers on the Eastern Shore of Virginia



However, significant drought events are typically associated with increased water demands, particularly for agricultural and landscaping irrigation and other seasonal water uses. *Indirect* impacts to groundwater availability during drought events on the Eastern Shore are typically associated with local water level declines due to increased usage. Therefore, for a given drought to be based on groundwater indicators alone, it may be preferable to provide the flexibility to discrete water supply systems (community, agricultural and other self-supplied systems) such that local groundwater water levels may be used as indicators of local drought conditions and severity for each system or portions of the County. The recommended indicator of a drought emergency for a (community or individual) groundwater water supply system is either a water level less than 5 ft above the intake or 80 percent of available drawdown in a production well. For systems where production well water level measurements are impracticable, a nearby observation well may also be used.

7.2.3. Streamflow and Reservoir Storage

As discussed in previous sections of the present WSP, Northampton County does not have any significant fresh surface water features and derives all of its water supply from groundwater, with the exception of a few irrigation ponds. Therefore, the use of streamflow and reservoir storage as an indicator of drought is not particularly pertinent in Northampton County.

7.2.4. Other Indicators

The DMTF also evaluates other available indicators including the VDOF Cumulative Severity and Keech-Byrum Drought Indeces and other data for forest impacts and information compiled by the Virginia Agricultural Statistics Service and the Virginia Cooperative Extension Service to assess the impacts of drought on agricultural interests, in addition to the number of requests for federal drought disaster designation reported by the Virginia Department of Agriculture and Consumer Services. Furthermore, the VDMTF also considers operating conditions at public waterworks in the determination of drought recommendations.

7.3. Drought Stage Declarations

The DMTF and individual water system managers may use the indicators described above to assess drought conditions across the County and at individual systems, respectively. The following general descriptions will be used to guide drought stage declarations locally and to make recommendations to the Virginia Drought Coordinator for County-wide declarations:

- **Normal Conditions**
  - Precipitation exceeds the percent of normal precipitation threshold specified for normal conditions and the relevant time period shown in Table 7-1 and
  - Groundwater levels are above the 25th percentile for all historic levels

- **Drought Watch**

- Precipitation at or below the percent of normal precipitation threshold specified for drought watch conditions and the relevant time period shown in Table 7-1 or
- Groundwater levels are between the 25th and 10th percentile for all historic levels

- **Drought Warning**
  - Precipitation at or below the percent of normal precipitation threshold specified for drought warning conditions and the relevant time period or
  - Groundwater levels are between the 25th and 10th percentile for all historic levels

- **Drought Emergency**
  - Precipitation at or below the percent of normal precipitation threshold specified for drought emergency conditions and the relevant time period,
  - Groundwater levels measured in production wells levels are less than 5 ft above the pump intake, or
  - Groundwater level measured in production or nearby observation wells show drawdown greater than 80 percent relative to non-pumping water levels.

The process of determining the presence or severity of a drought is complex and requires a certain level of professional judgment, therefore, the preceding descriptions should not be viewed as absolute requirements for drought designation, but rather as a mechanism to be used to reach consensus on the appropriate drought recommendations at the County-wide and local levels.

Drought Stages conditions may be declared for the entire county or portions of the county by the Virginia Drought Coordinator and for individual community and self-supplied water supply systems by their respective management. The more stringent of differing declarations should apply in the case of a discrepancy, subject to spatial jurisdiction.

7.4. Drought Stage Responses

As discussed above, the DRCP includes the use of four graduated drought stages: normal conditions, drought watch, drought warning, and drought emergency. Normal conditions represent status quo operating conditions.

The drought watch stage responses are generally responses intended to raise awareness of water users in the jurisdiction to climatic conditions that are likely to precede the occurrence of a significant drought event. Public outreach activities to raise this awareness are identified as well as conservation activities that may be used to reduce demand.

Drought warning stage responses are generally responses that are required when the onset of a significant drought event is imminent. Voluntary water conservation activities are identified with the goal of reducing water use by 5 – 10%, in accordance with 9 VAC 25-780-120.A.2.b.

Drought emergency stage responses are generally responses that are required during the height of a significant drought event. Mandatory water conservation activities are identified with the goal of reducing water use by 10 – 15%, in accordance with 9 VAC 25-780-120.A.2.c.

The subsections below represent guidelines and language that may be used to develop local or county wide Drought Management and Contingency Planning ordinances.

7.4.1. Normal Operation

Community water supply systems servicing incorporated towns in Northampton County shall be operated by a qualified operator and division supervisor under the purview of the director of public works and town manager. The supply system operator and/or supervisor shall report routine operations and monthly water usage to the director of public works and town manager. The town manager shall further advise the town council and the mayor. Other community water supply systems shall be operated by a qualified operator coordinating with relevant County and State agencies. Normal operation of community water systems will include at least monthly water level measurements in production wells or nearby observation wells and the collection or review of local precipitation data to monitor the potential for drought conditions to occur. More frequent data collection may be required during dry conditions.

7.4.2. Drought Watch

Following the declaration of a countywide, regional or local drought watch, the town manager, system operator/supervisor, and/or director of public works for affected individual public water supply systems and the administrators of affected large self-supplied water withdrawals exceeding 10,000 gpd will:

- Review existing drought water conservation and contingency plans and
- Make reasonable efforts to pursue leak detection and repair programs.

Furthermore, where an individual public water supply system unilaterally declares a drought watch for their service area, the system operator/supervisor will:

- Inform the VDH of their self-declared drought watch and
- Issue a press release indicating the reasons for the declaration.

If a major water leak or water supply equipment failure occurs in a community water supply system, repairs shall be immediately initiated by the relevant department and the town manager shall be immediately notified of such. In conjunction with the town manager, the waterworks supervisor/operator and director of public works shall determine if a water shortage will occur as a result of the leak or equipment failure.

7.4.3. Drought Warning

Following the declaration of a Countywide, regional or local drought warning or serious water shortage due to a major leak, equipment failure non-climate related water supply disruption, the town manager, system operator/supervisor, and/or director of public works for affected public water supply systems will:

- Issue public announcements encouraging the voluntary reduction or elimination of non-essential water uses including car washing, lawn watering, garden watering, and water usage by swimming pools and other recreational facilities after consultations with the mayor and public works committee chair and
- Voluntarily reduce or eliminate non-essential flushing of water lines and other operational water uses.

The goal of the voluntary water use restrictions shall be to reduce total water consumption by 5 to 10 percent. If the drought warning is self-declared, the town manager, system operator/supervisor, and/or director of public works for individual community water supply systems will also notify the VDH.

Following the declaration of a Countywide or regional the administrators of large self-supplied water withdrawals exceeding 10,000 gpd will voluntarily reduce or eliminate non-essential flushing of water lines and other operational water uses.

7.4.4. Drought Emergency

Following the declaration of a Statewide, Countywide, or regional drought emergency by the Governor by executive order, the town manager, system operator/supervisor, and/or director of public works for affected public water supply systems will:

- Issue public announcements declaring the mandatory reduction or elimination of non-essential water uses including car washing, lawn and garden watering, and water usage by swimming pools and other recreational facilities. The following specific prohibitions will apply:

  Unrestricted irrigation of lawns, gardens and other landscaped areas is prohibited

  - Newly sodded and seeded areas may be irrigated to establish cover on bare ground at the minimum rate necessary for no more than a period of 60 days, irrigation rate may not exceed a total of one inch of applied water in any seven day period.
  - Gardens, bedding plants, trees, shrubs and other landscape materials may be water with hand held containers, hand-held hoses equipped with an automatic shutoff device, sprinklers, or other automated water devices at the minimum rate necessary but in no case more frequently than twice per week.
  - All allowed lawn irrigation must be applied in a manner to assure that no runoff, puddling or excessive watering occurs.
  - Irrigation systems may be tested after installation, routine maintenance or repair for no more than ten minutes per zone.

  Unrestricted irrigation of golf courses is prohibited

  - Tees and greens may be irrigated between the hours of 9:00PM and 10 AM a the minimum rate necessary
  - Localized dry areas may be irrigated with a hand held container or hand held hose equipped with an automatic shutoff device at the minimum rate necessary.
  - Greens may be cooled by syringing or by the application of water with a hand held hose equipped with an automatic shutoff device at the minimum rate necessary.
  - Fairways may be irrigated between the hours of 9:00 PM and 10:00 AM at the minimum rate necessary not to exceed one inch of applied water in any ten-day period.
  - Fairways, tees and greens may be irrigated during necessary overseeding or resodding operations in September and October at the minimum rate necessary. Irrigation rates during this restorations period may not exceed one inch of applied water in any seven-day period.

- Newly constructed fairways, tees and greens and areas that are re-established by sprigging or sodding may be irrigated at the minimum rate necessary not to exceed one inch of applied water in any seven-day period for a total period that does not exceed 60 days.
- Fairways, tees and greens may be irrigated without regard to the restrictions listed above so long as:
  - The only water sources utilized are water features whose primary purpose is stormwater management,
  - Any water features utilized do not impound permanent streams,
  - During declared Drought Emergencies these water features receive no recharge from other water sources such as ground water wells, surface water intakes, or sources of public water supply, and,
  - All irrigation occurs between 9:00 p.m. and 10:00 a.m.
- All allowed golf course irrigation must be applied in a manner to assure that no runoff, puddling or excessive watering occurs.
- Rough areas may not be irrigated.

Unrestricted irrigation of athletic fields is prohibited.

- Athletic fields may be irrigated between the hours of 9:00 p.m. and 10:00 a.m. at a rate not to exceed one inch per application or more than a total of one inch in multiple applications during any ten-day period. All irrigation water must fall on playing surfaces with no outlying areas receiving irrigation water directly from irrigation heads.
- Localized dry areas that show signs of drought stress and wilt (curled leaves, foot-printing, purpling) may be syringed by the application of water for a cumulative time not to exceed fifteen minutes during any twenty four hour period. Syringing may be accomplished with an automated irrigation system or with a hand held hose equipped with an automatic shutoff device at the minimum rate necessary.
- Athletic fields may be irrigated between the hours of 9:00 p.m. and 10:00 a.m. during necessary overseeding, sprigging or resodding operations at the minimum rate necessary for a period that does not exceed 60 days. Irrigation rates during this restoration period may not exceed one inch of applied water in any seven-day period. Syringing is permitted during signs of drought stress and wilt (curled leaves, foot-printing, purpling).
- All allowed athletic field irrigation must be applied in a manner to assure that no runoff, puddling or excessive watering occurs.

- Irrigation is prohibited on athletic fields that are not scheduled for use within the next 120-day period.
- Water may be used for the daily maintenance of pitching mounds, home plate areas and base areas with the use of hand held containers or hand held hoses equipped with an automatic shutoff device at the minimum rate necessary.
- Skinned infield areas may utilize water to control dust and improve playing surface conditions utilizing hand held containers or hand held hoses equipped with an automatic shutoff device at the minimum rate necessary no earlier than two hours prior to official game time.

Washing paved surfaces such as streets, roads, sidewalks, driveways, garages, parking areas, tennis courts, and patios is prohibited.

- Driveways and roadways may be pre-washed in preparation for recoating and sealing.
- Tennis courts composed of clay or similar materials may be wetted by means of a hand-held hose equipped with an automatic shutoff device at the minimum rate necessary for maintenance. Automatic wetting systems may be used between the hours of 9:00 p.m. and 10:00 a.m. at the minimum rate necessary.
- Public eating and drinking areas may be washed using the minimum amount of water required to assure sanitation and public health.
- Water may be used at the minimum rate necessary to maintain effective dust control during the construction of highways and roads.

Use of water for washing or cleaning of mobile equipment including automobiles, trucks, trailers and boats is prohibited.

- Mobile equipment may be washed using hand held containers or hand held hoses equipped with automatic shutoff devices provided that no mobile equipment is washed more than once per calendar month and the minimum amount of water is utilized.
- Construction, emergency or public transportation vehicles may be washed as necessary to preserve the proper functioning and safe operation of the vehicle.
- Mobile equipment may be washed at car washes that utilize reclaimed water as part of the wash process or reduce water consumption by at least 10% when compared to a similar period when water use restrictions were not in effect.
- Automobile dealers may wash cars that are in inventory no more than once per week utilizing hand held containers and hoses equipped with automatic shutoff devices, automated equipment that utilizes reclaimed water as part of the wash

process, or automated equipment where water consumption is reduced by at least 10% when compared to a similar period when water use restrictions were not in effect.

- Automobile rental agencies may wash cars no more than once per week utilizing hand held containers and hoses equipped with automatic shutoff devices, automated equipment that utilizes reclaimed water as part of the wash process, or automated equipment where water consumption is reduced by at least 10% when compared to a similar period when water use restrictions were not in effect.
- Marine engines may be flushed with water for a period that does not exceed 5 minutes after each use.

Use of water for the operation of ornamental fountains, artificial waterfalls, misting machines, and reflecting pools is prohibited.

- Fountains and other means of aeration necessary to support aquatic life are permitted.
- Use of water to fill and top off outdoor swimming pools is prohibited.
- Newly built or repaired pools may be filled to protect their structural integrity.
- Outdoor pools operated by commercial ventures, community associations, recreation associations, and similar institutions open to the public may be refilled as long as:
  - Levels are maintained at mid-skimmer depth or lower,
  - Any visible leaks are immediately repaired
  - Backwashing occurs only when necessary to assure proper filter operation,
  - Deck areas are washed no more than once per calendar month (except where chemical spills or other health hazards occur),
  - All water features (other than slides) that increase losses due to evaporation are eliminated, and
  - Slides are turned off when the pool is not in operation.
- Swimming pools operated by health care facilities used in relation to patient care and rehabilitation may be filled or topped off.
- Indoor pools may be filled or topped off.
- Residential swimming pools may be filled only to protect structural integrity, public welfare, safety and health and may not be filled to allow the continued operation of such pools.

- Declare mandatory water use restrictions for hotels, motels, tourist homes, campgrounds, trailer parks, and all other commercial establishments. Such establishments shall be required to notify their patrons and restrict water usage for bathing and other purposes to a bare minimum. Restaurants and food service establishments will provide water to customers only when requested, and
- Place a moratorium on all new water service connections.
- Coordinate with law enforcement officials who shall issue tickets to violators of mandatory use restrictions. Upon conviction, a violator shall be guilty of a class 4 misdemeanor, and each incident shall be considered a separate offence.

The goal of the water use restrictions shall be to reduce total water consumption between 10 and 15 percent, or higher depending on the severity of the drought or critical water supply emergency. All residential, business and industrial water users; whether supplied by public water supplies, self-supplied sources, or private water wells; who do not normally utilize water for any of the listed prohibited uses are requested to voluntarily reduce water consumption by at least 10%. This reduction may be the result of elimination of other non-essential water uses, application of water conservation practices, or reduction in essential water uses.

If the drought emergency or water supply emergency is self-declared, the town manager, system operator/supervisor, and/or director of public works for individual community water supply systems will also notify the VDH and the Virginia Emergency Operations Center.

Water Rationing

In some cases, the mandatory non-essential water use restrictions may not be sufficient to protect the supplies of an individual public waterworks. When an individual waterworks' sources are so depleted as to threaten public health and safety, it may become necessary to ration water within that system in order to assure that water is available to support essential uses. Rationing water is a more severe measure than merely banning nonessential uses of water. Under rationing, each customer is allotted a given amount of water, based on a method of allotment developed by the waterworks or local government. Generally, it will be based on a percentage of previous usage or on a specific daily quantity per household. Rationing is more likely to have some effect on welfare than mandatory non-essential use restrictions, because industrial and commercial water uses may be curtailed or eliminated to assure an adequate supply is available for human consumptive uses.

The decision to ration water will typically be made by the local government or waterworks operator. The Virginia Drought Coordinator will work closely with any entity where water rationing is required to assure that all available State resources are effectively used to support these highly stressed water supply systems. The Virginia Department of Emergency Management (VDEM) is the first point of contact for waterworks or local governments who decide to ration water. VDEM will coordinate the Commonwealth's response and assistance to such entities.

8. Statement of Need and Alternatives (9 VAC 25-780-130)

This Section describes the adequacy of the existing water sources and whether they meet the current and projected demands. In addition, potential alternatives to increase current supplies or develop new water supplies are discussed.

8.1. Adequacy of Existing Water Sources

The Columbia and Yorktown-Eastover multi-aquifer system within Northampton County and the Eastern Shore of Virginia has been designated a Sole Source Aquifer by the USEPA. As such, availability of fresh water supply in Northampton County is limited. However, given the current and projected demands, there is sufficient water supply to meet the overall needs of Northampton County. The challenge for the County in the future is to manage the resource in a manner that will avoid local degradation of the water supply that can occur even under the current demands. The greatest risk is from local saltwater intrusion in the confined Yorktown-Eastover aquifer due to over pumping and contamination of the Columbia aquifer from various land use activities. The following alternatives help to avoid or mitigate these impacts.

8.2. Alternatives Analysis

Available alternatives to reduce potential impacts from saltwater intrusion in the Yorktown-Eastover aquifer and land use derived contamination to the Columbia aquifer can be divided into two general categories:

- Potential new or expansion of underutilized sources
- Use of new or emerging technologies that improve availability or provides access to previously unavailable sources

8.2.1. Alternatives Analysis: Potential New or Expanded Water Supply Sources

8.2.1.1. Water table withdrawals

Recharge to the water table aquifer is several orders of magnitude greater than the confined aquifer. As such, this groundwater resource is far more renewable. Benefits of encouraging use of the water table aquifer are:

- Encourage, proactively, use of the water table aquifer over the confined aquifers.

- Avoid retroactively waiting until all of the confined aquifers are "critical" before using the water table.

- The significantly higher recharge to the water table greatly reduces impacts of a withdrawal from the aquifer. A withdrawal from the water table system is far more sustainable than from the confined aquifers.

- Increased use of the water table aquifer helps to preserve the confined aquifers.

For water supply development, the water table aquifer is not targeted as a preferred source in large part due to:

- Individual well yields are typically lower: the water table aquifer is shallower than confined aquifers and is not under pressure.

- Because the aquifer is not under pressure, the wells are often more difficult to develop following construction.

- The aquifer is more susceptible to contamination from land use activities.

- Cost to develop a water table supply is often greater than for a confined aquifer. Additional field investigation and multiple wells are often required to provide the same yield.

To encourage use of the water table aquifer, funding through programs such as the NRCS EQIP have the potential to significantly increase the number of water table withdrawals for agricultural uses. Additionally, changes to the DEQ Groundwater Withdrawal Regulations to recognize the lesser impact from using this aquifer would encourage use of the Columbia aquifer over the confined Yorktown-Eastover aquifer for all withdrawals, including some for public water supply.

8.2.1.2. Dug ponds

Similar to groundwater withdrawals from the water table aquifer, this alternative focuses on maximizing use of the water table aquifer. Unlike water table withdrawals, dug ponds are used exclusively for agricultural irrigation and industrial cooling water supply. Currently, dug ponds are not a source of water for public water supplies in Northampton County.

The primary impediment to use of dug ponds as a source of water supply is the area required to create the pond. To avoid impacts to wetlands, upland areas that are also often prime agricultural lands must be used for the ponds. Increased funding through the NRCS EQIP program for new ponds or existing pond expansion could significantly improve the capacity and use of these ponds.

8.2.2. Alternatives Analysis: Potential New and Emerging Technologies

8.2.2.1. Aquifer Storage and Recovery (ASR)

Aquifer Storage and Recovery is a technology that uses confined aquifers as a reservoir to store water that will later be withdrawn for use. ASR can be used as a direct source of water or it can be used to impede saltwater intrusion, thereby increasing availability of fresh groundwater in the Yorktown-Eastover aquifer. The principal benefits of ASR are:

- Encourages use of a technology that can significantly increase recharge to the aquifer.
- Can result in a no-net-loss operation.
- Reduces impacts of withdrawals for all groundwater users.
- Reduces the potential for saltwater intrusion to occur

While there are significant technological costs associated with operation of an ASR system, this method of water management has been successfully used throughout the United States. The most significant impediment to expanded use of ASR within the Virginia Groundwater Management Areas, including Northampton County is the lack of specific criteria that clearly differentiates ASR as a system that uses the aquifer as a reservoir from conventional groundwater withdrawals.

8.2.2.2. Desalinization

Use of brackish groundwater through reverse osmosis is a technology that has been used in the Coastal Plain of Virginia since 1989, with the operation of the Suffolk EDR facility. Subsequently, reverse osmosis has been used by a large number of communities in the Coastal Plain of Virginia, including most of the major municipal systems, such as James City County, Newport News Waterworks, and Chesapeake. Additionally, over the past 10-years, cost of constructing new or retrofitting old systems has decreased on average 10% per-year.

For areas of Northampton County where there is a significant brackish water source, particularly along the coastal areas, desalinization has significant potential for providing a source of high quality potable water. Additionally, membrane treatment is a viable technology for areas where the quality of water in the Columbia aquifer is impaired. As cost for reverse osmosis or membrane treatment continues decline and as efficiency of these systems continue to improve, this technology has significant potential for providing additional water supply to N County.

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Northampton County

Water Supply Plan

Appendix A

Northampton County Community Water System Well Summary

3100-001 / NEW

Northampton County - Community Water System Well Summary

Water System and Well Name	Well Completion Date	Well Depth (ft)	Pumping Level (ft)	Diameter (in)	Casing Depth (ft)	Screen Depth (ft)	Annual Permitted Withdrawal (Gallons)	Max. Monthly Permitted Withdrawal (Gallons)
Arlington Plantation								
Missing Well Information	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bayview								
Missing Well Information	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cape Charles Municipal Corporation								
East Well 3 (165-00558)	4/16/2008	220	76	n/a	n/a	n/a	153,000,000	15,550,000
Tower Well(165-00387)	11/21/1996	210	88	n/a	n/a	n/a	153,000,000	15,550,000
Eastville, Town of								
backup well(165-00445)	1/8/1952	135	n/a	n/a	n/a	n/a	23,700,000	2,900,000
Main well(165-00038)	9/15/1972	165	128	n/a	n/a	n/a	23,700,000	2,900,000
Exmore, Town of								
Well #1(165-00015)	9/1/1950	200	52	n/a	160	190	60,800,000	9,920,000
Well #2(165-00014)	6/1/1965	228	100	n/a	160	212	60,800,000	9,920,000
Holiday Acres Mobile Home Park								
Missing Well Information	n/a	n/a	n/a	n/a	n/a	n/a	8,212,500	n/a
Kiptopeake Condominiums								
Missing Well Information	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Northampton County Government Complex								
Well #1(165-149)	n/a	n/a	n/a	n/a	n/a	n/a	16,206,000	2,025,750
Well #2(165-150)	n/a	n/a	n/a	n/a	n/a	n/a	16,206,000	2,025,750
Well #3(165-151)	n/a	n/a	n/a	n/a	n/a	n/a	16,206,000	2,025,750
Shore Memorial Hospital								
#1(165-00025)	10/31/1952	304	88	n/a	n/a	n/a	18,555,000	3,370,000
#2(165-00001)	2/13/1969	305	139.3	n/a	n/a	n/a	18,555,000	3,370,000

Source *: VDEQ Data (Well and System Info.xls) and paper copies of DEQ withdrawal permits*

Northampton County

Water Supply Plan

Appendix B

Northampton County Large Non-Agricultural User Well Summary

3100-001 / NEW

Northampton County - Large Non-Agricultural User Well Summary

Water System and Well Name	Well Completion Date	Well Depth (ft)	Pumping Level (ft)	Diameter (in)	Casing Depth (ft)	Screen Depth (Top & Bottom) or Water Zones (ft)	Annual Permitted Withdrawal (Gallons)	Max. Monthly Permitted Withdrawal (Gallons)
Bayshore Concrete Products Corp Cape Charles								
#1 Shop(165-00381)	9/26/1986	122	60	n/a	n/a	n/a	27,700,000	2,800,000
#10-A, Boiler near new office(165-00465)	12/16/1998	200	35	n/a	n/a	n/a	27,700,000	2,800,000
#10-B, New Boiler Room(165-00466)	2/2/2000	220	40	n/a	n/a	n/a	27,700,000	2,800,000
#11, New bathroom(165-00467)	1/27/2000	200	40	n/a	n/a	n/a	27,700,000	2,800,000
#12, Aggregate Bins well(165-00468)	10/19/2002	200	35	n/a	n/a	n/a	27,700,000	2,800,000
#3 Bkfld(165-00383)	7/1/1992	120	0	n/a	n/a	n/a	27,700,000	2,800,000
#4 Washout(165-00111)	4/11/1973	200	64	n/a	n/a	n/a	27,700,000	2,800,000
#5 Propane(165-00382)	1/22/1989	200	48	n/a	n/a	n/a	27,700,000	2,800,000
#5b Girder(165-00390)	7/8/1997	200	30	n/a	n/a	n/a	27,700,000	2,800,000
#6 Poles(165-00384)	5/10/1994	220	0	n/a	n/a	n/a	27,700,000	2,800,000
#7 Welding(165-00389)	10/16/1998	220	152	n/a	n/a	n/a	27,700,000	2,800,000
Girder #5C(165-00464)	10/16/2002	200	40	n/a	n/a	n/a	27,700,000	2,800,000
Best Western Sunset Beach Resort								
Well #1(165-00260)	1/1/1966	70	42	4	0-50	50-70	7,650,000	1,420,000
Well #2(165-00042)	8/1/1974	70	26	n/a	n/a	n/a	7,650,000	1,420,000
Well #3(165-00112)	7/11/1991	240	0	n/a	n/a	n/a	7,650,000	1,420,000
Well #4(165-00401)	7/7/1999	240	n/a	n/a	n/a	n/a	7,650,000	1,420,000
Well #5(165-00404)	8/21/1995	210	n/a	4	0-190	190-210	7,650,000	1,420,000
Well #6(165-00402)	n/a	60	n/a	n/a	n/a	n/a	7,650,000	1,420,000
Well #7(165-00403)	n/a	60	n/a	n/a	n/a	n/a	7,650,000	1,420,000
Cherrystone Family Camping Resort								
W1(165-00357)	2/10/1981	265	n/a	n/a	n/a	n/a	8,600,000	2,655,000
W10(165-00456)	n/a	n/a	n/a	n/a	n/a	n/a	11,100,000	3,310,000
W11(165-00457)	1/1/1985	n/a	n/a	n/a	n/a	n/a	11,100,000	3,310,000
W2(165-00356)	2/15/1988	266	123	n/a	n/a	n/a	8,600,000	2,655,000
W3(165-00082)	12/10/1974	260	30	n/a	n/a	n/a	8,600,000	2,655,000
W4(165-00027)	6/2/1970	260	n/a	n/a	n/a	n/a	8,600,000	2,655,000
W5(165-00453)	1/1/1974	n/a	n/a	n/a	n/a	n/a	11,100,000	3,310,000
W6(165-00454)	1/1/1980	n/a	n/a	n/a	n/a	n/a	11,100,000	3,310,000
W7(165-00097)	2/25/1974	n/a	11	n/a	n/a	n/a	11,100,000	3,310,000
W8(165-00096)	2/20/1970	268	27	n/a	n/a	n/a	11,100,000	3,310,000
YMCA Family Campground								
Well #1(165-00395)	9/18/1998	220	140	4	n/a	200-220	5,500,000	1,100,000
Well #2(165-00396)	7/7/1967	220	192	6	n/a	200-220	5,500,000	1,100,000

Source *: VDEQ Data (Well and System Info.xls) and paper copies of DEQ withdrawal permits*

Northampton County
Water Supply Plan

Appendix C

Northampton County Groundwater Withdrawal Permits and Demand Management Plans

MALCOLM PIRNIE

3100-001 / NEW

COMMUNITY WATER SUPPLY SYSTEMS

Virginia's Eastern Shore

MALCOLM PIRNIE

3100-001 / NEW

Bayview

3100-001 / NEW

'14
3
$42

Current Status Time Scheduled Report as of 8/15/2006 9:56:05 AM
Device: **3970** Model: **XR-50** Description: **Bayview Pump Station** Local Time: **10/26/2006 4:54:13 PM**

Address: Bayview Circle Cheriton, Va

Note: A Bold condition indicates the latest change. A Red condition indicates a status in the alarm state.
Click on Device Update button for the latest status.

3/
$42
'26
16

Digital Inputs

#	Description	Current Condition	# of State Changes	Last
1	Wet Well High Level	5.26.06 11:14 pm Normal	10	5/
2	Wet Well Low Level	1.5.06 10:10 am Normal	21	1.
3	Power Fail	6.22.06 3:01 pm **Normal**	28	6.
4	Battery Fail	7.31.03 11:10 am Normal	0	7/
5	Pump 1 Fail	9.29.04 3:55 pm Normal	6	9.
6	Pump 2 Fail	9.29.04 3:55 pm Normal	4	9.
7	Seal Fail Pump 1	1.30.05 1:24 pm Normal	0	1.
8	Seal Fail Pump 2	1.30.05 1:24 pm Normal	0	1.

Pump Runtimes

#	Description	Number Starts	Elapsed Runtime (Hrs:Min:Secs)	Pump GPM	Amount Total Total Gallons	Date Time am 9:5
9	Pump 1 Cycles	8987	545:40:00	120	3,928,800	8/15/06
10	Pump 2 Cycles	9036	612:60:00	120	4,413,600	8.15.06 9:56 am

General Alarms

Description	Status	Last State
Celluar Signal Strength	Acceptable	8/4/2004 1:00pm

Device Setup **Device Activity** **Runtime History**

Device Update | Reset Pump Runtime
Reset State Changes | Alarm Acknowledge

Device List ■ **Main Menu** ■ **Support** ■ **Help** ■ **Log-Off**

Send mail to webmaster@omni-site.net with questions or comments about this web site.

Last State Change

5.26.06 11:14PM
1/5/~~06~~05 10:10AM
6.22.06
7.31.03
9.29.04

8,000
12,348 = 99 birth.

Bayview

	Pump Station Cycles	Treatment Plant Cycles	Amt. Pumped	Amt. Disposed		
			#VALUE!	#VALUE!		
9/30/2005	18	4	10332	7040		
9/29/2005	16	6	9184	10560		
9/28/2005	16	5	9184	8800		
9/27/2005	17	6	9758	10560		
9/26/2005	20	6	11480	10560		
9/25/2005	19	6	10906	10560		
9/24/2005	17	6	9758	10560		
9/23/2005	15	4	8610	7040		
9/22/2005	20	8	11480	14080		
9/21/2005	16	4	9184	7040		
9/20/2005	16	6	9184	10560		
9/19/2005	18	6	10332	10560		
9/18/2005	17	4	9758	7040		
9/17/2005	17	6	9758	10560		
9/16/2005	16	6	9184	10560		
9/15/2005	16	4	9184	7040		
9/14/2005	17	6	9758	10560		
9/13/2005	18	6	10332	10560		
9/12/2005	18	6	10332	10560		
9/11/2005	17	4	9758	7040		
9/10/2005	16	6	9184	10560		
9/9/2005	16	6	9184	10560		
9/8/2005	17	4	9758	7040		
9/7/2005	18	6	10332	10560		
9/6/2005	19	6	10906	10560		
9/5/2005	19	6	10906	10560		
9/4/2005	18	6	10332	10560		
9/3/2005	17	4	9758	7040		
9/2/2005	16	6	9184	10560		
9/1/2005	16	4	9184	7040		
					9254.194	220.3379
	516	163	296184	286880	9254.194	220.3379
			296184	286880	9554.323	227.4839
				9254.193548	231.3548	

5.1.04.
9.~~29~~.04
30

	Pump Station Cycles	Treatment Plant Cycles	Amt. Pumped	Amt. Disposed	
9/30/2004	10	2	5780	3520	
9/29/2004	10	4	5780	7040	Alarm at Pump Station, long cycle on reactivation
9/28/2004	9	2	5202	3520	
9/27/2004	10	4	5780	7040	
9/26/2004	15	4	8670	7040	
9/25/2004	9	4	5202	7040	
9/24/2004	8	2	4624	3520	
9/23/2004	9	4	5202	7040	
9/22/2004	9	2	5202	3520	
9/21/2004	8	2	4592	3520	
9/20/2004	8	2	4592	3520	
9/19/2004	11	4	6314	7040	
9/18/2004	8	4	4592	7040	
9/17/2004	8	2	4592	3520	
9/16/2004	10	4	5740	7040	
9/15/2004	8	2	4592	3520	
9/14/2004	8	2	4592	3520	
9/13/2004	12	4	6888	7040	
9/12/2004	8	4	4592	7040	
9/11/2004	24	8	13776	14080	
9/10/2004	17	4	9758	7040	
9/9/2004	13	4	7462	7040	
9/8/2004	21	8	12054	14080	
9/7/2004	9	4	5166	7040	
9/6/2004	9	2	5166	3520	
9/5/2004	9	2	5166	3520	
9/4/2004	15	6	8610	10560	
9/3/2004	10	4	5740	7040	
9/2/2004	12	2	6888	3520	
9/1/2004	12	4	6888	7040	
8/31/2004	22	8	12628	14080	
8/30/2004	10	4	5740	7040	
8/29/2004	10	2	5740	3520	
8/28/2004	11	4	6314	7040	
8/27/2004	11	4	6314	7040	
8/26/2004	11	4	6314	7040	
8/25/2004	11	4	6314	7040	
8/24/2004	12	4	6888	7040	
8/23/2004	13	4	7462	7040	
8/22/2004	25	8	14350	14080	
8/21/2004	14	4	8036	7040	

8/20/2004	11	4	6314	7040		
8/19/2004	17	6	9758	10560		
8/18/2004	13	4	7462	7040		
8/17/2004	18	6	10332	10560		
8/16/2004	19	6	10906	10560		
8/15/2004	15	6	8610	10560		
8/14/2004	9	2	5166	3520		
8/13/2004	8	2	4592	3520		
8/12/2004	6	2	3444	3520		
8/11/2004	9	4	5166	7040		
8/10/2004	8	2	4592	3520		
8/9/2004	8	2	4592	3520		
8/8/2004	8	4	4592	7040		
8/7/2004	13	4	7462	7040		
8/6/2004	13	4	7462	7040		
8/5/2004	18	2	10332	3520		
8/4/2004	9	4	5166	7040		
8/3/2004	18	6	10332	10560		
8/2/2004	11	4	6314	7040		
8/1/2004	9	2	5166	3520		
7/31/2004	13	6	7462	10560	189420	186560
7/30/2004	26	8	14924	14080	6018 avg.	
7/29/2004	8	2	4592	3520	188/dwelling	
7/28/2004	8	2	4592	3520	per	
7/27/2004	10	4	5740	7040		
7/26/2004	7	2	4018	3520		
7/25/2004	8	4	4592	7040		
7/24/2004	10	2	5740	3520		
7/23/2004	8	2	4592	3520		
7/22/2004	6	2	3444	3520		
7/21/2004	10	4	5740	7040		
7/20/2004	12	4	6888	7040		
7/19/2004	11	2	6314	3520		
7/18/2004	7	2	4018	3520		rain
7/17/2004	7	2	4018	3520		rain
7/16/2004	15	6	8610	10560		
7/15/2004	15	6	8610	10560		
7/14/2004	11	2	6314	3520		rain event
7/13/2004	13	6	7462	10560		
7/12/2004	18	6	10332	10560		
7/11/2004	11	2	6314	3520		
7/10/2004	14	6	8036	10560		
7/9/2004	10	2	5740	3520		
7/8/2004	12	4	6888	7040		
7/7/2004	10	2	5740	3520		rain event
7/6/2004	9	4	5166	7040		
7/5/2004	8	2	4592	3520		
7/4/2004	9	2	5166	3520		rain event
7/3/2004	8	4	4592	7040		
7/2/2004	7	2	4018	3520		rain event
7/1/2004	9	2	5166	3520		
6/30/2004	8	4	4592	7040	140630	144320

6/29/2004	12	4	6888	7040	4811 avg.	
6/28/2004	6	2	3444	3520	150/dwe	
6/27/2004	13	4	7462	7040		
6/26/2004	10	2	5740	3520		
6/25/2004	6	2	3444	3520		rain event
6/24/2004	6	2	3444	3520		
6/23/2004	6	2	3444	3520		
6/22/2004	6	2	3444	3520		
6/21/2004	10	4	5740	7040		
6/20/2004	7	2	4018	3520		
6/19/2004	9	2	5166	3520		
6/18/2004	7	2	4018	3520		
6/17/2004	5	2	2870	3520		
6/16/2004	6	2	3444	3520		
6/15/2004	7	2	4018	3520		
6/14/2004	6	2	3444	3520		
6/13/2004	8	2	4592	3520		
6/12/2004	8	4	4592	7040		
6/11/2004	13	4	7462	7040		
6/10/2004	6	2	3444	3520		
6/9/2004	6	2	3444	3520		
6/8/2004	7	2	4018	3520		
6/7/2004	7	2	4018	3520		
6/6/2004	8	2	4592	3520		
6/5/2004	15	4	8610	7040		
6/4/2004	7	2	4018	3520		
6/3/2004	6	2	3444	3520		
6/2/2004	15	6	8610	10560		
6/1/2004	9	6	5166	10560		
5/31/2004	8	4	4592	7040		133760
5/30/2004	8	2	4592	3520	4315 avg.	
5/29/2004	6	2	3444	3520	135/dwelling	
5/28/2004	11	4	6314	7040		
5/27/2004	16	6	9184	10560		
5/26/2004	9	2	5166	3520		
5/25/2004	8	2	4592	3520		
5/24/2004	6	2	3444	3520		
5/23/2004	6	2	3444	3520		
5/22/2004	6	2	3444	3520		
5/21/2004	8	2	4592	3520		
5/20/2004	6	2	3444	3520		
5/19/2004	7	4	4018	7040		
5/18/2004	6	2	3444	3520		
5/17/2004	6	2	3444	3520		
5/16/2004	9	2	5166	3520		
5/15/2004	7	2	4018	3520		
5/14/2004	8	2	4592	3520		
5/13/2004	6	2	3444	3520		
5/12/2004	5	4	2870	7040		
5/11/2004	7	2	4018	3520		
5/10/2004	8	2	4592	3520		
5/9/2004	7	2	4018	3520		

5/8/2004	7	2	4018	3520
5/7/2004	7	2	4018	3520
5/6/2004	6	2	3444	3520
5/5/2004	6	2	3444	3520
5/4/2004	10	4	5740	7040
5/3/2004	6	2	3444	3520
5/2/2004	7	2	4018	3520
5/1/2004	6	2	3444	3520
	1523	496	874558	872960
			874202	872960

VIRGINIA DEPARTMENT OF HEALTH
ENGINEERING DESCRIPTION SHEET

DATE: September 7, 2005

WATERWORKS NAME:	Bayview	CERTIFIED CLASS: VI
COUNTY/CITY:	Northampton County	TYPE: Community
LOCATION:	This waterworks is located on off state route 684 (Bayview Road) approximately 0.5 miles south of intersection of state route 684 and state route 184 to Cheriton.	
OWNER:	Bayview Citizens for Social Justice 21186 North Bayside Road P.O. Box 527 Cheriton, Virginia 23316 C/O Ms. Alice Coles, President (757) 331-1840	
OPERATOR:	Bayview Citizens for Social Justice P.O. Box 527 Cheriton, Virginia 23316 C/O Ms. Alice Coles, President (757) 331-1840	
PERMIT NO.:	3131061	
DATE ISSUED:	September 7, 2005	
TYPE OF TREATMENT:	None	
SOURCE:	2 Wells	
DESIGN CAPACITY:	29,000 GPD	

DESCRIPTION OF PROPOSED PROJECT

The proposed waterworks project consists of two wells, a 15,000-gallon ground storage tank, a 5,000-gallon hydropneumatic tank, two transfer pumps, and the distribution system.

North Well: The drilling of this well started on December 5, 2000 and was completed on January 3, 2001, to a total depth of 260 feet. The drill hole size is 15 inches from 0 to 50 feet and 11-inches from 50 to 260 feet. The well is provided with a 12-inch diameter steel outer casing from 0 to 50 feet and the annular space around the outer casing is grouted with neat cement grout from 0 to 50 feet. The 6-inch diameter inner steel casing extends from +2 feet to 205 feet followed by 30 feet of 6-inch diameter stainless screen (mesh size .020) followed by 10 feet of 6-inch diameter steel casing. The inner casing is grouted from 0 to 174 feet with neat cement grout and from 174 to 184 feet with bentonite. The well is gravel packed from 205 feet to 237 feet with U.S. Silica No. 1 and 237 feet to 245 feet with U.S. Silica No. 2. During a 48-hour simultaneous yield and drawdown test of the North and South Well, the North Well yield was 39.6 gpm with water level falling from 24.8 feet (static) to 182.9 feet (dynamic). The well is equipped with a submersible pump rated at 30 gpm at 205 feet TDH and is powered by a 2 H.P. motor.

South Well: The drilling of this well started on December 5, 2000 and was completed on January 12, 2001, to a total depth of 260 feet. The drill hole size is 15 inches from 0 to 50 feet and 11-inches from 50 to 260 feet. The well is provided with a 12-inch diameter steel outer casing from 0 to 50 feet and the annular space around the outer casing is grouted with neat cement from 0 to 50 feet. The 6-inch diameter inner steel casing extends from +2 feet to -205 feet followed by 30 feet of 6-inch diameter stainless screen (mesh size .020) followed by another 10 feet of 6-inch diameter steel casing. The inner casing is grouted from 0 to 183 feet with neat cement grout and from 183 to 193 feet with bentonite. The well is gravel packed from 193 feet to 237 feet with U.S. Silica No. 1, and from 237 feet to 245 feet with U.S. Silica No. 2. During a 48-hour simultaneous yield and drawdown test of the North and South Well, the South Well yield was 35.3 gpm with water level falling from 24.5 feet (static) to 190.4 feet (dynamic). The well is equipped with a submersible pump rated at 28 gpm at 210 feet TDH and is powered by a 2 H.P. motor.

Storage is provided by a 15,000-gallon ground tank and a 5,000-gallon (effective capacity 1,667 gallons) hydropneumatic tank. Duplicate transfer pumps, each rated at 80 gpm at 140 feet and 225 gpm at 112 feet TDH, transfer water from the 15,000-gallon ground tank to the 5,000-gallon hydropneumatic tank.

EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent residential connections (ERCs). One ERC for will utilize 360 gallons per day. This system's capacity is evaluated as follows:

I. Source Capacity

A. Source Yield

1. Number of Sources

a. Required = 1 up to 49 ERCs, more than 1 for 50 or more ERCs
b. Provided = 2 wells

2. Yield:

Well Number	Well Yield (gpm)(over a 48 hour test)		Pump
North Well (No.1)	39.6		30
South Well (No.2)	35.3		28
Total =	75	Total =	58 gpm

B. Well yield: 75 gpm/(.5 gpm/ERC) = 150 ERCs
150 ERC * 360 gpd/ERC = 54,000 gpd

C. Well Pump Capacity: 58 gpm *1440 minutes/day = 83,520 gpd

II. Transfer Pump Capacity

A. Total Pumping Capacity = 80 + 80 = 160 gpm (assume worse case)

B. Capacity = $Q = 11.4\ N^{0.544}$
$160\text{ gpm} = 11.4\ N^{0.544}$
N= 128 ERC

C. Pumping Equivalent: 128 ERC * 360 gpd/ERC = 46,030 gpd

III. Storage Capacity

A. Total Storage = 15,000 gal. + 5,000 gal. = 20,000 gallons (effective storage = 12,800+1666)

B. Storage Capacity = $\frac{\text{14,466 gallons}}{\text{180 gal./ERC}}$ = 80.37 ERCs

C. Equivalent: 80.37 ERC * 360 gpd/ERC = 28,930

IV. Limiting Case

A. Storage Capacity = 80.37 ERCs

B. Capacity Equivalent = 80.37 ERCs x 360 gpd/ERC = 28, 933 gpd (say 29,000 gpd)

Therefore, based on the critical values discussed above, the proposed waterworks has a design capacity of 29,000 gpd or 80 ERC.

DWT/mw

Town of Cape Charles

3100-001 / NEW

COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

APPLICATION FOR A GROUND WATER WITHDRAWAL PERMIT
(FOR USE IN GROUND WATER MANAGEMENT AREAS)

PREAPPLICATION CONFERENCE DATE: February 7, 2008

RECEIVED – DEQ
SEP 13 2010
Tidewater Regional Office

1. APPLICANT INFORMATION: FIN/SSN: ____________

Applicant: Municipal Corporation of Cape Charles Phone: 757-331-3259

Applicant Address: 2 Plum Street, Cape Charles, VA 23310
(Street, City, State, Zip Code)

2. FACILITY INFORMATION:

Facility/System Name: Cape Charles Waterworks

Facility Address: 2140 Stone Road, Cape Charles, VA 23310
(If Applicable, Street, City, State, Zip Code)

Contact Name: Dave Fauber Title: Director, Public Works + Utilities Phone: 757-331-3259, X17

Fax: 757-331-4820

Location of Withdrawal Well or Well System: Northampton County (County/City)

3. TYPE OF APPLICATION:
This application is for:

- ☐ Existing withdrawal, not previously permitted
- ☐ New withdrawal
- ☐ Expand or enlarge existing permit No. ____________
- ☐ Modification of permit No. ____________
- ☒ Reapplication for existing permit No. 0041200 with modification
- ☐ Reissue existing permit No. ________ without modification

Existing withdrawal permit amount 252,200,000 gallons per Year (Day,Month,Year)

Date of expiration of existing Ground Water Withdrawal Permit November 30, 2008

Requested withdrawal amount 63,200,000 maximum gallons per year,
7,900,000 maximum gallons per month

4. TYPE OF USE: (Check all that apply)

USE	%USE		%USE
☑ Public Water Supply	75 %	☐ Aquaculture	
☐ Industrial		☐ Golf Course Irrigation	
☑ Commercial	11 %	☐ Landscape Irrigation	
☑ Fire Protection	< 1 %	☐ Nursery	
☐ Drought Relief		☐ Crop Irrigation	
☐ Livestock Watering		☑ Other Backwash	7 %
		Unaccounted	6 %

If type of use is public water supply;

Estimate the percentage of the withdrawal for human consumptive use 81 %;

Attach a complete copy of the Virginia Department of Health Water Works Operation Permit and Engineering Description Sheets or equivalent.

OFFICE USE ONLY

Application # GW0055400

Date Application Received 5/5/08 Date Fee Received 3/18/08 Amount $6,000

Notice Date ________ LGOF Date ____________ Returned ________ Date Complete ____________

As amended, September 10, 2010

SECTION 5
JUSTIFICATION OF AMOUNT OF WITHDRAWAL REQUESTED

INTRODUCTION

The Town of Cape Charles owns and operates a public water supply system that provides potable water to its residential and commercial customers within the municipal boundaries. The Town does not supply water to any customers outside these boundaries. Under the existing Ground Water Withdrawal Permit (GW0041200), Cape Charles is permitted to withdraw up to 252, 200,000 gallons per year. A review of the last two years of water withdrawals and recently updated demand projections for the next 10-year permit cycle indicate that this amount is in excess of that required to meet future water supply needs. Therefore, the Town is reapplying for a permit with modification to withdraw 63,200,000 gallons per year and a maximum of 7,900,000 gallons per month.

Water is supplied from two groundwater wells (Tower Well 1 and East Well 3). Four additional wells have been drilled: East Well 2, Tower Well 2, Keck Well 1 and Keck Well 2. There are no plans to use East Well 2 for groundwater withdrawal due to poor quality and low volume. The remaining three wells will be incorporated into the water supply system in the future. Water from the wells is conveyed to the Water Treatment Plant (WTP) located on State Route 184 adjacent to the 300,000 gallon elevated storage tank. Water treatment consists of oxidation and green sand filtration, ionic exchange softening (partial flow) to treat elevated iron and hardness, and disinfection. Backwash from the filters is discharged to the Town's Wastewater Treatment Plant (WWTP). The Town currently serves a population of about 1,500 full time and part time residents through approximately 1,150 residential and commercial service connections. This equates to about 1,245 Equivalent Residential Connections (ERCs).

EXISTING WATER USE

The following is a discussion of population trends, historic water demands and water conservation efforts to document that the amount of groundwater withdrawal requested is the smallest amount to support the proposed beneficial use and that the amount is representative of similar projected uses.

Population Trends

The 2007 Cape Charles Population Study (http://www.capecharles.org/pop.htm) was undertaken to better understand the Town's changing population characteristics and to help develop the Town's Comprehensive Plan. Each household within the Town was asked a series of questions to gather demographic, housing and economic data. The Town's population has changed dramatically in recent years.

As of the 2007 study, the Town's full time population was about 972. This is a decrease of about 14 percent since 2000. This decrease continues a trend which was also observed during the 1990s when the full time population decreased by 19 percent. As the full time population has decreased, part time residents have dramatically increased, continuing the trend of a steady increase in the part time population over the past several decades. As of the 2007 study, the part time population (seasonal and weekends) was about 602.

Of the full time population, Cape Charles has seen a major decrease of up to 30% among the young to middle age population. Many of the new full time residents are older retirees. The average full time household size has decreased to less than 2 persons as families have left the area. On the other hand, the part time population shows a concentration of middle-age adults and teenage children as well as older retirees. The average number of persons per part time household is slightly greater than 2.

As of the 2007 study, there were 984 housing units in the Town. Between 2000 and 2007, the number of housing units increased by one third. Most of the new units are located in the Bay Creek development and include both single-family homes and multiple family units such as condominiums and duplexes. Bay Creek features two signature golf courses and an up-scale marina. The number of units occupied on a full time basis decreased from 534 to 502 between 2000 and 2007. However, the number of units occupied on a part time basis increased from 82 to 239, and the number of vacant units increased from 122 to 243.

Full time occupancy is expected to increase somewhat in the future due to planned community enhancements, increased job opportunities, and increased baby boomer retirement. However, it is anticipated that Cape Charles will continue its evolution into primarily a resort and retirement community centered on abundant recreational opportunities. The percentage of part time occupancy will likely remain high. This, coupled with low water use by retirees, should continue the trend of low demand per ERC we have experienced in recent years.

Historic Water Use

An annual summary and statistical analysis of water withdrawal data and average annual water use per ERC between 1987 and 2007 is summarized in Table 5.1 and Figure 5.1. This data is from the Town's Water Supply Reports submitted to the Virginia Department of Health (VDH) and Quarterly Groundwater Withdrawal Reports submitted to the Virginia Department of Environmental Quality (DEQ).

As shown, groundwater withdrawal/water use was significantly higher between 1987 and 1994 ranging up to 67.3 million gallons per year (MGY) and averaging 55.9 MGY. From 1995 through 2007, annual water use ranged up to 58.8 MGY in 2006 and averaged 47.1 MGY. Since this analysis was completed, annual water use has further declined to just over 40 MGY for 2008 and 2009.

Between 1999 and 2006, water use increased from a daily average of 117,401 gpd in 1999 to 161,146 gpd in 2006, representing an average increase of 4.7 percent per year. The number of connections during that same period increased an average of 6.5 percent per year. The average daily usage rate per connection decreased slightly from 158 gpd in 1999 to 153 gpd in 2006. The declining water use rate is in part due to the changing nature of the Town's population discussed above. In 2007, water use declined significantly (17.7% below 2006) averaging 135,544 gpd, for a rate of approximately 118 gpd per connection. For 2008 and 2009, the average usage rate has further declined to approximately 88 gpd per ERC (40 MGY/365/1,245).

The continuing decline in water use reflects our continuing efforts to improve our water production and distribution system, promotion of water conservation, and the changing nature of the Town to primarily a resort and retirement community. The Town has implemented the following to curb water use:

- Water Treatment Plant improvements to reduce filter backwash water
- A stepped system of higher water rates to encourage conservation
- Identification and metering of previously un-metered users
- Repair of distribution system leaks
- Metering of construction site use.

The maximum monthly water use between 1999 and 2007 ranged from approximately 4.5 to 6.6 million gallons occurring primarily during summer months. This is typically 1.2 to 1.4 times the average monthly use due to a higher seasonal population driven by increased home and transient housing occupancy rates, as well as greater landscaping irrigation. The maximum monthly use in 2006 of 6.6 million gallons exceeded the threshold of 5.8 million gallons specified under Special Condition 2 of the GWWP requiring Tower Well 2 to be connected to the water system and groundwater withdrawn for beneficial use. However, the maximum monthly use declined to less than 5.4 million gallons in 2007, reflecting the increased efficiencies derived from the water loss reduction and conservation actions implemented in 2007. For 2008 and 2009, the maximum monthly use further declined to about 5 million gallons in July.

Disaggregated Water Use

Cape Charles provides metered public water service to approximately 1,100 connections for residential, industrial, commercial and municipal uses, equating to approximately 1,245 ERCs. Residential use represents the largest single use accounting for about 75% of total groundwater withdrawn in 2007. Residential use is broken down into single family homes (71.9%), condominiums (1.2%) and mixed use (1.9%). The mixed use category consists of properties having both residential and commercial uses supplied by one meter. The water use rate for the residential and mixed use properties ranged from 95 to115 gpd/ERC in 2007

Commercial and industrial use represented 10.5% of total withdrawals in 2007. There were approximately 86 commercial and industrial customers. Only 10 of these customers used more than 500 gpd on an annual average basis, and only two used more than 1,000 gpd. The restaurant at the Bay Creek Resort Marina has a seating capacity of 150 and averaged 1,188 gpd in 2007. The T&W Block ready-mix concrete and aggregate supplier averaged 1,036 gpd in 2007. T&W Block has since ceased operations. The Laundry Basket laundromat averaged 1,758 gpd; however, this business utilizes its own well for water supply and is metered for sewer use charges only. Municipal use includes water for public buildings such as the Municipal Building, the Town Harbor, and the water and wastewater treatment plants.

Backwash water is the water used to backwash the filters at the Water Treatment Plant. Unaccounted-for water is estimated by subtracting backwash and metered sales from the metered total withdrawals. Unaccounted-for water includes un-metered uses such as fire protection and fighting, distribution system flushing, storm-water system flushing and street cleaning by VDOT, as well as actual losses from leaky pipes, illegal hookups, and faulty or broken meters. Table 5.2 presents the water production and metered sales for 2007.

PROJECTED WATER DEMAND ESTIMATES

Since submission of our GWWP application in May 2008, we updated our growth projections in January 2010 to take into account the current economy and development plans. These projections are shown in Table 5.3. At that time, we projected 2,576 ERCs in 2018, an increase of 1,328 from our current baseline but 2,024 fewer than reflected in our May 2008 application. This reflects a more gradual build out of Bay Creek Resort and Club (an approved Planned Unit Development), as well as three planned mixed-use developments (Cape Harbor, South Port and Harbor Development Group). Conditional Use Permits have been approved for Cape Harbor and Harbor Development Group, for a total of 979 ERCs, about half of which were projected to be completed by 2018. South Port, a mixed-use yacht and marine industrial center, is still being planned by the developer and we have included a preliminary estimate in our projections. The Keck property has been recently rezoned to allow more dense multi-family home development.

The January 2010 growth projection was prepared under the assumption that the economy and real estate market would sufficiently recover during 2010 and 2011 to allow significant development and home building to occur in 2012. So far, economic conditions have not improved on the pace envisioned. We have therefore discounted the January 2010 projections for each demand center outlined below, based on its development status, to reflect the continued uncertainty of the pace of economic recovery.

As indicated above, our current water use rate is approximately 88 gpd/ERC. Future water use rates should not be markedly different since, based on the nature of approved future developments, the Town should continue to evolve into primarily a resort and retirement community. In addition to the stock of part time residences, Cape Charles has had 5 or 6 operational transient lodging businesses (bed and breakfasts and small hotels) over the past decade. The mixed-use developments currently approved will consist of a mixture of single family homes, condominiums, transient lodging, restaurants and other businesses. While we know the overall parameters of the uses approved under the Conditional Use Permits, we do not know what the exact mix of uses will be or how those uses will be built over time. That will be determined by the developers based on market demand. However, recent occupancy rates for both part time homes and transient lodgings should be applicable to future development.

We believe it is prudent to use 100 gpd/ERC for estimating future water demand instead of the 88 gpd/ERC recently experienced for the following reasons:

- The commercial component of the approved future developments may drive somewhat higher usage, particularly if restaurants and bars are built
- South Port is planned to be a year-round employment center which could result in more full time residents
- Our current conservation gains from stepped rates could erode as the economy improves.

A description of each demand center displayed on the growth projection follows:

Bay Creek South Tract

This is the golf course community portion of Bay Creek Resort and Club which is planned for about 90% of the 3,000 residential units in the approved Planned Unit Development. Most of these will be single family residences of various sizes that can only be determined as lots are sold and owners submit building plans. The growth projections of 1% to 2% per year during the permit period were obtained from the developer. Additional amenities (non-residential development) are planned for the South Tract. These include a Beach Club, Inn and Spa, Golf Club House, and some retail properties. Amenity projections were also obtained from the developer and are keyed to residential growth. The development is primarily a retirement and vacation community and that profile is likely to continue. Thus, the current occupancy trend reflecting part-time owner use and vacation rentals is expected to continue. In January 2010, we projected 781 ERCs (residential and amenities) in this demand center, for an increase of 523 ERCs. Due to the slow pace of economic recovery we are discounting the projected growth by 50%, for a total of 519 ERCs equating to 18.9 million gallons per year.

Historic District

This reflects in-fill development of currently vacant lots in the Historic District. The construction of 2 or 3 new residences per year is the Town staff's projection based on historical experience. Similar to the discussion above, the Historic District contains a high proportion of vacation residences. In January 2010, we projected 879 ERCs in this demand center, for an increase of 24 ERCs. Due to the slow pace of economic recovery we are discounting the projected growth by 50%, for a total of 867 ERCs equating to 31.6 million gallons per year.

Cape Harbor

This is a planned mixed-use development in the Harbor District for which the Town Council has approved a Conditional Use Permit. It is planned for a mix of 400 residential condominiums, commercial space, and a 120 room hotel. The developer is currently pursuing site planning and permitting activities. The projection of total ERCs was calculated by the developer based on the planned mix of uses. The phase in of ERCs was projected by the Town staff based on coordination with the developer. As above, the vast majority of the condominiums are expected to be part-time residences and vacation rentals. We therefore expect a water consumption profile very similar to what we currently experience. In January 2010, we projected 285 ERCs in this new demand center. Due to the slow pace of economic recovery we are discounting the projected growth by 75%, for a total of 71 ERCs equating to 2.6 million gallons per year.

South Port

This is a planned yacht center and marine industrial park in the Harbor District and former Sustainable Technologies Industrial Park. The developer has not yet completed land use and site planning. The Town staff has made an initial estimate of ERCs based on developer conceptual plans, which are primarily industrial/commercial with limited residential uses. In January 2010, we projected 80 ERCs in this new demand center. Due to the slow pace of economic recovery we are discounting the projected growth by 75%, for a total of 20 ERCs equating to 0.7 million gallons per year.

Harbor Development Group

This is a planned mixed-use development in the Harbor District for which the Town Council has approved a Conditional Use Permit. It is planned for a mix of 300 residential condominiums, commercial space, a boatel, and a marina. The developer is currently pursuing site planning and permitting activities. The projection of total ERCs was calculated by the developer based on the planned mix of uses. The phase in of ERCs was projected by the Town staff based on coordination with the developer. As above, the vast majority of the condominiums are expected to be part-time residences and vacation rentals. We therefore expect a water consumption profile very similar to what we currently experience. In January 2010, we projected 252 ERCs in this new demand center. Due to the slow pace of economic recovery we are discounting the projected growth by 75%, for a total of 63 ERCs equating to 2.3 million gallons per year.

Keck

This property was recently rezoned to allow a maximum of 100 residential units in a multi-family configuration, e.g. townhouses. It is difficult to predict the occupancy profile of this potential development, as the property owner plans to sell to another party rather than develop the property himself. It could wind up being mainly full-time residences supporting the yacht center and marine industrial park, part-time/vacation rentals, or a mix of both. In January 2010, we projected 48 ERCs in this new demand center. Due to the slow pace of economic recovery and the absence of current development plans we are discounting the projected growth by 100%.

Bay Creek Marina

This is the portion of Bay Creek Club and Resort that is centered around their marina on the north side of town, and is planned for about 10% of the 3,000 residential units in the approved Planned Unit Development. The primary development concept is similar to the South Tract – sell lots for owners to build on. The growth projections during the permit period were obtained from the developer. Two additional amenities are planned; Island Villas (a condo-hotel with 3 units now completed), and a small marina hotel. The phase in of these amenities was also obtained from the developer. As with the South Tract, we expect the part-time and vacation rental character to continue, as well as the associated water consumption rate. In January 2010, we projected 251 ERCs (residential and amenities) in this demand center, for an increase of 116 ERCs. Due to the slow pace of economic recovery we are discounting the projected growth by 50%, for a total of 193 ERCs equating to 7.0 million gallons per year.

REQUESTED WITHDRAWAL AMOUNT

Our request of 63.2 million gallons per year is based on 1,733 ERCs @ 100 GPD in 2018. The requested maximum monthly withdrawal of 7.9 million gallons reflects the same percentage as our current maximum monthly withdrawal.

APPORTIONMENT OF WITHDRAWAL

Well Construction Details

The Town operates two active wells referred to as Tower Well 1 (DEQ 165-387) and East Well 3 (DEQ 165-558).

Tower Well 1 was drilled in 1996 to replace the original West Well (DEQ 165-48) which has since been abandoned. It was drilled to a total depth of 210 feet and is constructed of 8-inch schedule 80 PVC casing and 20-slot PVC screens across the upper Yorktown Eastover (UYE) aquifer and middle Yorktown Eastover (MYE) aquifer. It was pump tested at 250 gpm with a static water level of 11.75 feet, a measured drawdown after 48 hours of 75.92 feet, and a calculated specific capacity of 3.29 gpm per foot of drawdown (gpm/ft).

East Well 3 was drilled in 2008 to replace East Well 1 (DEQ 165-123) which has since been abandoned. It was drilled to a total depth of 220 feet and is constructed of 8-inch and 6-inch schedule 80 PVC casing and 10-slot PVC screens across the UYE and MYE aquifer. It was pump tested at 245 gpm with a static water level of 12.5 feet, a measured drawdown after 48 hours of 76.4 feet, and a calculated specific capacity of 3.83 gpm/ft. Construction and performance of this well is similar to East Well 1.

Two additional wells were drilled in 2006 but have not been brought on line.

East Well 2 (DEQ 165-480) was drilled to a total depth of 225 feet and is constructed of 12-inch steel casing and 10-inch stainless steel screen across the MYE aquifer. It was pump tested at 70 gpm with a static water level of 12.76 feet, a measured drawdown after 24 hours of 75.3 feet, and a calculated specific capacity of 0.93 gpm/ft. There are no plans to bring this well on line, as poor water quality and volume were consistently encountered during recent bacteria testing.

Tower Well 2 (DEQ 165-479) was drilled to a total depth of 300 feet and is constructed of nominal 10-inch PVC (Certainteed Certa-Lok) casing and 8-inch, 0.020 slot stainless steel screen across the upper portion of the lower Yorktown Eastover (LYE) aquifer. It was pump tested at 59 gpm with a static water level of 12.43 feet, a measured drawdown after 24 hours of 167.7 feet, and a calculated specific capacity of 0.35 gpm/ft. This well will be brought on line when total withdrawals exceed 5.8 million gallons per month (GWWP Special Condition 2), probably in 2013 or 2014.

Two additional wells were drilled in 2010 and are planned to be brought on line in 2011.

Keck Well I (DEQ 165-608) was drilled to a total depth of 122 feet and is constructed of 8-inch schedule 40 PVC casing, and 6-inch PVC 0.010 mesh screen across the UYE aquifer. It has not yet been pump tested, but we anticipate a yield of 200 gpm.

Keck Well II (DEQ 165-609) was constructed identical to Keck Well I. It also has not yet been pump tested, but we anticipate a yield of 200 gpm.

Well completion reports and geophysical logs are provided in Section 8.

Apportionment of Withdrawal to Individual Wells

As indicated above, East Well 3 replaced East Well 1 in 2008 after discovery of a hole in the well casing. Up to that time daily withdrawals were made from East Well 1 and Tower Well 1 in almost equal proportion. That practice has continued since East Well 3 has come on line and will continue until the Keck Wells are connected to the system.

It is anticipated that Keck Well I and Keck Well II will have approximately the same performance capacity as East Well 3 and Tower Well 1. We plan to apportion daily withdrawals equally among the four production wells to balance water quality and improve water treatment efficiency (i.e. reduce filter backwash). The four wells will need to be pumped for about 4 hours per day to meet the estimated average daily demand of 173,300 gpd (1,733 ERCs x 100 gpd) at the end of the permit period in 2018.

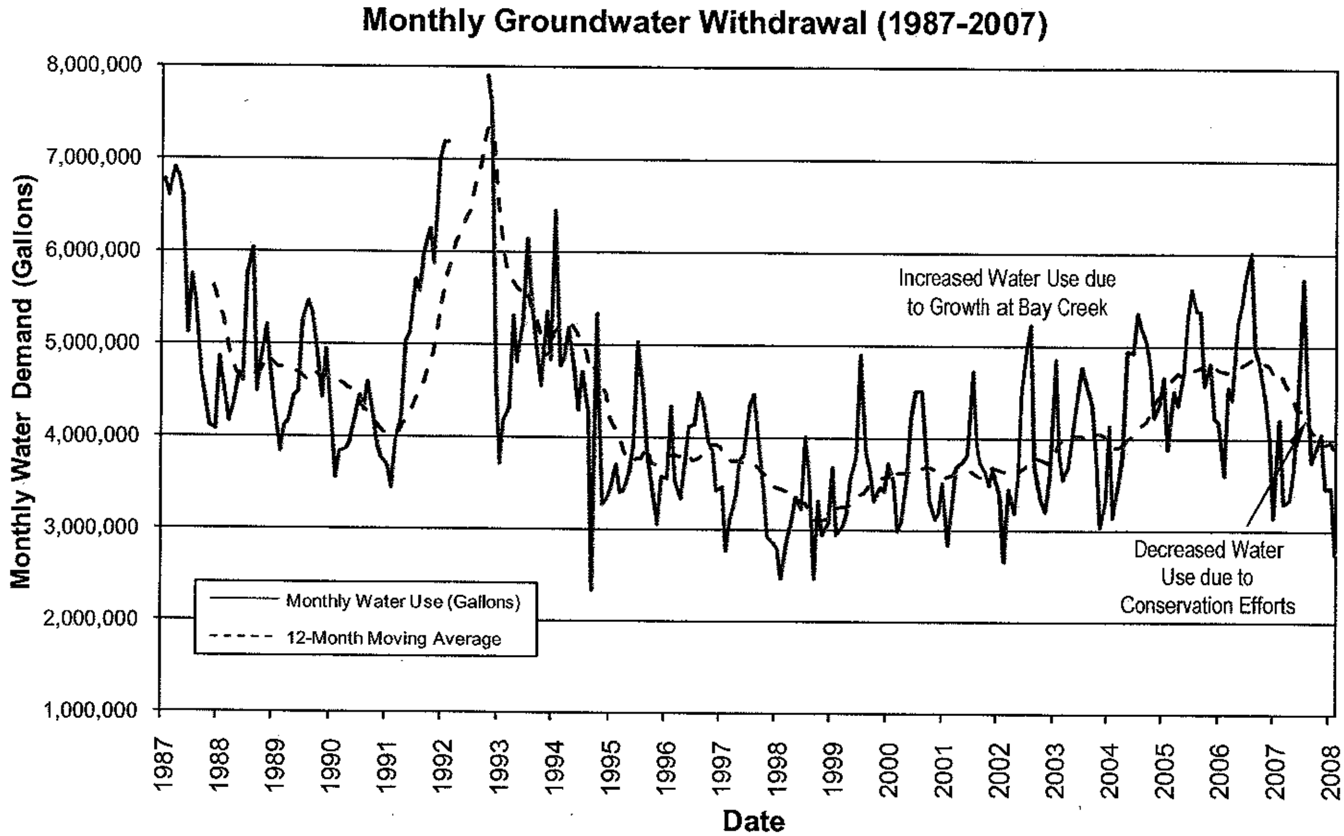
Withdrawal from the lower Yorktown Eastover aquifer is required when total withdrawals exceed 5.8 million gallons per month (GWWP Special Condition 2), and must constitute 10% of total monthly withdrawal when total withdrawal exceeds 10 million gallons per month (GWWP Special Condition 3). Based on current demand projections, we anticipate bringing Tower Well 2 on line around 2013/2014. Withdrawals from this well will be made during peak summer months and should constitute less than 10% of total withdrawals. GWWP Special Condition 3 will not be encountered during the permit period.

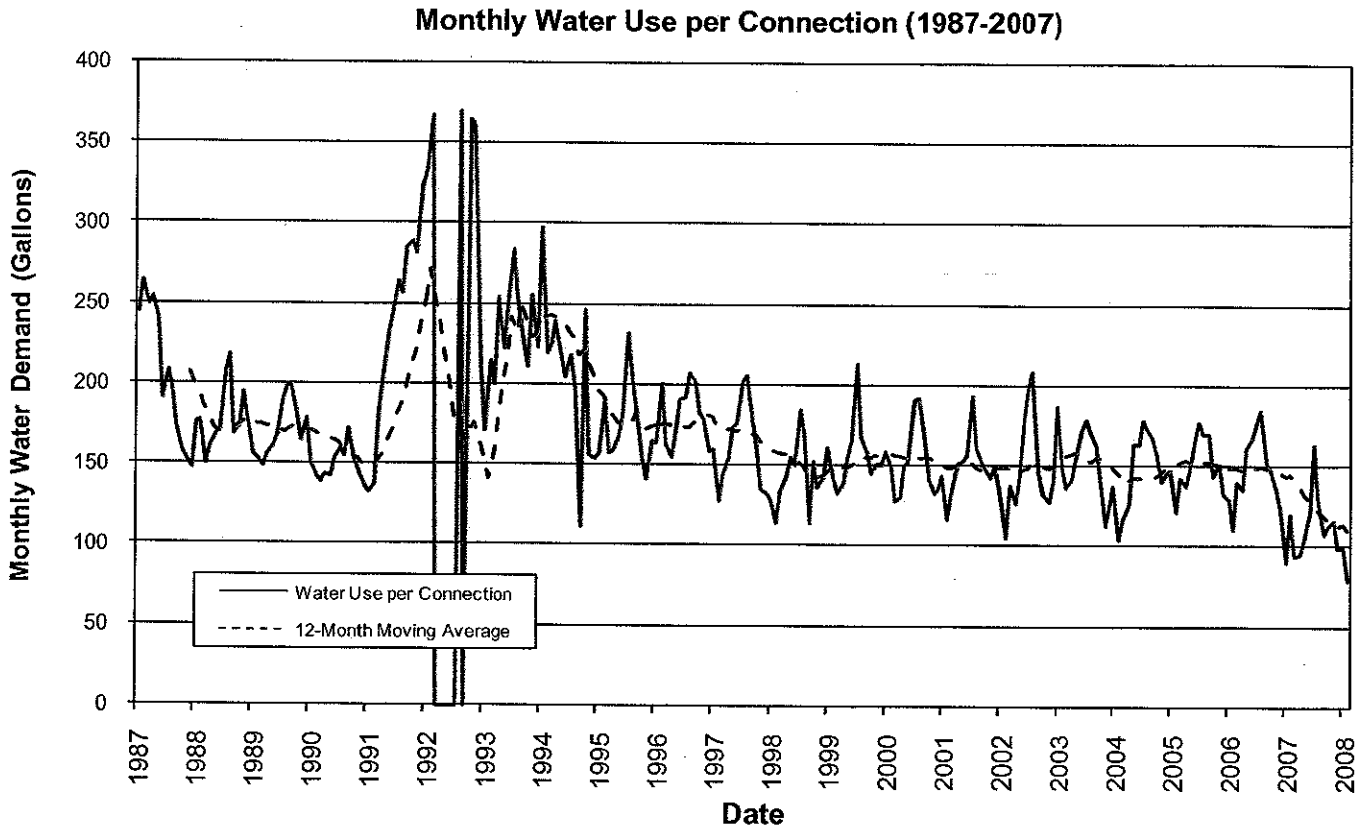
TABLE 5.1
HISTORICAL GROUNDWATER WITHDRAWALS
TOWN OF CAPE CHARLES, VIRGINIA

Date	Annual Total Water Withdrawal[1] (gpd)	Annual Average Daily Demand (gpd)	Estimated[2] Average No. of Connections	Annual Use per Connection (gpd/ERC)
1987	67,339,335	184,491	894	206
1988	58,129,228	159,258	894	178
1989	55,892,600	153,130	894	171
1990	48,750,300	133,562	894	149
1991	61,913,610	169,626	700	242
1992	42,477,500	116,377	700	166
1993	58,889,411	161,341	700	230
1994	53,581,200	146,798	700	210
1995	44,803,913	122,750	700	175
1996	46,926,504	128,566	700	184
1997	42,269,745	115,808	700	165
1998	37,369,542	102,382	700	146
1999	42,851,300	117,401	742	158
2000	43,199,900	118,356	762	155
2001	44,098,200	120,817	791	153
2002	44,807,300	122,760	813	151
2003	48,298,000	132,323	866	153
2004	53,524,759	146,643	973	151
2005	57,112,190	156,472	1,026	153
2006	58,818,170	161,146	1,053	153
2007	48,378,500	132,544	1,128	118
Statistical Summary of Water Use (1999-2007)				
Minimum	42,851,300	117,401	742	118
Maximum	58,818,170	161,146	1,128	158
Average	49,009,813	134,273	906	149
Median	48,298,000	132,323	866	153

(1) Total measured withdrawal from West Well (DEQ 165-48), Tower Well 1 (DEQ 165-387) and East Well 1 (DEQ 165-123) as reported on VDH Water Supply Reports (1987-1998) and DEQ Groundwater Withdrawal Monitoring Reports (1999-2007). 1992 data is partial.

(2) Estimated number of actual water connections (residual and commercial) billed in December of the given year. Prior to 1999, the number of connections is estimated and is derived from the VDH Water Supply Reports for Cape Charles





Golder Associates

DATE: 05/02/2008	Title: MONTHLY GROUNDWATER WITHDRAWAL (1987-2007) Town of Cape Charles, Virginia	Figure No. 5.1
Project #: 063-6568		
Prepared By: PWN		
Reviewed By: BBW		

TABLE 5.2

2007 PUBLIC WATER USE
TOWN OF CAPE CHARLES, VIRGINIA

Category	2007 Water Use (gallons)	Percentage	# of Connections	Avg. Use per Connection (gpd/ERC)
Well Production	**48,378,500**	**100.0%**		
Backwash[1]	**3,690,380**	**7.6%**		
Plant Production	**44,688,120**	**92.4%**		
Metered Sales[2]	**41,714,119**	**86.2%**		
Residential	*34,805,088*	*71.9%*	*967*	*99*
Condo	*586,600*	*1.2%*	*17*	*95*
Commercial	*5,102,752*	*10.5%*	*86*	*163*
Municipal	*298,360*	*0.6%*	*4*	*204*
Mixed Use	*921,319*	*1.9%*	*22*	*115*
Unaccounted For[3]	**2,974,001**	**6.1%**		
System Flushing	*450,000*	*0.9%*		
Fire Protection	*104,000*	*0.2%*		
VDOT	*235,900*	*0.5%*		
Leaks/Other	*2,184,101*	*4.5%*		

Source: Town of Cape Charles Condensed Meter Reading Report by Account ID for the period January through December 2007. Some discrepancies exist in the data. Notes:

1. Well production and backwash waste values are metered. Plant production is calculated by subtracting backwash waste from total well withdrawals.
2. Meter sales provided by the Town of Cape Charles by metered account type. Metered account type include residential (RES), condo (CND), commercial and industrial (COM), municipal (MUN), and mixed use (ZZZ).
3. Unaccounted water is the difference between total water produced from the treatment plant and the metered use. Unaccounted-for water included unmetered uses, such as fire fighting, flushing pipes, fire protection and VDOT uses which are estimated, illegal hookups or inaccurate meters; or actual physical losses from leaky pipes

TABLE 5.3

Cape Charles Growth Projection

	Bay Creek - South Tract					Historic District, Harbor District, Bay Creek Marina										
TIME PERIOD	% GROWTH	UNITS / YEAR	AMENITY / YEAR	TOTAL PER YEAR	CUMULATIVE ERC	HIST DIST	CAPE HARBOR	SOUTH PORT	HARBOR DEV GRP	KECK	Marina Residential	Marina Amenity	TOTAL PER YEAR	CUMULATIVE ERC	CUM TOTAL	100gpd / ERC
12/31/2009		250	8	258	258	855	0	0	0	0	68	67	990	990	1,248	124,800
2010	1.0%	24	0	24	282	2	0	10	0	0	6	3	21	1,011	1,293	129,332
2011	1.5%	36	0	36	319	2	0	10	0	0	4	3	19	1,030	1,348	134,840
2012	1.8%	43	20	63	381	2	0	0	0	0	4	3	9	1,039	1,420	142,016
2013	1.8%	43	20	63	444	3	55	20	100	12	4	3	197	1,236	1,680	167,992
2014	1.8%	43	20	63	506	3	0	0	0	0	4	6	13	1,249	1,756	175,568
2015	2.0%	49	20	69	575	3	55	20	50	12	4	4	148	1,397	1,972	197,232
2016	2.0%	49	20	69	644	3	0	0	0	0	4	50	57	1,454	2,098	209,796
2017	2.0%	49	20	69	712	3	175	20	102	12	4	3	319	1,773	2,486	248,560
2018	2.0%	49	20	69	781	3	0	0	0	12	4	3	22	1,795	2,576	257,624
	15.8%	633	148	781		879	285	80	252	48	106	145	1795			

NOTES / ASSUMPTIONS:

1. Up to 3,000 residential units allowed for Bay Creek.
2. 318 residential units costructed as of 12-31-09, 250 south & 68 marina.
3. Additional build out period assumed to be 30 years starting in 2009
4. Percent growth is the percent of total units to be built in a specific year
5. 38 Island Villas included in Marina Amenities. Marina hotel is 46 ERC in 2016.
6. Water use for future south side amenities is projected to be equivalent to 460 ERC. This figure excludes pools, fountains, outdoor showers, HVAC, etc for the Beach Club and the Inn & Spa.
7. Future amenities assumed to be built in 16 years, starting 2012 roughly keyed to residential growth.
8. Lot sell out assumed to occur 4 to 5 years prior to build out

Cape Harbor reflects the approved conditional use permit.
South Port reflects a "best guess" in absence of a development plan.
Harbor Development Group reflects the approved conditional use permit.
Keck assumes vitually all of the request under the approved rezoning.

SECTION 13

WATER CONSERVATION & MANAGEMENT PLAN

APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT

GROUNDWATER WITHDRAWAL PERMIT NO. GW0041200

Municipal Corporation of Cape Charles
2 Plum Street
Cape Charles, VA 23310

May 2008

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TOWN OF CAPE CHARLES
WATER CONSERVATION & MANAGEMENT PLAN

1.0 INTRODUCTION

The Town of Cape Charles is aware of the need to conserve and manage effectively its valuable water resources. Without an effective and comprehensive plan aimed at reducing water loss and utilizing water use efficiency, the Town cannot hope to satisfy its much needed water demands into the next decade. The effects of an inadequate water supply are such that the entire Town would experience reduced economic development opportunities and the resulting reduction in needed revenues for Cape Charles to prosper beyond the year 2010. Every effort must be made to efficiently maximize currently available supplies thus reducing the need for additional sources.

The following constitutes the Town of Cape Charles's Water Conservation and Management Plan, which is designed to optimize water resources and to help reduce its need for future water demands. The Town of Cape Charles first developed a Water Conservation and Management Plan in 1998 to address the conservation needs, and continues to refine and develop the Plan as needed.

1.1 REGULATORY REQUIREMENTS

In 1992, Virginia adopted the Groundwater Management Act (Title 62.1, Chapter 25, code of Virginia, 1950, as amended) regulating groundwater withdrawals in critical aquifer use areas. The Eastern Virginia and the Eastern Shore Groundwater Management Areas were established at that time due to a decline in groundwater levels of up to 200 feet in some places due to excessive groundwater use. In these management areas, a groundwater withdrawal permit is required for any application to initiate a new withdrawal or expand an existing withdrawal in the groundwater management area. As part of the Ground Water Withdrawal Permit (GWWP) application, a Water Conservation and Management Plan (WCMP) must be submitted with the GWWP application and becomes an enforceable part of the GWWP permit. In accordance with 9VAC25-610-100, a WCMP must include at a minimum the following items.

- The use of water saving plumbing and processes including, where appropriate, the use of water saving fixtures in new and renovated plumbing as provided in the Uniform Statewide Building Code;

- A water loss reduction program;
- A water use education program;
- An evaluation of potential water reuse options; and
- Requirements for mandatory water use restrictions during water shortage emergencies declared by the local governing body.

1.2 THE NEED FOR WATER CONSERVATION

The Town of Cape Charles is situated on Virginia's Eastern Shore, a peninsula that is surrounded by saltwater on three sides. Groundwater represents the primary source of freshwater in the region and is derived from and limited by the amount of recharge the aquifers receive from precipitation. The fresh groundwater occurs as a shallow lens, approximately 250 feet thick in the Cape Charles area that floats on underlying brackish and saline groundwater. A delicate balance exists between the fresh groundwater lens beneath the peninsula and the surrounding saltwater. Over-pumping can cause intrusion of saltwater from lateral migration of the freshwater-saltwater boundary or upconing of saltwater from underlying brackish aquifers. Intrusion of saltwater can degrade groundwater quality to the point that groundwater can no longer be used as a direct, untreated source of fresh water for public consumption, commercial and agricultural uses. For this reason, the Town will have to carefully manage its future water supply needs to ensure a sustainable source of water can be developed without detrimental impact to the freshwater resources and those who depend on them.

Water conservation is a focused effort by a water user to reduce the use of water. This effort can minimize development of new resources and reduce the cost of future water service. Each gallon of water that is not used through conservation is one less that needs to be stored, treated, pumped and distributed. The reduction in the use of water may also result in energy savings if the water needs to be heated for washing or bathing or pass through a wastewater treatment system before it is returned to the environment.

Water conservation has reached a new level of awareness. Conservation may represent a practical alternative to developing and increasing the water supply or at least complement new water supply development projects until technologies evolve to meet the needs of an ever growing population. Clean water supplies, like other natural resources, are a limited resource, which must be managed carefully so that they are preserved for future generations. Efforts to conserve existing supplies and the efficient allocation of water resources need to be made at each stage of the water supply planning process.

1.3 OBJECTIVES

The objective of the Water Conservation and Management Plan is to develop a documented, effective conservation and management strategy that is designed to minimize the demand for groundwater and comply with 9VAC25-610. The plan consists of operational programs and strategies that will be used every day in the management and maintenance of the water and wastewater utility. The specific conservation and management strategies are presented in the following sections and are briefly summarized in the conclusion.

2.0 WATER CONSERVATION DURING NORMAL CONDITIONS

This section of the Water Conservation and Management Plan addresses low flow devices and fixtures that are required by the Virginia Uniform Statewide Building Code:

2.1 Flow Rates for Plumbing Fixtures

The Town Manager will continue to work very closely with the Town's inspectors to ensure that low flow devices and fixtures are utilized in new construction and renovations in existing structures. In addition, the Town Manager will promote incentive programs to encourage existing households to retrofit with low flow devices.

The Town's inspectors will continue to implement the Comprehensive Water Conservation Program, first developed in 1998 as promulgated by the Commonwealth of Virginia via the Virginia Uniform Statewide Building Code. As listed below, these requirements are consistent with the Federal Energy Policy Act of 1992. In all new construction and in all remodeling and/or replacement of plumbing fixtures, only fixtures not exceeding the following flow rates and/or water consumption shall be permitted:

Lavatory nonpublic	2.2 gallon per minute at 60 psi
Lavatory public	0.5 gallon per minute at 80 psi
Lavatory public metering self-closing	0.25 gallon per metering cycle
Shower Head	2.5 gallon per minute at 80 psi
Sink faucet	2.2 gallon per minute at 60 psi
Urinal	1.0 gallon per flushing cycle
Water Closet	1.6 gallon per flushing cycle

Replacing older showerheads with low-flow fixtures, installing faucet aerators in older baths and kitchens, and water saving flappers in older toilet tanks can reduce household water use by approximately 10 to 15 percent.

2.1.1 Public Lavatories

Lavatories in a public facility restroom shall be equipped with standard valve or spring self-closing faucets having outlet devices that limit the flow rate to a maximum of 0.5 gallons per minute or self-closing metering valves which limit flow of 0.25 gallons per cycle.

2.1.2 Car Washes

No commercial car washing facilities are located within the service area. All new car wash installations shall be equipped with an approved water recycling system.

2.1.3 Continuous Flow Equipment

All new construction, all repair or replacement of continuous flow devices, any other water connector device or appliance requiring a continuous flow of five (5) gallons per minute or more shall be equipped with a recycling system or as approved by the Town Manager.

2.1.4 Leak Repairs

The owner of any residual dwelling, commercial, or industrial facility who is found to be an excessive user of water due to leakage from water lines or plumbing fixtures on the premises, and who fails to repair and stop such leakage during a reasonable period of time after notice by the Town Manager, shall be subject to the penalties for noncompliance.

The Town's employees shall observe customers piping which exists in and adjacent to the Public Works and Utility's facilities during meter reading for leaks on the customers plumbing. Employees shall make note of any leaks observed and report the leaks to the Utility. The Utility shall notify the customer in timely manner that a leak has been observed on their plumbing. The Utility will also notify a customer in a timely manner if abnormally high usage is indicated on the account which could indicate a possible leak.

2.1.5 Water Reuse Evaluation

For all new commercial or industrial construction, an evaluation by the owner for potential water reuse options will be studied and the results are to be submitted to the

Town Manager at the time construction plans are submitted for approval. In all instances where it is determined by the Town Manager to be feasible, such modifications will be incorporated into the design prior to approval by the Town.

As part of the new wastewater treatment expansion, the Town of Cape Charles will evaluate the reuse of high quality treated wastewater. The wastewater generated may be used for irrigation purposes, commercial reuse, or other uses allowed by the DEQ.

2.1.6 Waste of Water (General)

No person shall permit water to run from any hydrant, meter, valve, or fixture without proper care to prevent waste. All such use must be metered or an estimated use reported to the utilities clerk. Prior notification is required except for emergencies.

2.1.7 Penalties for Noncompliance

This section outlines the Town of Cape Charles specific penalties for noncompliance with the above listed provisions. The following penalties are addressed:

A. Any person who shall violate any provision of this plan, or any of the conservation regulations promulgated by the Town Manager or his or her designee pursuant thereto, shall, upon conviction thereof, in addition to additional charges and/or other actions set forth herein, be fined not more than two hundred fifty dollars ($250.00). Each act, or each day's continuation of a violation shall be considered a separate offense.

B. In addition to the foregoing, the Town Manager or his or her designee may suspend water service to any person violating the provisions of this plan or the regulations promulgated hereunder. If water service is terminated, the person shall pay a reconnection fee or fifty dollars ($50.00) plus all outstanding fines and fees before service will be restored.

3.0 WATER CONSERVATION DURING EMERGENCY CONDITIONS

3.1 Purpose

The following section outlines the Town of Cape Charles specific water conservation requirements during emergency supply conditions. During emergency conditions the protection of the health, safety and welfare of the residents of the Town of Cape Charles may require that certain uses of water, nonessential to public health, safety and welfare, be reduced, restricted or curtailed; and as the shortage of potable water may become increasingly more critical, conservation measures to further reduce consumption or curtail essential water use may be required.

During periods of water shortage emergencies, declared by the local governing body, DEQ Director, or the Town of Cape Charles, customers will be notified that there is a water shortage emergency and that water use reductions or restrictions are mandatory. The Town of Cape Charles will be responsible for enforcing penalties, such as imposing fines to customers using water for restricted purposes during water shortage emergencies. Requirements for mandatory use reductions during local or regional water shortage emergencies typically involve local ordinances, which detail restrictions and penalties that may be applied during a declared water shortage emergency, described below.

In the event a water shortage and an emergency is declared by the local governing body or the director of DEQ, all water usage shall be ceased except for sanitary and human consumptive uses.

3.2 Procedures

1. The Town Council or the Director of the Commonwealth of Virginia Department of Environmental Quality finds that when there exists an immediate potential for a shortage of potable water in the Town of Cape Charles's water system that increasingly more restrictive conservation measures may be required to prevent a water shortage.
2. The Town Manager or his or her designee is hereby directed to implement conservation measures at such times by ordering the restricted use or absolute curtailment of the use of water for certain non-essential purposes for the duration of the water shortage in the manner hereinafter set out. In exercising his discretionary authority and making the determinations set forth herein, the Town Manager or his or her designee shall give due consideration to water storage, system purification and pumping capacity, daily water consumption data, fire service requirements, pipeline conditions including stoppages and leaks, estimates of minimum essential supplies to preserve public health and safety, and any other pertinent data.
3. The provisions of this plan or regulations promulgated hereunder by the Town Manager or his or her designee which are hereby authorized shall not apply to any governmental activity, institution facility, commercial business or industry which

shall be declared by the Town Manager, upon a proper showing, to be necessary for the public health,- safety and welfare, or the imposition of the provisions of this plan are reasonably determined to place a severe economic hardship on the establishment or cause a substantial loss of employment.

4. Upon Determination by the Town Manager of the existence of the following conditions, the Town Manager shall take the following actions:

    a. <u>Condition 1: Voluntary Use Restrictions (Drought Watch).</u> When moderate but limited supplies of water are available, the Town Manager shall, through appropriate means, call upon the general public to employ prudent restraint in water usage, and to conserve water voluntarily by whatever means available.

    b. <u>Condition 2: Mandatory Use Restrictions (Drought Warning)</u> When very limited supplies of water are available, the Town Manager shall order curtailment of less essential usage of water, including, but not limited to, one or more of the following:

        1) The watering of shrubbery, trees, lawns, grass, plants or any other vegetation, except indoor plantings, greenhouse or nursery stocks and except watering by commercial nurseries of freshly planted plants and once a week for five (5) weeks following planting.

        2) The washing of automobiles, trucks, trailers, boats, airplanes, or any other type of mobile equipment, with the exception of facilities operating with a water recycling system approved by the Town Manager; provided, however, that any facility operating with a water recycling system shall permanently display in public view a notice stating that such recycling system is in operation. In lieu of the provisions hereof, the Town Manager may curtail the hours of operation of commercial enterprises offering such services.

        3) The washing of streets, driveways, parking lots, service station aprons, office buildings, exteriors of homes or apartments, or other outdoor surfaces.

        4) The operation of any ornamental fountain or other structure requiring a similar use of water.

        5) The filling of swimming and/or wading pools, or the refilling of swimming and/or wading pools which were drained after the effective date of the Town Manager's order except for commercial use.

6) The use of water from hydrants for any purpose other than fire suppression or other public emergency or scheduled flushing if deemed necessary to maintain water quality in the distribution system.

c. Condition 3: Water Rationing (Drought Emergency). When critically limited supplies of water are available, the Town Manager shall institute mandatory reductions to each customer as follows:

1) Industrial, institutional, commercial, governmental, and all other non-residential customers shall be allotted a percentage reduction based on their average monthly billings over the preceding six-month period.

2) Individual residential customers shall be limited to a specific volume or percentage reduction based on the same procedure noted above.

3) If allotted monthly usage is exceeded, the customer shall be charged ten dollars ($10.00) for every seven hundred and fifty (750) gallons of water consumed above the allotted volume. Where prior consumption data is not available, the Town Manager or his or her designee shall estimate allocations based on the best available data.

d. Condition 4: When only limited supplies of water are available, the Town Manager or his or her designee shall restrict the use of water to purposes that are absolutely essential to life, health and safety.

3.3 Written Report Required

When it is determined that Conditions 2, 3, and 4 are in existence, a written report will be prepared with supporting documentation. Each report shall be promptly filed with the Town Clerk who shall make the report available for public inspection. The Town Manager shall forthwith transmit a copy of said report to the Town Council.

3.4 Penalties for Noncompliance

1. Any person who shall violate any provision of this plan, or any of the conservation regulations promulgated by the Town Manager pursuant thereto, shall, upon conviction thereof, in addition to additional charges and/or other actions set forth herein, be fined not more than two hundred fifty dollars ($250.00). Each act or each day's continuation of a violation shall be considered a separate offense.

2. In addition to the foregoing, the Town Manager may suspend water service to any person violating the provisions of this plan or the regulations promulgated hereunder. If such water service is terminated, then the person shall pay a reconnection fee of

fifty dollars ($50.00) plus all outstanding fines and fees before service will be restored.

3.5 Notice of Temporary or Final Ceasing of Emergency

The Town Manager shall notify the Town Council when the resource shortage is over and the emergency situation no longer exists. Information regarding the temporary or final ceasing of emergency conditions will be made available to the public via posting notices in public buildings and utilizing other public information strategies.

4.0 WATER REUSE

The Water Reuse and Reclamation Regulations (9 VAC 25-740) promote the reclamation and reuse of wastewater that are protective of state waters and public health as an alternative to directly discharging pollutants into state waters. The Chesapeake Bay Watershed Nutrient Credit Exchange Program also identifies the reuse and reclamation of wastewater as a means of reducing the Nitrogen and Phosphorus waste loads to the Chesapeake Bay.

Existing industrial water demands utilize a potable water source in their production needs. Future alternatives will be provided to possibly eliminate this dependency on potable water and allow for the conversion to a non-potable process water. The development of the Sustainable Technologies Industrial Park in the Town of Cape Charles is being promoted to demonstrate the potential of energy-efficient, water-conserving and nonpolluting industries. Proposed industrial water demands will promote the use of non-potable process water, reclaimed wastewater. These applications will dictate the advanced treatment and reuse of wastewater plant effluent as a way of reducing the demand of potable water sources.

This section discusses the opportunity for reducing potable water demands in the Town of Cape Charles by developing non-potable reuse and reclaimed wastewater supplies.

4.1 Construction Reuse Markets

Non-potable water used for soil compaction, dust control and other construction purposes is a potential reuse option. Where workers or the public have access or exposure, it is not considered necessary for people to avoid contact. This usage would have to be approved by the DEQ and state and local Health departments. Truck drivers would need instructions as to specific hauling requirements and the potential hazards involved with non-potable water. The following additional criteria would require adoption:

1. Tanker trucks and other equipment which contain non-potable water would have to be clearly identified with warning signs.
2. Tanker trucks used for non-potable water would have to be thoroughly cleaned of contaminants prior to use.
3. Use of non-potable water could not create any odor or other nuisance.
4. Ponding or runoff of non-potable water should not occur.
5. Non-potable water should be applied so as to minimize public or employee contact with the water.
6. Non-potable water must not be introduced into any part of a domestic water system.
7. After project is complete, tanker trucks should be cleaned and disinfected.
8. Tanker trucks used to transport non-potable water shall not be used to carry domestic water.

4.2 Irrigation Reuse Markets

Bay Creek is developing the residential and recreational area south of Cape Charles, including two golf courses. The Bay Creek management has been open to the option of using the wastewater as a supplement for irrigation and augmenting storage in surface water features, provided no reclaimed water signage is required. The Town of Cape Charles will evaluate the potential uses of reclaimed water for Bay Creek that will comply with reuse regulations and Bay Creek's management requests.

4.3 Industrial Reuse Markets

At the present time, there is only one large user of industrial process water in the Cape Charles area that could likely utilize treated effluent. Bayshore Concrete is located less than 1 mile from the Town's Wastewater Treatment Plant and uses up to 60,000 gpd for process water in the manufacturing of concrete structures, cooling, and dust control. Process water is currently supplied from individual water supply wells owned and permitted by Bayshore Concrete. Much of this process water could likely be supplied from wastewater and the drinking water at the facility could be supplied from the Town's public water system. Because Bayshore Concrete's wells are close to the Chesapeake Bay, reducing or eliminating the pumping from these wells will reduce the potential of saltwater intrusion and water quality degradation, which could eventually impact the Town's wells.

The availability of treated effluent water supplies could be desireable in attracting other industries into the area without placing demands on the potable water supply. Cape Charles staff will continue to incorporate this option within its economic development program. The viability of the industrial reuse market is a function of many factors, including:

- Location of non-potable source
- Specific water quality requirements of the industry
- Degree of treatment required for the reclaimed water
- Cost of reclaimed water and availability of alternative supplies

5.0 PUBLIC EDUCATION PROGRAM

A key factor in reducing water use by the general public is the development of a comprehensive education program. It is extremely important to educate water consumers on the various aspects of the water industry and information on how drinking water is produced and why we need to conserve. The goal of the water use education program will be to make the customer understand their water sources, the costs of supplying the water to the customer, the problems associated with supplying water, and how changes in consumer behavior can lower the cost of supplying water and result in a lower water bill for the customer. By understanding the environment that water suppliers are faced with on a daily basis, the public will have a better appreciation of water and the need to become directly involved in conservation programs. To achieve this goal, the Town of Cape Charles has selected the following items for the establishment of a comprehensive public education program:

A. Bill Inserts - On an annual basis, inserts will be added to the outgoing water bills or the consumer confidence reports. These inserts will include water conservation techniques and leak detection strategies. This method can be useful in showing the consumer how water conservation is a winning deal for both the water customer and the Town. Consumers benefit by having lower water bills and the Town benefits by the preservation of its water resources.

B. Brochures - During public events, water conservation brochures and pamphlets will be available for public distribution. These same items will be available on a continuous basis at the Town Hall.

C. Video Tapes - A variety of water conservation video tapes will be available from the Town Hall to be checked out by the public free of charge. These tapes can be used for classroom instruction in schools of for other types of public meetings. These tapes will cover such subjects as water conservation, general lawn care, and efficient watering devices.

D. Water Conservation Hot Line - A telephone number will be made available for residents to have their water conservation questions answered by a knowledgeable Town employee. In addition, requests for information on various water conservation topics will be coordinated through this function.

E. News Releases - Greater emphasis will be placed on keeping the public informed through news releases by the print media, radio, and the Cape Charles website (www.capecharles.org). This method of public education will not be used only during emergencies, but on a regular basis to keep the public informed on water related issues.

These programs will be targeted to representative age groups and will be given by Town staff and/or guest speakers. Information and assistance will be available to teachers who wish to develop their own water awareness program.

6.0 WATER USE REDUCTION PROGRAM

6.1 Water Loss Audit

The Town is actively upgrading the water system to provide 100% metering of all connections. The metering program will provide the Town with the tools to accurately assess water loss and audit water uses. The water distribution will be evaluated for leaks using the comparison of system water meters and the pump house master meter; thus, an unaccounted for water analysis will show any major leaks or discrepancies. For the purposes of this plan, the unaccounted for water analysis will occur annually at a minimum to establish the system base line for error within metering equipment. In addition, potential discrepancies between the amount of water produced and the amount sold to customers will be reviewed on a monthly to bimonthly basis once the majority of homes are metered. The current billing system will be modified and upgraded to assist in analyzing water usage and detecting possible leaks. Utility operators will also be able to detect leaks on the basis of daily and weekly review of water use data including well pump operational logs and wellhead meter readings which can detect possible leaks by a general comparison to typical seasonal water use. More frequent reviews may be possible as new technologies are implemented within the meter reading systems.

The audit will also identify sources of water demand on the system that would normally escape detection through normal metering devices, in particular municipal uses. Examples of this type of demand are:

- Water for Fire Fighting
- Water Main Flushing
- Water Meter Errors
- Water Main Breaks
- Water Leak Detection
- Water Tank Drainage and Leaks
- Water Treatment Backwashing

Water for Fire Fighting: All hydrant use will be recorded at the water plant and reported to the utilities clerk either within 24 hours. The Town of Cape Charles Volunteer Fire Department will report water use (i.e. fire fighting, hydrant flushing, etc.) to the utilities clerk within 24 hours of said usage. Prior notice of water usage in excess of 1,000 gallons is required to be given the utilities clerk, except in emergency situations.

Water Main Flushing: All main flushing performed by the Utilities Department (i.e. water quality improvement, construction, etc.) will require the submittal of an estimate of water consumption.

Water Meter Errors: The Town of Cape Charles is currently installing and replacing meters as needed. Meter errors are evaluated based on historical use and unanticipated changes in water use rates, and visual inspections during meter reading. There are presently approximately 1160 meters in the Town. The town has recently purchased meter-testing equipment to check suspect meters for accuracy

Water Main Breaks: All main breaks will require the reporting of the estimated volume of water loss by the Utility Department.

Water Leak Detection: The Utilities Department will develop an ongoing leak detection program in conjunction with the water system metering upgrades. Water loss estimates will be quantified and water leaks may be estimated based on the ongoing water loss audits. The Town will purchase leak detection equipment in 2008 to facilitate the program.

If a leak in the system occurs, it will be fixed within 24 hours. If the usage data or unaccounted for water analysis indicates a water leak which cannot be visually located, the system will be searched for leaks. Additionally, exceptionally high usage at customer's meters must be also be reviewed from billing department data. The location of leaks in the distribution system and the success of a repair program depend on the following factors:

- Pipe age and material;
- System operating pressures;
- Soil Type;
- Soil pH; and
- Pipeline depth

Generally, the initial searches for leaks include walking the system lines and looking for puddles or wet areas that could hint of a leak. For subsurface leaks in well-drained soils, electronic leach detection equipment will be employed.

Employees shall inspect all pump station piping for leaks during each visit and shall notify management of any leaks observed in the pump stations or in the distribution system in a timely manner.

The entire distribution system will be visually inspected on each meter reading cycle by walking and driving the system and reviewing the meter locations and searching for apparent leaks. Upon bill generation for customer bills, high usage bills will be reviewed carefully and may be re-read to verify the usage and look for customer leaks.

Upon notification that a leak exists in the pump station or on the distribution system, the leak(s) shall be repaired in a timely manner. Customers are responsible for home plumbing leaks and water usage may be discontinued by the Town until the repair is made if sufficient water is being wasted, the customer is not responsive, or the home is abandoned.

Water Tank Drainage and Leaks: All water system storage tank draining will be reported. Further, the Town will develop an inspection program for all water storage tanks which would include leak detection.

Water Treatment Backwashing: All backwashing operations conducted at the water treatment plant are metered. The backwash volumes are tabulated and are used to evaluate system performance. In conjunction with the water treatment system upgrades, the backwash operations will be monitored and will be used as required to improve the overall water treatment efficiency and minimize water loss.

All forms for reporting los and unaccounted for loss will be maintained by the Utility Department.

6.2 Water Use Reduction through Future Rate Structures

Water billing can be used as a means to disseminate water conservation information to water users and to provide incentives to customers to use water efficiently. The Town has adapted a water rate structure to promote water conservation. Conservation-based rate structures such as flat rates, increasing block rates, seasonal rates, or quantity-based surcharges encourage water conservation and discourage wasteful water use. Increasing rate structures are most effective and allow for average water use at a reasonable rate. However, above an allowable amount of normal household water usage, the rates become higher per unit of water used. Residents who use large amounts of water each month would pay substantially more than residents who do not.

6.3 Outdoor Water Use

Outdoor water use increase significantly during the summer months primarily due to increased seasonal population and lawn and garden irrigation. As part of the water use education program and through conservation-based rate structures, the Town will help reduce excessive outdoor water use and promote better conservation and management practices by the customers. Developing proper grass watering practices and encouraging the use of drought tolerant landscaping can greatly reduce irrigation demands. Watering less frequently can better establish root systems, which make grass and shrubs more drought tolerant.

In addition, Bay Creek has adopted covenants that do not allow the use of town water for outside use such as lawn watering and car washing. However, Bay Creek also requires sod and extensive landscaping so irrigation is necessary. To accommodate the irrigation needs, all homes on larger lots require their own shallow well. For smaller lots (New Quarter, the Condos, Bayside Village), Bay Creek provides a central irrigation system with one shallow well for every 8 to 12 homes. All of Bay Creek's common areas are irrigated using water from their lake system.

VIRGINIA DEPARTMENT OF HEALTH
ENGINEERING DESCRIPTION SHEET

DATE: June 27, 2008

WATERWORKS NAME:	Cape Charles, Town of	CERTIFIED CLASS: III
COUNTY/CITY:	Northampton County	TYPE: Community

LOCATION: The plant and the wells are located 1/4 mile east of the Town of Cape Charles along Route 184 (approximately 1 mile west of intersection of Route 184 and US Route13) in Northampton County.

OWNER: The Town of Cape Charles
c/o Mr. Joe Vaccaro, Town Manager
P.O. Box 391
Cape Charles, Virginia 23310
Phone: (804) 331-3259

OPERATOR: Certified Class III Operator Required

PERMIT NO.: 3131120

DATE ISSUED: June 27, 2008

TYPE OF TREATMENT: Fluoridation, iron, and manganese removal, softening (ion exchange), pH adjustment and disinfection by hypochlorination.

SOURCE: Two Wells

DESIGN CAPACITY: 416,000 gpd (0.416 mgd) or 1,040 equivalent residential connections

DESCRIPTION OF SYSTEM

GENERAL

This waterworks consists of two wells, treatment, an elevated storage tank, and the distribution system. The treatment plant building houses the onsite laboratory and water treatment facilities for iron and manganese removal, water softening, pH adjustment, fluoridation, and disinfection.

SOURCE

The Replacement East Well (2008) was drilled on April 15th and 16th 2008, to a total depth of 220 feet. The well was completed to a depth of 220 feet with 8 and 6-inch diameter PVC casing and screens, and it was grouted to 100 feet. The screens are shown at depths of 100-120; 165-185; and 200-220 feet. The static water level was 12.5 feet and the well yielded 245 gpm for a drawdown of 64 feet during a 48 hour drawdown test. The well is equipped with a submersible pump (driven by a 20 H.P. electric motor) rated at 243 gpm @ 260 feet TDH.

The West Well (originally named as deep well or Well No. 5) was drilled on February 27, 1973 and it was completed on August 15, 1973 to a total depth of 210 feet. The first 60 feet is grouted and cased with 14-inch diameter casing while the remaining of the well is equipped with 6-inch diameter casing, or screen. The screens are shown at depths of 65-85; 88-98; 105-115; and 194-204 feet. The static water level was 15 feet and the well yielded 275 gpm for a drawdown of 90 feet during a 30 hour yield and drawdown test. The submersible pump (driven by 20 H.P electric motor) in the well is rated at 275 gpm. The actual pumping rate under the system head conditions (elevated tank level 85% full) has been measured to be 236 gpm.

TREATMENT

Fluoridation:

Sodium fluoride is the first chemical fed to the raw water. The feed equipment consists of a single head metering pump (maximum capacity of 5.5 gph @ 150 psi), finished water make up line protected by an RPZ, and a 50 gallon upflow type saturator.

Oxidation and disinfection chemical addition:

Both potassium permanganate and sodium hypochlorite are employed for the oxidation of iron and manganese in the raw water and for continuous regeneration of the greensand filter media. Potassium permanganate solution is applied upstream of the sodium hypochlorite application. The potassium permanganate feed equipment consists of a 100 gallon solution tank with a mixer mounted on top and a single head metering pump (maximum capacity of 1.83 gph @ 150 psi). Sodium hypochlorite feed equipment for oxidation (pre) and disinfection (post) consists of a dual head metering pump (maximum capacity of 3.66 gph combined) feeding pure liquid sodium hypochlorite from 55 gallon original containers to the raw water as well as the finished water lines. An automatic chlorine analyzer is located downstream of the chlorine injection point in the finished water line. Contact time for disinfection is provided by the riser pipe volume of the elevated storage tank.

Iron and manganese removal filters:

This unit consists of two (steel, cylindrical-10 feet diameter x 7 feet side wall) greensand media filters with 158 sq. feet of filter area. Filters are provided with air scour, headloss gauges, and sampling ports. The filter media consists of 1.3 feet of support gravel, 2 feet of manganese green sand and 1 foot of anthracite. The backwash and rinse water is supplied by the elevated storage tank and the waste is discharged to the polishing pond at the Cape Charles wastewater treatment plant.

Softening (ion exchange):

This unit consists of an ion exchange water softener and a brine regeneration system. Partial flow from the green sand filters is treated by the softener and is blended with the bypassed water for a target hardness of 80 mg/l in the finished water. The softener is a cylindrical steel tank (10 feet diameter x 7 feet side wall) containing 3.5 feet of ion exchange resin supported on 1.25 feet of gravel. The brine system consists of a 1,500 gallon capacity fiber glass brine tank with manual salt and water feed system and a 525 gpm regenerant pump. Regeneration can be accomplished with either automatic or manual control. The regenerant and rinse waste stream are discharged to the polishing pond at the Cape Charles wastewater treatment plant.

pH adjustment:

The chemical feed equipment consists of a single head metering pump (maximum capacity of 1.83 gph @ 150 psi) and a 50 gallon chemical solution tank with a mixer mounted on top. Sodium carbonate (soda ash) solution is added to the finished water line downstream of the sodium hypochlorite addition for post disinfection. There is a provision to change the point of application of pH adjustment chemicals from the finished water to the raw water if necessary.

STORAGE

The storage is provided by a 300,000 gallon elevated tank which looks like a light house and is located right next to the treatment plant building. The tank floats on the distribution system with the exception of the riser pipe which provides the volume necessary for contact time for disinfection. Wet riser volume of approximately 27,500 gallons provides 68 minutes of contact time at 400 gpm treatment capacity.

The Department of Environmental Quality has issued a permit (No. GW 0037200) for this groundwater source public water system. Cape Charles is entrusted with resource use responsibilities via that permit, and is advised to be aware of any compliance requirements of that permit.

EVALUATION OF SYSTEM

<u>Design Basis</u>: per *Waterworks Regulations*, one ERC = 400 gpd

1. Estimated Water Demand: (1,030 connections)(400 gpd/ERC) = 413,000 gpd

2. Source Capacity

Well	Well Yield (gpd) =gpm/(0.5 gpm/ERC)* 400gpd/ERC		Well Pump (gpd) = gpm * 1440 min/day		Limiting Capacity (gpd)
EWR 2008	245	196,000	243	349,920	196,000
Tower	275	220,000	236	339,840	220,000
Total					416,000

3. Storage Capacity: 300,000 gallon elevated tank = 300,000 gallons effective
300,000 gallons/ 200 gallons/ERC = 1,500 ERC
1,500 ERC * 400 gpd/ERC = 600,000 gallons

4. Treatment Capacity:

   1. Filter Capacity

      a. Filtration capacity = 474 gpm (158 sq.ft x 3 gpm/sq. ft.)
      b. Flow control set at = 400 gpm
      c. 400 gpm * 1440 min/day = 576,000 gpd

      Filter production = 400 gpm x 1440 min/day = 576,000 gpd

   2. Softener Capacity (with 60:40, filter: by pass ratio)

      a. Softening actual capacity = 316 gpm (79 sq. ft x 4 gpm/sq.ft)
      b. Softener effective capacity = $\frac{316 \text{ gpm x } 1440 \text{ min/d}}{0.6 \text{ (ratio factor)}}$ = 758,400 gpd

<u>Conclusion:</u> This waterworks is limited to a capacity of 416,000 gallons per day due to limited well yield.

Town of Eastville

3100-001 / NEW

VIRGINIA DEPARTMENT OF HEALTH

ENGINEERING DESCRIPTION SHEET

DATE: October 25, 1977

REVISED: June 7, 1984; March 29, 1996

WATERWORKS NAME: Town of Eastville CERTIFIED CLASS: N/A

COUNTY/CITY: Northampton County TYPE: Community

LOCATION: Well #4 (main well) is located approximately 100 yards west of Route 13 and north of Route 631 at the intersection of Route 13 and Route 631. Well #3 (auxiliary well) is located at the southwest base of the elevated storage tank east of Business Route 13.

OWNER: Town of Eastville
Mr. Edgar S. Sturgis, III, Mayor
P.O. Box 447
16437 Courthouse Rd.
Eastville, Virginia 23347

OPERATOR: Mr. James C. Sturgis
P.O. Box 447
16437 Courthouse Rd.
Eastville, Virginia 23347
Phone (804) 678-5183
(Northampton Insurance Agency, Inc.)
FAX 678-SFAX (5329)

PERMIT NO.: 3131200

DATE ISSUED: June 24, 1977

TYPE OF TREATMENT: None

SOURCE: Two Wells

DESIGN CAPACITY 375 ERCs or 150,000 gpd

DESCRIPTION OF SYSTEM

The system consists of two wells, a 75,000 gallon elevated storage tank, and the distribution system.

Well #3 (auxiliary well) was drilled starting on January 12, 1970, and was completed on February 4, 1970. The well bore is 320 feet deep, with cement grout extending from the surface to 100 feet. The well casing is 6-inches in diameter and extends to 300 feet, extending to 320 feet of 12-slot screen. The well is equipped with a turbine pump rated at 90 gpm, driven by a 7 1/2 H.P. motor. The well has a tested yield of 100 gpm, over a 24-hour period, with the water level dropping from 27 feet (static condition) to 42 feet (dynamic condition).

Well #4 (main well) was completed on September 15, 1972. The well bore is 175 feet, with cement grout extending from the surface to 60 feet. The galvanized well casing is 6-inches in diameter and extends to 145 feet, extending to 165 feet of stainless steel screen (7-slot). Gravel pack is installed from 140 feet to 175 feet. The well is equipped with a submersible pump rated at 110 gpm at 78 feet TDH, driven by a 7 1/2 H.P. motor. The well has yielded 110 gpm with the water level dropping from 70 feet to 78 feet during a 12 hour pump test. In another test of unknown duration, the well has yielded 30 gpm, with the water level dropping from 18 feet (static condition) to 30 feet (dynamic condition).

EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent residential connections (ERC). One ERC will utilize 400 gallons per day. This system's capacity is evaluated as follows:

I. Source Capacity

A. Source Yield

1. Number of Sources

a. Required = 1 up to 49 ERC, more than 1 for 50 or more ERCs
b. Provided= 2 wells

2. Well Yield: 100 gpm + 110 gpm = 210 gpm

3. Pump Yield: 110 gpm + 90 gpm = 200 gpm

B. Production Capacity

$$\frac{200 \text{ gpm}}{0.5 \text{ gpm/ERC}} = 400 \text{ ERCs}$$

II. Storage Capacity

A. Effective Storage= 75,000 gallons

B. Storage Capacity

75,000 gallons/(200 gal./ERC) = 375 ERCs (Limiting Case)

III. Limiting Case

A. Storage Capacity = 375 ERCs

375 ERCs x 400 gpd/ERC = 150,000 gpd

Therefore, based on the critical values discussed above, this waterworks was issued an operation permit for a design capacity of 150,000 gpd or 375 ERCs. It is stressed that the storage capacity is the limiting factor and that the permitted number of ERCs is only an indicator of when the flow restriction will be reached. Therefore, this system may exceed the permitted number of ERCs as long as the flow is within limits as indicated by proper reporting as determined by the Health Department engineers.

Town of Exmore

Virginia's Eastern Shore

MALCOLM PIRNIE

3100-001 / NEW

PERMIT PART 5
JUSTIFICATION FOR WITHDRAWAL REQUESTED

The Town of Exmore, located in Northampton County, Virginia, owns and operates a Public Water Supply that serves the Town and surrounding environs. The water supply consists of two wells, a 200,000-gallon elevated storage tank and distribution piping.

The Town's Groundwater Withdrawal Permit (No. GW0038800) was issued by the Virginia Department of Environmental Quality (DEQ) on November 1, 1995 and expired on October 31, 2005. The Permit authorized the Town to withdraw 60,800,000 gallons per year and restricted the maximum withdrawal in a calendar month to not more than 9,920,000 gallons. DEQ has assigned Permit No. GW0050800 to the forthcoming renewed permit.

The table below presents a summary of water use for the past 10 years, based on reports submitted by the Town to the Virginia Department of Health (VDH).

Table 1
Past Water Use Summary

YEAR	Connections		Total Connections	Monthly Maximum *(million gallons)*	Reported Annual Total *(million gallons)*
	Commercial	Residential			
1999	n/a*	n/a	670 (est)	4.926 (Jul)	46.56
2000	n/a	n/a	690 (est)	4.792 (May)	46.91
2001	n/a	n/a	690 (est)	5.070 (Jul)	48.65
2002	n/a	n/a	690 (est)	6.799 (Jul)	56.69
2003	n/a	n/a	700 (est)	6.561 (Jul)	60.93
2004	n/a	n/a	700 (est)	5.931 (Aug)	61.32
2005	124	579	703	7.845 (May)	63.50
2006	122	579	701	5.996 (Aug)	57.74
2007	124	601	701	5.134 (Jan)	49.42
2008	124	601	725	5.061 (Jul)	49.68
				Total	541.40
				Ten-Year Average	54.14

n/a - not available*

Water use for January – May 2009 is 19,935,300 gallons or approximately 3.99 million gallons/month.

Examples of Growth

The Northampton County Comprehensive Plan (April 2009) identifies towns located within the Route 13 corridor as future growth areas. This growth includes commercial, industrial and residential development. Exmore, which is strategically located along Route 13 near the geographic center of the Eastern Shore, is envisioned as a primary growth area. Town growth over the past 5 years includes a shopping center; a new fast food restaurant (Wendy's); a convenience store (Royal Farms); two motels (80-room Holiday Inn Express in 2008 and an 86-room Hampton Inn & Suites in July 2009); a 36-unit elderly-housing development; and major redevelopment of the New Road neighborhood (an area of low to moderate-income persons), which will experience new and renovated housing construction. The New Road development has potentially 100 housing units, many of which currently do not have indoor plumbing.

Projected Increased Water Use

In 2008, a 300-lot subdivision was proposed west of Route 13. The developer's marketing analysis indicated 60 connections per year, beginning in 2008 through 2012, or until build out. This would require an additional 10,500 gal/day each year or at build out, 52,500 gal/day (19.16 million gallons/year). Local approvals and development are on hold, due to the current economy. Start up is anticipated in 2011.

A biodiesel blending facility is planned for development within the Town limits on the former Dulaney Foods property. The owner hopes to "break ground" in October 2009. Chicken wastes from the nearby Perdue processing plants will be used in the blending process. Water use is estimated by the owner to be less than 300,000 gallons per month. For the purpose of this application, use is projected at 250,000 gallons per month or 3.0 million gallons/year.

Population Projections

According to U.S. Census Bureau, Exmore's population between 1990 and 2000 ranged from a low of 1,090 in 1998 to a high of 1,136 in 2000. The population in 2007 was 1,166 and 1,355 in 2009. For the 9-year period between 2000 and 2009 the population increased by 19.3% or approximately 2% per year. For the 2-year period between 2007 and 2009 the population increased by 16.2% or 8% per year.

The Town is in the process of negotiating with a company to bring broadband service to the community within the next 12 to 24 months. In addition, there are plans to upgrade the wastewater treatment facility within the next 24 to 36 months. The Town anticipates increased growth once these services are available.

Assuming economic conditions do not improve until the beginning of 2011, population growth is estimated at no more than 2% per year (2009 and 2010). Population growth is projected to increase annually thereafter by 5% per year (2011 through 2019) with an improved economy, the addition of broadband services, and the increased wastewater plant capacity.

Projected Water Requirements

2009

- 2009 base usage = the 10 year average .... 54.14 MG

- New Hampton Inn .... 0.64 MG

  Assume 75% occupancy for 100 days (May – September 2009)
  86 rooms x 75% = 64.5 rooms at 65 gallons/room =
  4,193 gallons/day x 100 days = 419,250 gallons
  Assume 15% occupancy for 265 days (remainder of year)
  86 rooms x 15% = 13 rooms at 65 gallons/room =
  845 gallons/day x 265 days = 223,925 gallons
  Total annual use = 643,175 gallons

- 2% growth in 2009 (1,355 x 2% = 27 persons).. 0.74 MG
  27 x 75 gpd/person = 2,025 gpd x 365 days = 739,125

Total, 2009............................ 55.52 MG

2010

- 2010 base usage = 2009 Total .... 55.52 MG

- Biodiesel facility use for 3 months x 250,000 gal/mo. = ... 0.75 MG

- 2% growth in 2010 (1,382 x 2% = 28 persons)
  28 x 75 gpd/person = 2,100 gpd x 365 days = ... 0.77 MG

Total, 2010............................ 57.04 MG

2011

- 2011 base usage = 2010 Total .... 58.19 MG

- Biodiesel facility use for 12 months x 250,000 gal/mo. .... 3.00 MG

- First year of 300-lot subdivision
  60 connections x 175 gpd/connection = 10,500 gpd x 365 days = ... 3.83 MG
  (the projected 5% growth is accounted for in the subdivision
  at 3 persons per connection or 180 people)

Total, 2011............................ 63.87 MG

2012

- 2012 base usage = 2011 Total .... 63.87 MG
- Second year of 300 lot subdivision = ... 3.83 MG
  (the projected 5% growth is accounted for in the subdivision)

Total, 2012............................ 67.70 MG

2013

- 2013 base usage = 2012 Total .... 67.70 MG
- Third year of 300 lot subdivision = ... 3.83 MG
  (the projected 5% growth is accounted for in the subdivision)

Total, 2013............................ 71.53 MG

2014

- 2014 base usage = 2013 Total .... 71.53 MG
- Fourth year of 300 lot subdivision = ... 3.83 MG
  (the 5% growth is accounted for in the subdivision)

Total, 2014............................ 75.36 MG

2015

- 2015 base usage = 2014 Total .... 75.36 MG
- Fifth (final) year of 300 lot sub division = ... 3.83 MG
  (the 5% growth is accounted for in the subdivision)

Total, 2015............................ 79.19 MG

Note: The population at the end of 2015 is projected to be:
2011 = 1,410 + 300 subdivision units at 3 persons/unit =
900 persons for an end of 2015 total of 2,310 persons.

2016

- 2016 base usage = 2015 Total .... 79.19 MG

- 5% growth in 2016 (2,310 x 5% = 116 persons).. 3.18 MG
  116 x 75 gpd/person = 8,700 gpd x 365 days = 3,175,500

Total, 2016............................ 82.37 MG

2017

- 2017 base usage = 2016 Total .... 82.37 MG

- 5% growth in 2017 (2,426 x 5% = 121 persons).. 3.31 MG
  121 x 75 gpd/person = 9,075 gpd x 365 days = 3,312,375

Total, 2017............................ 85.68 MG

2018

- 2018 base usage = 2017 Total .... 85.68 MG

- 5% growth in 2018 (2,547 x 5% = 127 persons).. 3.48 MG
  127 x 75 gpd/person = 9,525 gpd x 365 days = 3,476,625

Total, 2018............................ 89.16 MG

2019

- 2019 base usage = 2018 Total .... 89.16 MG

- 5% growth in 2019 (2,674 x 5% = 134 persons).. 3.67 MG
  134 x 75 gpd/person = 10,050 gpd x 365 days = 3,668,250

Total, 2019............................ 92.83 MG
say .... 93.00 MG

An evaluation of the public water system by the Virginia Department of Health (VDH) shows that the existing wells and storage tank are capable of providing a design capacity of 400,000 gpd (146 MG/yr).

This request to increase the permitted Groundwater Withdrawal to 93.00 million gallons is reasonable, based on existing and potential future growth in the Exmore area expected between 2009 and 2019, as described above.

Town of Exmore
Historical Well Yields

Peak month per year

Missing data

		YIELD IN GALLONS									Annual	
	YR	YIELD WELL 1	YIELD WELL 2	TOTAL YIELD	GPD	GPDPC	GAL/CON	POP	CONN	% OF PERMIT	Average of % of permit	NOTES / ANNUAL TOTAL
1	87	8,974,350		8,974,350	289,495	277	482	1,115	640	72%		
2	87	2,878,150		2,878,150	92,844	89	155	1,115	640	23%		
3	87	3,235,110		3,235,110	104,358	100	174	1,115	640	26%		
4	87	3,616,430		3,616,430	116,659	112	194	1,115	640	29%		
5	87	3,409,760		3,409,760	109,992	105	183	1,115	640	27%		
6	87	4,334,420		4,334,420	139,820	134	233	1,115	640	35%		
7	87	4,863,840		4,863,840	156,898	150	261	1,115	640	39%		
8	87		2,055,000	2,055,000	66,290	63	110	1,115	640	17%		
9	87		2,201,000	2,201,000	71,000	68	118	1,115	640	18%		
10	87	1,740,230	1,581,100	3,321,330	107,140	102	179	1,115	640	27%		
11	87	1,643,325	1,500,850	3,144,175	101,425	97	169	1,115	640	25%		Annual data incomplete
12	87	1,643,325	1,500,850	3,144,175	101,425	97	169	1,115	640	25%	NP	45,177,740
1	88	1,826,200	1,670,200	3,496,400	112,787	108	188	1,115	640	28%		
2	88	1,544,800	1,432,600	2,977,400	96,045	92	160	1,115	640	24%		
3	88	1,362,250	1,280,000	2,642,250	85,234	82	136	1,115	670	21%		
4	88	1,994,660	1,695,700	3,690,360	119,044	114	190	1,115	670	30%		
5	88	1,714,720	1,492,600	3,207,320	103,462	99	165	1,115	670	26%		
6	88	2,245,180	2,091,000	4,336,180	139,877	134	223	1,115	670	35%		
7	88	2,490,670	2,435,500	4,926,170	158,909	152	253	1,115	670	40%		
8	88	2,040,020	1,824,900	3,864,920	124,675	119	198	1,115	670	31%		
9	88	1,913,310	1,799,900	3,713,210	119,781	115	191	1,115	670	30%		
10	88	1,740,230	1,581,100	3,321,330	107,140	102	171	1,115	670	27%		
11	88	1,643,325	1,500,850	3,144,175	101,425	97	161	1,115	670	25%		
12	88	1,643,325	1,500,850	3,144,175	101,425	97	161	1,115	670	25%	NP	42,463,890
1	89	1,826,200	1,670,200	3,496,400	112,787	108	180	1,115	670	28%		
2	89	1,544,800	1,432,600	2,977,400	96,045	92	153	1,115	670	24%		
3	89	1,362,250	1,280,000	2,642,250	85,234	82	136	1,115	670	21%		
4	89	1,994,660	1,695,700	3,690,360	119,044	114	190	1,115	670	30%		
[illegible]	89	1,714,720	1,492,600	3,207,320	103,462	99	165	1,115	670	26%		
[illegible]	89	1,907,270	1,528,200	3,435,470	110,822	106	176	1,115	670	28%		
[illegible]	89	2,246,180	2,091,000	4,337,180	139,909	134	223	1,115	670	35%		
8	89			0	0	0	0	1,115	670	0%		data not available
9	89	2,048,620	2,020,700	4,069,320	131,268	126	209	1,115	670	33%		
10	89	1,739,430	1,675,100	3,414,530	110,146	105	175	1,115	670	28%		
11	89	2,799,390	535,400	3,334,790	107,574	103	171	1,115	670	27%		
12	89	3,063,360	1,017,600	4,080,960	131,644	126	210	1,115	670	33%	NP	38,685,980
1	90	1,945,950	1,133,500	3,079,450	99,337	95	158	1,114	670	25%		
2	90	1,574,300	1,515,600	3,089,900	99,674	95	159	1,114	670	25%		
3	90	1,724,890	1,659,600	3,384,490	109,177	105	174	1,114	670	27%		
4	90	1,756,530	1,651,700	3,408,230	109,943	105	175	1,114	670	27%		
5	90	1,688,840	1,801,800	3,490,640	112,601	108	179	1,114	670	28%		
6	90	1,821,720	1,945,600	3,767,320	121,526	116	193	1,114	670	30%		
7	90	2,238,510	2,414,100	4,652,610	150,084	144	239	1,114	670	38%		
8	90	2,128,360	2,130,400	4,258,760	137,379	132	219	1,114	670	34%		
9	90	1,998,020	1,825,100	3,823,120	123,326	118	196	1,114	670	31%		
10	90	1,825,670	1,771,120	3,596,790	116,025	108	179	1,114	670	29%		
11	90	1,632,996	1,509,900	3,142,896	101,384	94	156	1,114	670	25%		
12	90	1,331,841	1,413,999	2,745,840	88,575	82	137	1,114	670	22%	NP	42,440,046
1	91	1,775,230	1,619,000	3,394,230	109,491	102	169	1,112	670	27%		
2	91	1,665,870	1,453,000	3,118,870	100,609	93	155	1,112	670	25%		
3	91	1,640,060	1,536,701	3,176,761	102,476	95	158	1,112	670	26%		
4	91	1,756,160	1,778,201	3,534,361	114,012	106	176	1,112	670	29%		
5	91	2,053,746	2,052,200	4,105,946	132,450	123	204	1,112	670	33%		
6	91	2,335,481	2,258,808	4,594,289	148,203	138	229	1,112	670	37%		
7	91	7,172,620	5,016,800	12,189,420	393,207	365	606	1,112	670	98%		
8	91	7,761,140	1,978,000	9,739,140	314,166	292	485	1,112	670	79%		
9	91	2,568,310	1,283,800	3,852,110	124,262	115	192	1,112	670	31%		
10	91	1,837,440	2,019,000	3,856,440	124,401	116	192	1,112	670	31%		
11	91	1,504,170	1,476,700	2,980,870	96,157	89	148	1,112	670	24%		
12	91	1,596,090	1,498,500	3,094,590	99,825	93	154	1,112	670	25%	NP	57,637,027

Town of Exmore
Historical Well Yields

Peak month per year — Missing data

		YIELD IN GALLONS										
	R	YIELD WELL 1	YIELD WELL 2	TOTAL YIELD	GPD	GPDPC	GAL/CON	POP	CONN	% OF PERMIT	Annual Average of % of permit	NOTES / ANNUAL TOTAL
1	92	1,790,760	1,629,200	3,419,960	110,321	103	170	1,111	670	28%		
2	92	1,499,740	1,439,800	2,939,540	94,824	88	146	1,111	670	24%		
3	92	1,557,130	1,521,100	3,078,230	99,298	92	153	1,111	670	25%		
4	92	1,647,930	1,528,600	3,176,530	102,469	95	158	1,111	670	26%		
5	92	1,531,660	1,647,100	3,178,760	102,541	95	158	1,111	670	26%		
6	92	1,819,710	1,978,900	3,798,610	122,536	114	189	1,111	670	31%		
7	92	2,259,530	2,136,900	4,396,430	141,820	132	219	1,111	670	35%		
8	92	1,853,650	1,909,500	3,763,150	121,392	113	187	1,111	670	30%		
9	92	1,647,150	1,966,900	3,614,050	116,582	108	180	1,111	670	29%		
10	92	1,733,320	1,833,500	3,566,820	115,059	107	177	1,111	670	29%		
11	92	1,803,880	1,789,900	3,593,780	115,928	108	179	1,111	670	29%		
12	92	1,740,720	1,614,000	3,354,720	108,217	101	167	1,111	670	27%	NP	41,880,580
1	93	1,605,670	1,461,500	3,067,170	98,941	92	153	1,110	670	25%		
2	93	1,691,630	1,401,800	3,093,430	99,788	93	154	1,110	670	25%		
3	93	1,800,460	1,689,600	3,490,060	112,583	105	174	1,110	670	28%		
4	93	1,696,740	1,592,600	3,289,340	106,108	99	164	1,110	670	27%		
5	93	1,674,700	1,357,400	3,032,100	97,810	91	151	1,110	670	24%		
6	93	2,331,900	2,177,300	4,509,200	145,458	135	224	1,110	670	36%		
7	93	2,560,300	2,287,700	4,848,000	156,387	146	241	1,110	670	39%		
8	93	2,477,990	2,175,500	4,653,490	150,113	140	232	1,110	670	38%		
9	93	2,088,460	1,902,500	3,990,960	128,741	120	199	1,110	670	32%		
10	93	1,820,950	1,706,500	3,527,450	113,789	106	175	1,110	670	28%		
11	93	1,921,500	1,710,600	3,632,100	117,165	109	181	1,110	670	29%		
12	93	1,590,070	1,573,600	3,163,670	102,054	95	157	1,110	670	26%	NP	44,296,970
1	94	2,622,330	2,457,700	5,080,030	163,872	153	253	1,106	670	41%		
2	94	2,192,400	2008600	4,201,000	135,516	127	209	1,106	670	34%		
3	94	2,288,900	2177400	4,466,300	144,074	135	222	1,106	670	36%		
4	94	2,109,520	2212900	4,322,420	139,433	130	215	1,106	670	35%		
[illegible]	94	2,675,120	2542900	5,218,020	168,323	157	260	1,106	670	42%		
[illegible]	94	2,648,840	2876500	5,525,340	178,237	167	275	1,106	670	45%		
[illegible]	94	2,650,540	2,723,700	5,374,240	173,363	162	267	1,106	670	43%		
8	94	2,799,100	2,819,000	5,618,100	181,229	169	280	1,106	670	45%		
9	94	2,916,840	2,453,300	5,370,140	173,230	162	267	1,106	670	43%		
10	94	2,558,580	2,376,300	4,934,880	159,190	149	246	1,106	670	40%		
11	94	2,454,280	2,166,200	4,620,480	149,048	139	230	1,106	670	37%		
12	94	2,489,470	2,173,400	4,662,870	150,415	141	232	1,106	670	38%	NP	59,393,820
1	95	2,409,930	2,176,000	4,585,930	147,933	138	228	1,107	670	37%		
2	95	1,730,600	1,646,000	3,376,600	108,923	102	168	1,107	670	27%		
3	95	2,102,300	1,949,900	4,052,200	130,716	122	202	1,107	670	33%		
4	95	1,879,700	1,805,400	3,685,100	118,874	111	183	1,107	670	30%		
5	95	2,379,760	2,188,900	4,568,660	147,376	138	227	1,107	670	37%		
6	95	2,571,640	2,254,700	4,826,340	155,688	145	240	1,107	670	39%		
7	95	2,900,000	2,737,200	5,637,200	181,845	170	280	1,107	670	45%		
8	95	2,832,600	2,709,000	5,541,600	178,761	167	276	1,107	670	45%		
9	95	2,151,600	1,892,200	4,043,800	130,445	122	201	1,107	670	33%		
10	95	4,469,600	3,284,100	7,753,700	250,119	233	386	1,107	670	63%	permit *	
11	95	1,858,600	1,588,200	3,446,800	111,187	104	171	1,107	670	28%		
12	95	1,802,560	1,634,000	3,436,560	110,857	103	171	1,107	670	28%	90.4%	54,954,490
1	96	1,859,160	1,720,000	3,579,160	115,457	108	178	1,102	670	29%		
2	96	1,765,710	1,568,500	3,334,210	107,555	101	166	1,102	670	27%		
3	96	1,791,250	1,612,000	3,403,250	109,782	103	169	1,102	670	27%		
4	96	2,262,690	1,792,200	4,054,890	130,803	123	202	1,102	670	33%		
5	96	2,052,560	1,821,100	3,873,660	124,957	117	193	1,102	670	31%		
6	96	2,249,070	2,055,700	4,304,770	138,864	130	214	1,102	670	35%		
7	96	2,659,200	2,300,700	4,959,900	159,997	150	247	1,102	670	40%		
8	96	1,889,700	1,900,300	3,790,000	122,258	115	189	1,102	670	31%		
9	96	2,037,800	1,881,200	3,919,000	126,419	119	195	1,102	670	32%		
10	96	2,184,720	1,548,000	3,732,720	120,410	113	186	1,102	670	30%		
11	96	1,759,690	1,428,100	3,187,790	102,832	96	159	1,102	670	26%		
12	96	1,866,990	1,519,400	3,386,390	109,238	102	168	1,102	670	27%	74.9%	45,525,740

Town of Exmore
Historical Well Yields

Peak month per year (shaded) | Missing data (blank box)

		YIELD IN GALLONS									Annual	
	YR	YIELD WELL 1	YIELD WELL 2	TOTAL YIELD	GPD	GPDPC	GAL/CON	POP	CONN	% OF PERMIT	Average of % of permit	NOTES / ANNUAL TOTAL
1	97	1,760,910	1,640,800	3,401,710	109,733	104	169	1,095	670	27%		
2	97	1,549,690	1,434,500	2,984,190	96,264	91	148	1,095	670	24%		
3	97	1,900,300	1,594,400	3,494,700	112,732	106	174	1,095	670	28%		
4	97	1,576,260	1,392,900	2,969,160	95,779	90	148	1,095	670	24%		
5	97	2,363,710	2,255,200	4,618,910	148,997	141	230	1,095	670	37%		
6	97	2,473,060	2,236,400	4,709,460	151,918	143	234	1,095	670	38%		
7	97	3,162,670	3,432,600	6,595,270	212,751	201	328	1,095	670	53%		
8	97	3,151,390	1,547,500	4,698,890	151,577	143	234	1,095	670	38%		
9	97	2,624,290	2,404,100	5,028,390	162,206	153	250	1,095	670	41%		
10	97	2,215,010	2,003,700	4,218,710	136,087	128	210	1,095	670	34%		
11	97	1,561,680	1,389,500	2,951,180	95,199	90	147	1,095	670	24%		52,811,770
12	97	2,198,910	1,555,900	3,754,810	121,123	114	187	1,095	670	30%	86.9%	Well #2 meter broke 12/26/97
1	98	1,824,690	meter broke	1,824,690	58,861	56	91	1,090	670	15%		Well #2 meter still broke
2	98	1,587,240	877,900	2,465,140	79,521	75	123	1,090	670	20%		#2 meter back on line 2/13/98
3	98	1,891,020	1,682,500	3,573,520	115,275	109	178	1,090	670	29%		
4	98	2,185,360	1,532,800	3,718,160	119,941	114	185	1,090	670	30%		
5	98	1,737,500	1,814,500	3,552,000	114,581	109	177	1,090	670	29%		
6	98	2,592,509	2,236,000	4,828,509	155,758	148	240	1,090	670	39%		
7	98	2,527,300	2,542,100	5,069,400	163,529	155	252	1,090	670	41%		
8	98	2,525,500	2,172,000	4,697,500	151,532	144	234	1,090	670	38%		
9	98	2,224,210	2,238,600	4,462,810	143,962	136	222	1,090	670	36%		
10	98	2,448,190	2,213,900	4,662,090	150,390	143	232	1,090	670	38%		
11	98	1,917,920	1,671,600	3,589,520	115,791	110	179	1,090	670	29%		
12	98			0	0	0	0	1,090	670	0%	69.8%	42,443,339
1	99	1,901,000	1,825,700	3,726,700	120,216	113	185	1,099	670	30%		
2	99	1,651,600	1,681,400	3,333,000	107,516	101	161	1,099	692	27%		
3	99	1,718,000	1,656,600	3,374,600	108,858	102	163	1,099	692	27%		
4	99	1,737,700	1,850,000	3,587,700	115,732	109	173	1,099	692	29%		
[illegible]	99	2,003,700	2,227,300	4,231,000	136,484	128	205	1,099	689	34%		
[illegible]	99	2,262,000	2,546,200	4,808,200	155,103	146	233	1,099	689	39%		
[illegible]	99	2,978,800	1,947,000	4,925,800	158,897	149	238	1,099	689	40%		
8	99	2,323,500	2,254,800	4,578,300	147,687	139	221	1,099	689	37%		
9	99	1,773,200	1,812,200	3,585,400	115,658	109	173	1,099	689	29%		
10	99	1,469,800	1,929,000	3,398,800	109,639	103	164	1,099	689	27%		
11	99	1,674,000	1,935,900	3,609,900	116,448	109	174	1,099	690	29%		
12	99	1,571,400	1,825,900	3,397,300	109,590	103	164	1,099	690	27%	76.6%	46,556,700
1	2000	1,563,200	2,015,800	3,579,000	115,452	105	173	1,136	690	29%		
2	2000	1,669,300	1,961,800	3,631,100	117,132	107	175	1,136	690	29%		
3	2000	1,597,100	1,974,700	3,571,800	115,219	105	173	1,136	690	29%		
4	2000	1,603,100	1,695,400	3,298,500	106,403	97	159	1,136	690	27%		
5	2000	2,159,100	2,632,600	4,791,700	154,571	141	231	1,136	690	39%		
6	2000	2,151,500	2,507,000	4,658,500	150,274	137	225	1,136	690	38%		
7	2000	2,236,700	2,343,300	4,580,000	147,742	134	221	1,136	690	37%		
8	2000	2,000,000	2,313,700	4,313,700	139,152	127	208	1,136	690	35%		
9	2000	1,880,900	1,769,100	3,650,000	117,742	107	176	1,136	690	29%		
10	2000	1,956,200	2,149,400	4,105,600	132,439	120	198	1,136	690	33%		
11	2000	1,882,300	1,563,300	3,445,600	111,148	101	166	1,136	690	28%		
12	2000	1,546,500	1,741,800	3,288,300	106,074	96	159	1,136	690	27%	77.2%	46,913,800
1	2001	1,703,700	1,807,300	3,511,000	113,258	103	170	1,140	690	28%		
2	2001	1,426,700	1,649,100	3,075,800	109,850	90	149	1,140	690	27%		
3	2001	1,523,500	1,790,000	3,313,500	106,887	97	160	1,140	690	27%		
4	2001	1,643,400	2,118,800	3,762,200	121,361	110	182	1,140	690	30%		
5	2001	1,979,100	2,414,800	4,393,900	141,739	128	212	1,140	690	35%		
6	2001	1,825,400	2,434,100	4,259,500	137,403	125	206	1,140	690	34%		
7	2001	2,083,600	2,986,000	5,069,600	163,535	148	245	1,140	690	41%		
8	2001	1,985,200	2,567,600	4,552,800	146,865	133	220	1,140	690	37%		
9	2001	1,829,800	2,290,700	4,120,500	132,919	120	199	1,140	690	33%		
10	2001	2,450,100	2,129,900	4,580,000	147,742	134	221	1,140	690	37%		
11	2001	1,736,700	2,246,200	3,982,900	128,481	116	192	1,140	690	32%		
12	2001	1,676,100	2,350,300	4,026,400	129,884	118	195	1,140	690	32%	80.0%	48,648,100

Town of Exmore
Historical Well Yields

Peak month per year

Missing data

		YIELD IN GALLONS										Annual	
	YR	YIELD WELL 1	YIELD WELL 2	TOTAL YIELD	GPD	GPDPC	GAL/CON	POP	CONN	% OF PERMIT	Average of % of permit	NOTES / ANNUAL TOTAL
1	2002	1,767,200	2,161,500	3,928,700	126,732	114	190	1,144	690	32%		
2	2002	1,463,200	2,006,500	3,469,700	111,926	101	168	1,144	690	28%		
3	2002	1,482,000	2,144,800	3,626,800	116,994	106	175	1,144	690	29%		
4	2002	2,076,200	2,613,400	4,689,600	151,277	137	227	1,144	690	38%		
5	2002	2,409,200	2,283,300	4,692,500	151,371	140	227	1,114	690	38%		
6	2002	2,254,900	3,123,900	5,378,800	173,510	157	260	1,144	690	43%		
7	2002	2,803,600	3,995,000	6,798,600	219,310	198	328	1,144	690	55%		
8	2002	2,335,100	3,418,000	5,753,100	185,584	168	278	1,144	690	46%		
9	2002	2,172,200	2,807,600	4,979,800	160,639	145	241	1,144	690	40%		
10	2002	1,865,000	2,884,300	4,749,300	153,203	138	226	1,144	700	38%		
11	2002	1,559,300	2,070,900	3,630,200	117,103	106	173	1,144	700	29%		
12	2002	2,055,400	2,938,300	4,993,700	161,087	146	238	1,144	700	40%	93.2%	56,690,800
1	2003	1,955,300	2,833,200	4,788,500	154,468	138	228	1,158	700	39%		
2	2003	1,887,600	2,593,800	4,481,400	144,561	129	213	1,158	700	36%		
3	2003	1,850,100	2,500,800	4,350,900	140,352	125	207	1,158	700	35%		
4	2003	2,081,900	2,916,200	4,998,100	161,229	144	238	1,158	700	40%		
5	2003	2,180,700	3,208,900	5,389,600	173,858	155	257	1,158	700	43%		
6	2003	2,669,500	3,797,800	6,467,300	208,623	186	308	1,158	700	52%		
7	2003	2,649,200	3,911,400	6,560,600	211,632	189	312	1,158	700	53%		
8	2003	1,801,800	3,126,700	4,928,500	158,984	142	235	1,158	700	40%		
9	2003	2,001,500	2,890,700	4,892,200	157,813	141	233	1,158	700	39%		
10	2003	2,001,500	2,890,700	4,892,200	157,813	141	233	1,158	700	39%		
11	2003	1,739,300	2,089,300	3,828,600	123,503	110	182	1,158	700	31%		
12	2003	2,169,600	3,186,800	5,356,400	172,787	154	255	1,158	700	43%	100.2%	60,934,300
1	2004	2,228,200	2,824,300	5,052,500	162,984	146	241	1,152	700	41%		
2	2004	1,612,600	2,485,200	4,097,800	132,187	119	195	1,152	700	33%		
3	2004	2,005,400	2,968,800	4,974,200	160,458	144	237	1,152	700	40%		
4	2004	1,741,400	2,781,600	4,523,000	145,903	131	215	1,152	700	36%		
[illegible]	2004	1,957,900	2,943,600	4,901,500	158,113	142	233	1,152	700	40%		
[illegible]	2004	2,355,000	3,439,200	5,794,200	186,910	168	276	1,152	700	47%		
[illegible]	2004	2,192,800	3,275,800	5,468,600	176,406	158	260	1,152	700	44%		
8	2004	2,296,200	3,633,900	5,930,100	191,294	172	282	1,152	700	48%		
9	2004	2,000,200	3,175,700	5,175,900	166,965	150	246	1,152	700	42%		
10	2004	2,902,500	1,947,500	4,850,000	156,452	140	231	1,152	700	39%		
11	2004	1,950,100	3,154,700	5,104,800	164,671	148	243	1,152	700	41%		
12	2004	2,021,900	3,428,300	5,450,200	175,813	158	260	1,152	700	44%	100.9%	61,322,800
1	2005	1,959,800	3,493,600	5,453,400	175,916	157	260	1,156	700	44%		
2	2005	1,725,300	2,630,200	4,355,500	140,500	126	207	1,156	700	35%		
3	2005	1,873,200	2,698,300	4,571,500	147,468	132	218	1,156	700	37%		
4	2005	1,569,900	2,724,100	4,294,000	138,516	124	204	1,156	700	35%		
5	2005	2,963,900	4,881,400	7,845,300	253,074	226	374	1,156	700	63%		
6	2005	2,021,200	3,258,000	5,279,200	170,297	152	251	1,156	700	43%		
7	2005	2,196,800	3,422,300	5,619,100	181,261	162	268	1,156	700	45%		
8	2005	2,196,500	3,653,800	5,850,300	188,719	169	279	1,156	700	47%		
9	2005	2,140,300	3,559,000	5,699,300	183,848	164	271	1,156	700	46%		
10	2005	1,930,400	3,360,900	5,291,300	170,687	153	252	1,156	700	43%		
11	2005	1,882,200	2,831,100	4,713,300	152,042	136	224	1,156	700	38%		
12	2005	1,755,400	2,773,800	4,529,200	146,103	131	216	1,156	700	37%	104.4%	63,501,400
1	2006	1,855,700	2,896,200	4,751,900	153,287	137	226	1,160	700	38%		
2	2006	1,596,900	2,447,500	4,044,400	130,465	116	193	1,160	700	33%		
3	2006	1,813,400	3,008,000	4,821,400	155,529	139	230	1,160	700	39%		
4	2006	1,907,900	2,800,700	4,708,600	151,890	135	224	1,160	700	38%		
5	2006	2,041,700	3,045,400	5,087,100	164,100	146	242	1,160	700	41%		
6	2006	2,100,600	2,843,100	4,943,700	159,474	142	235	1,160	700	40%		
7	2006	1,960,500	3,579,100	5,539,600	178,697	159	264	1,160	700	45%		
8	2006	2,458,600	3,537,700	5,996,300	193,429	172	286	1,160	700	48%		
9	2006	1,738,200	2,698,100	4,436,300	143,106	127	211	1,160	700	36%		
10	2006	2,009,700	2,885,100	4,894,800	157,897	141	233	1,160	700	39%		
11	2006	1,707,600	2,753,800	4,461,400	143,916	128	212	1,160	700	36%		
12	2006	1,586,300	2,469,200	4,055,500	130,823	117	193	1,160	700	33%	95.0%	57,741,000

Town of Exmore
Historical Well Yields

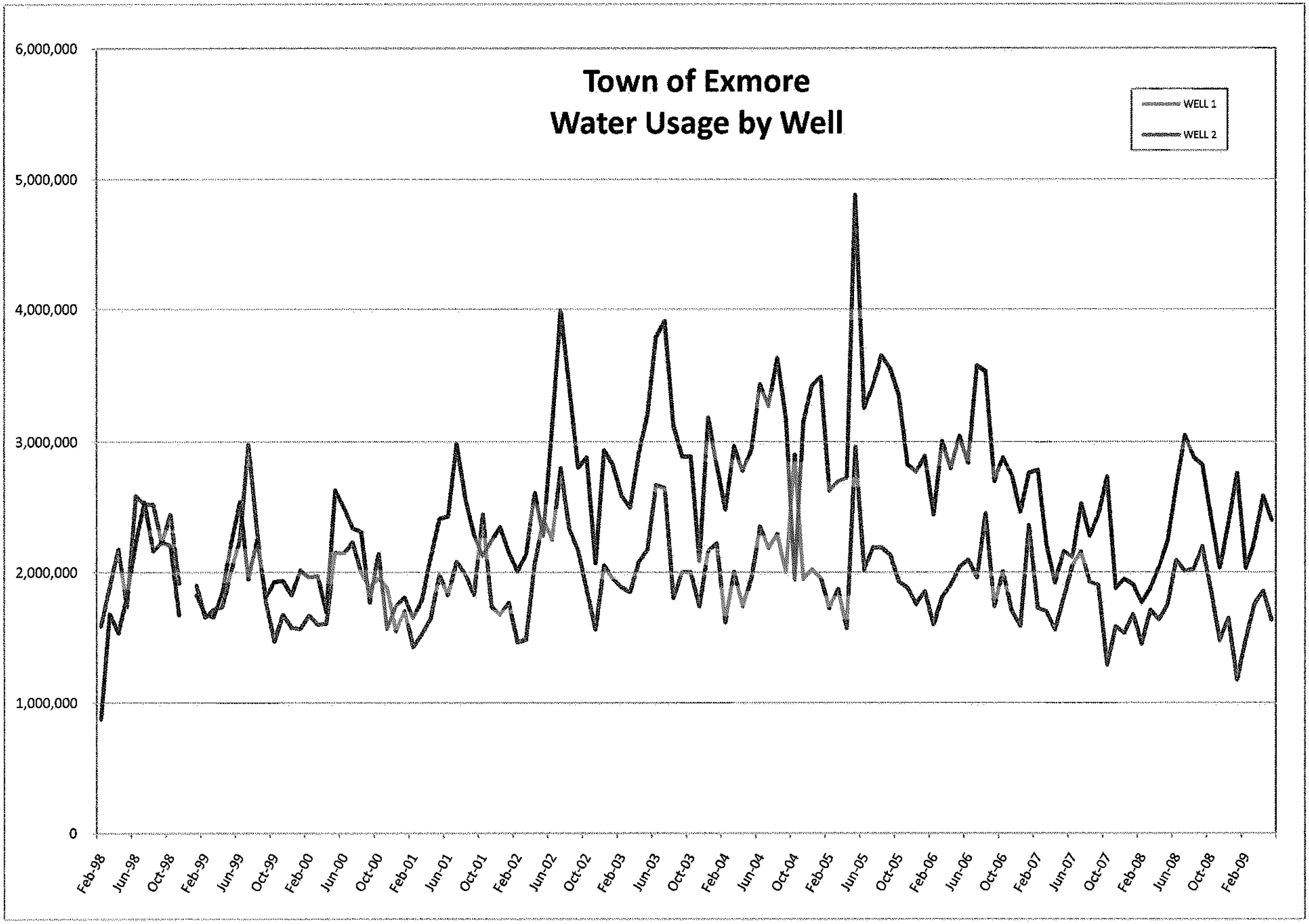
Peak month per year — Missing data

[illegible]	R	YIELD IN GALLONS: YIELD WELL 1	YIELD WELL 2	TOTAL YIELD	GPD	GPDPC	GAL/CON	POP	CONN	% OF PERMIT	Annual Average of % of permit	NOTES / ANNUAL TOTAL
1	2007	2,366,767	2,766,800	5,133,567	165,599	147	244	1,166	700	41%		
2	2007	1,727,600	2,788,200	4,515,800	145,671	129	215	1,166	700	36%		
3	2007	1,703,200	2,221,400	3,924,600	126,600	112	187	1,166	700	32%		
4	2007	1,557,800	1,919,300	3,477,100	112,165	99	166	1,166	700	28%		
5	2007	1,806,200	2,166,400	3,972,600	128,148	114	189	1,166	700	32%		
6	2007	2,049,900	2,121,800	4,171,700	134,571	119	199	1,166	700	34%		New meters installed on wells in 2007.
7	2007	2,164,700	2,530,600	4,695,300	151,461	134	224	1,166	700	38%		
8	2007	1,928,200	2,282,900	4,211,100	135,842	120	201	1,166	700	34%		
9	2007	1,903,700	2,446,700	4,350,400	140,335	124	207	1,166	700	35%		
10	2007	1,288,700	2,736,100	4,024,800	129,832	115	192	1,166	700	32%		
11	2007	1,582,000	1,878,800	3,460,800	111,639	99	165	1,166	700	28%		
12	2007	1,531,500	1,948,100	3,479,600	112,245	99	166	1,166	700	28%	81.3%	49,417,367
1	2008	1,678,300	1,907,100	3,585,400	115,658	95	171	1,260	700	29%		
2	2008	1,449,300	1,766,600	3,215,900	103,739	85	153	1,260	700	26%		
3	2008	1,711,000	1,883,200	3,594,200	115,942	95	171	1,260	700	29%		
4	2008	1,637,000	2,044,300	3,681,300	118,752	97	175	1,260	700	30%		
5	2008	1,752,000	2,246,800	3,998,800	128,994	106	190	1,260	700	32%		
6	2008	2,097,600	2,675,400	4,773,000	153,968	126	227	1,260	700	38%		
7	2008	2,008,100	3,052,800	5,060,900	163,255	134	241	1,260	700	41%		
8	2008	2,027,300	2,883,700	4,911,000	158,419	130	234	1,260	700	40%		
9	2008	2,205,300	2,828,100	5,033,400	162,368	84	240	1,260	700	41%		
10	2008	1,861,800	2,426,100	4,287,900	138,319	71	204	1,260	700	35%		
11	2008	1,474,900	2,033,500	3,508,400	113,174	58	167	1,260	700	28%		
12	2008	1,646,900	2,379,200	4,026,100	129,874	67	192	1,260	700	32%	81.7%	49,676,300
1	2009	1,174,900	2,763,400	3,938,300	127,042	66	188	1,355	725	32%		
2	2009	1,480,600	2,032,000	3,512,600	113,310	59	167	1,355	725	28%		
3	2009	1,753,400	2,245,500	3,998,900	128,997	67	190	1,355	725	32%		
4	2009	1,859,200	2,590,800	4,450,000	143,548	74	212	1,355	725	36%		19,935,300
[illegible]	2009	1,631,300	2,404,200	4,035,500	130,177	67	192	1,355	725	33%		
[illegible]	2009			0	0	0	0	1,355	725	0%		
[illegible]	2009			0	0	0	0	1,355	725	0%		
8	2009			0	0	0	0	1,355	725	0%		
9	2009			0	0	0	0	1,355	725	0%		
10	2009			0	0	0	0	1,355	725	0%		
11	2009			0	0	0	0	1,355	725	0%		
12	2009			0	0	0	0	1,355	725	0%		

Note: Population information taken from U.S. Census Bureau estimates, except for 1990 and 2000, which are confirmed numbers.

NP - Withdrawal not permitted

* Permitted annual withdrawal = 60,800,000 gallons per year



Town of Exmore
Water Usage by Well
WELL 1
WELL 2
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Feb-98
Jun-98
Oct-98
Feb-99
Jun-99
Oct-99
Feb-00
Jun-00
Oct-00
Feb-01
Jun-01
Oct-01
Feb-02
Jun-02
Oct-02
Feb-03
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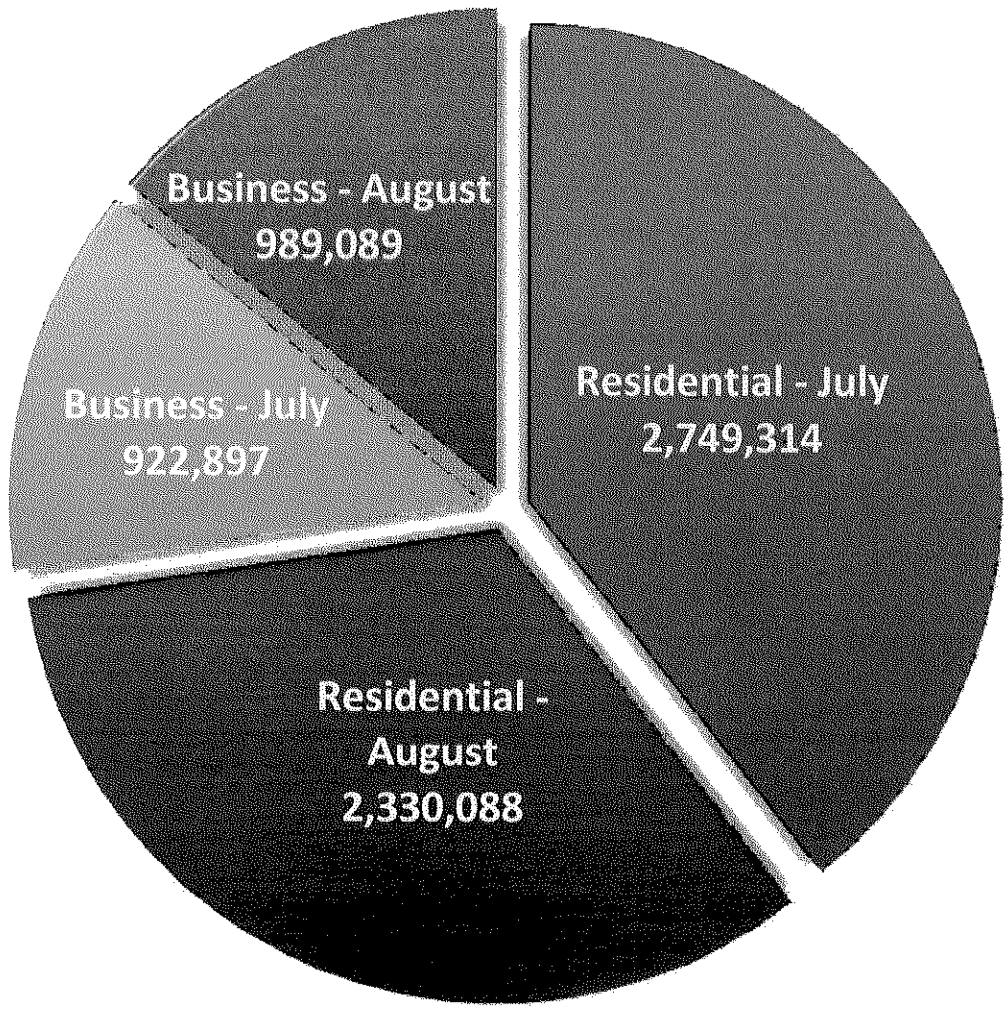
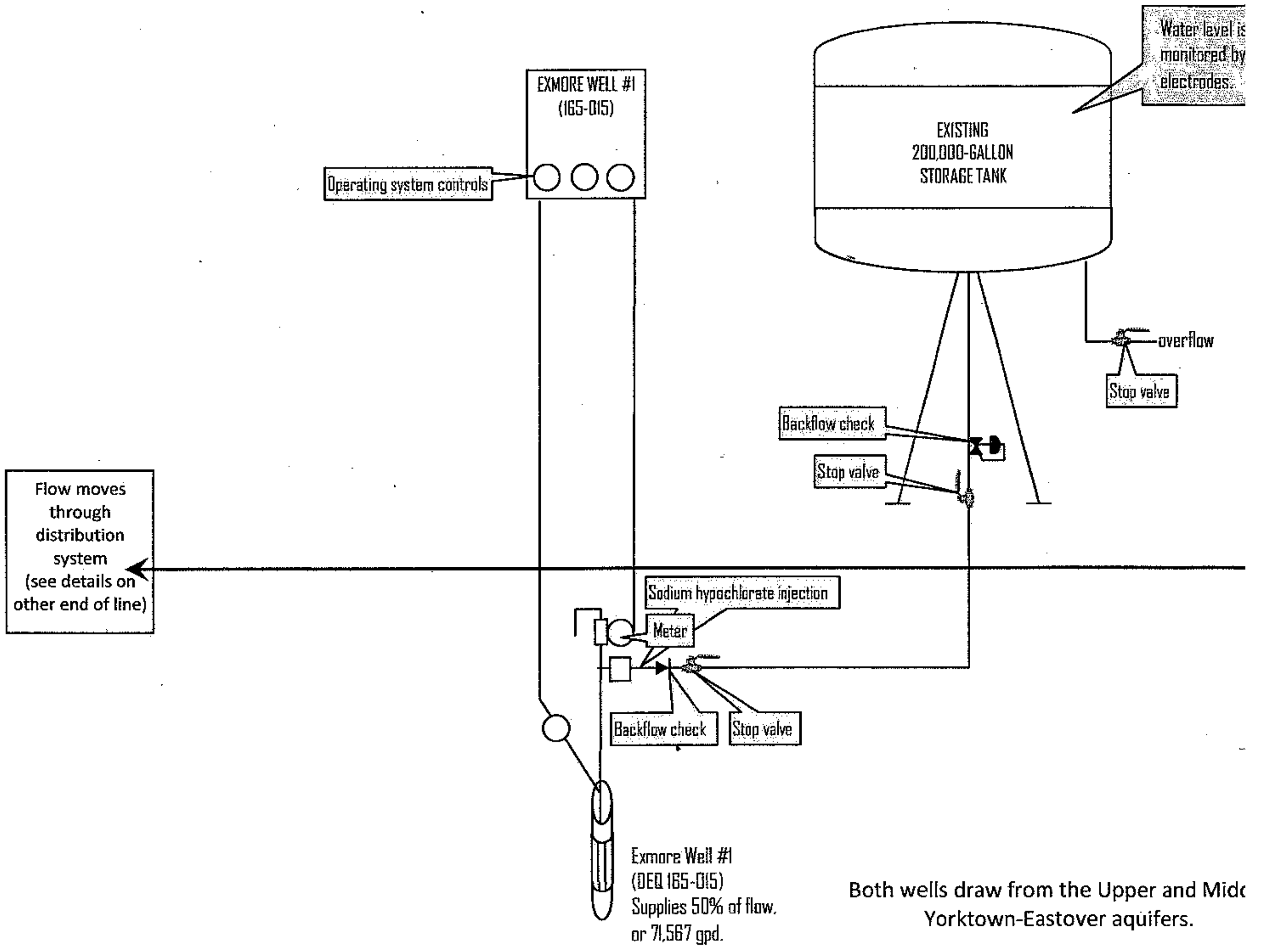
Feb-08
Jun-08
Oct-08
Feb-09

Residential-vs-Business Water Usage
July and August 2008 Meter Readings

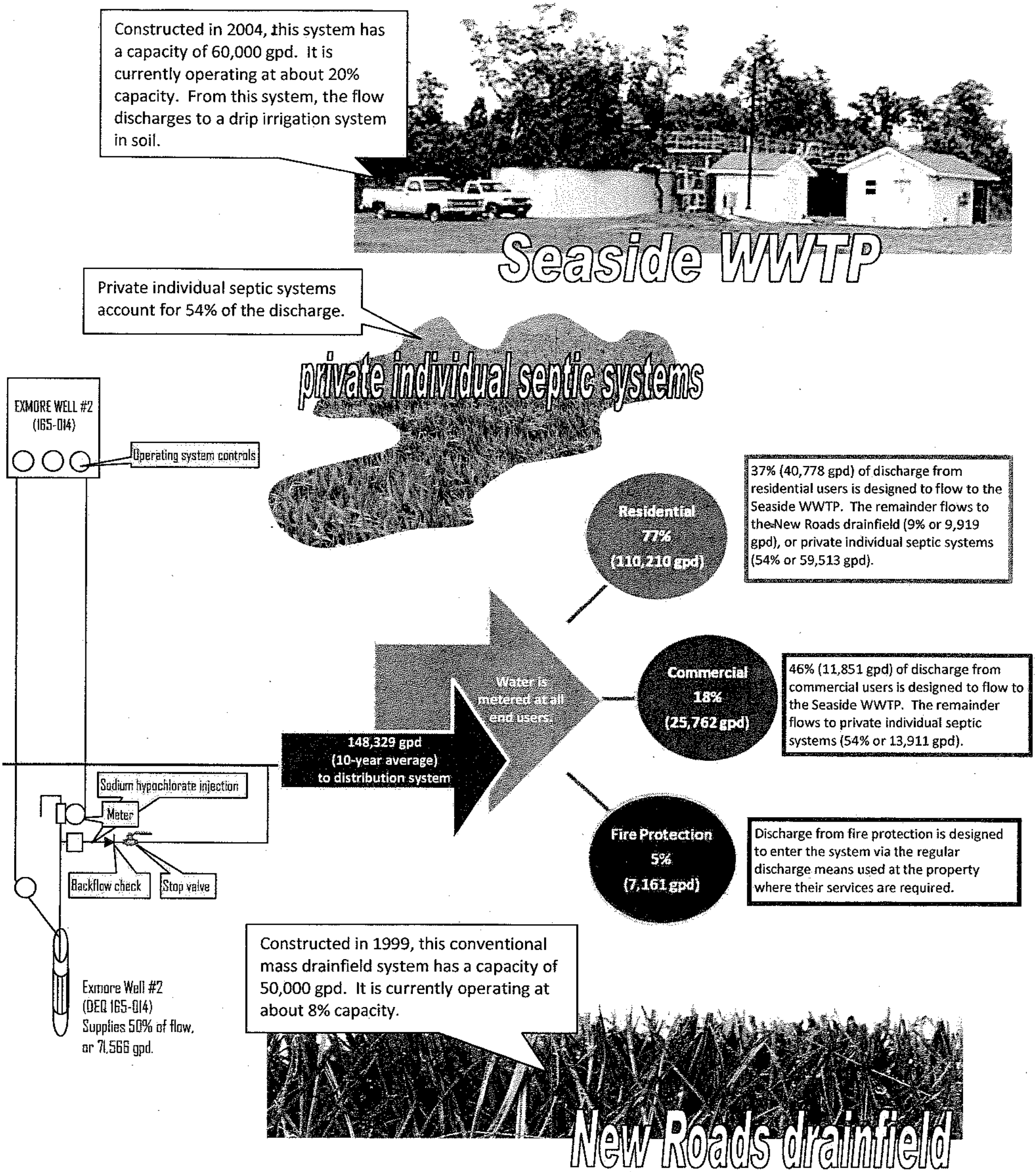


Town of Exmore
Water System
(current)



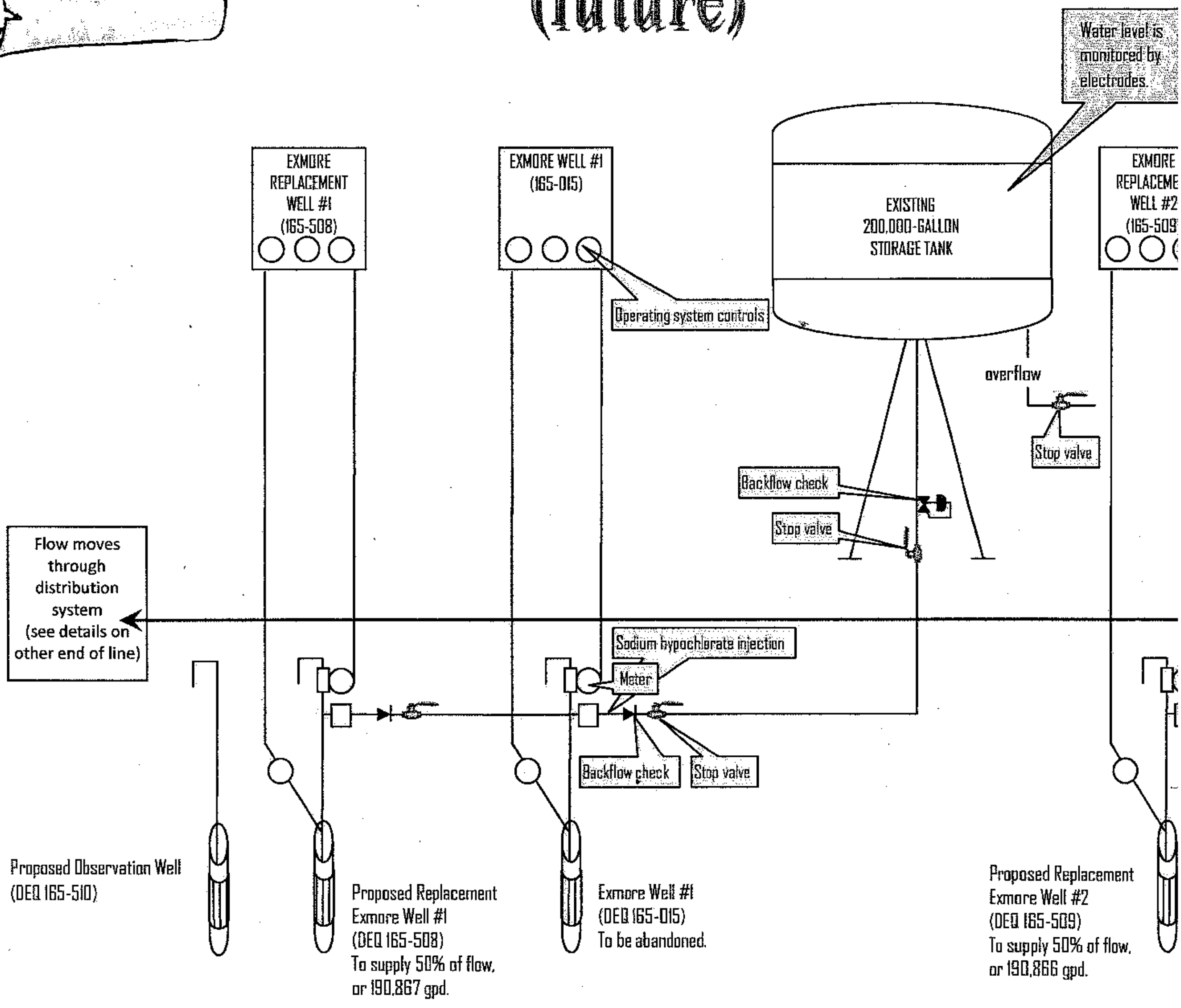
Drawing is not to scale.

Draper Aden Associates *Engineering • Surveying • Environmental Services*	Line Drawing of System (C Client: Town of Exmore Facility: Town of Exmore Water Sys Location: Exmore, Virginia Project: Groundwater Withdrawal P



nt)	DESIGNED DRAWN CHECKED DATE	BHH BHH SGW 10/20/08	**FIGURE**
Application	DAA No.	R05329-01	

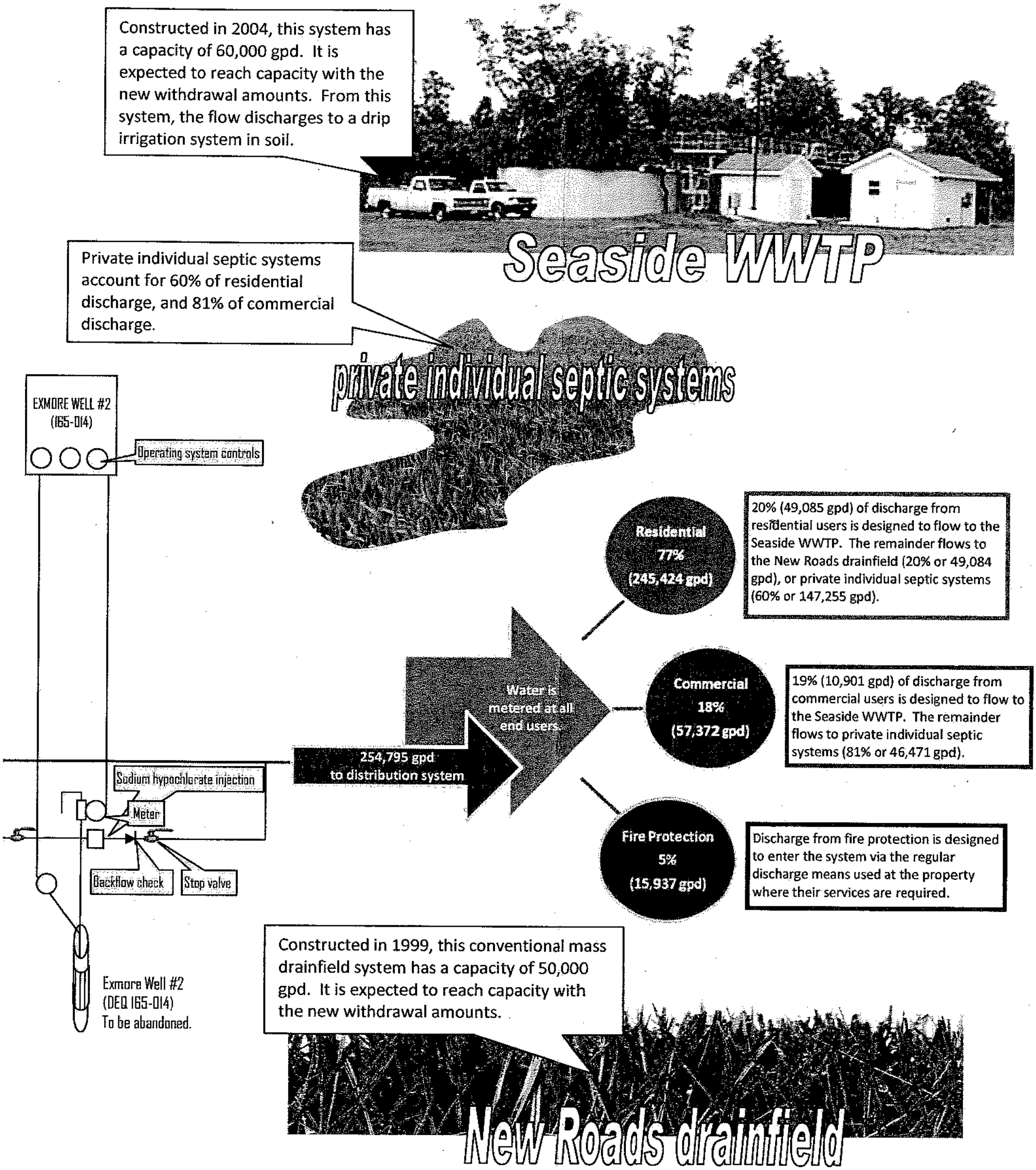
Town of Exmore
Water System
(future)



Both proposed replacement wells are planned to draw from the Middle Yorktown-Eastover aquifer.

Drawing is not to scale.

Draper Aden Associates *Engineering • Surveying • Environmental Services*	Line Drawing of System (Fu
	Client: Town of Exmore Facility: Town of Exmore Water Sys Location: Exmore, Virginia Project: Groundwater Withdrawal P



e)	DESIGNED	BHH	**FIGURE**
	DRAWN	BHH	
	CHECKED	SGW	
	DATE	10/20/08	
Application	DAA No.	R05329-01	

1.0 INTRODUCTION

1.1 NEED FOR CONSERVATION

Water conservation involves both an increase in efficiency of water use and a reduction of water losses. The net result is a decrease in demand for treated water that can defer development of new resources and reduce the cost of future water service. Each gallon of water conserved is one less requiring storage, treatment, and distribution. It may also represent one less gallon that has to be heated for washing or bathing, thus saving energy costs, or that must pass through a wastewater conveyance system and treatment before it is returned to the environment.

Conservation is an important complement to new supply sources. In some cases, conservation may eliminate the need for new sources of supply. Fresh water, like other natural resources, is a limited commodity, which must be managed wisely to preserve the wellbeing of future generations. Efforts to conserve existing supplies and efficient allocation of water resources are important during each stage of the water supply planning process.

The Town of Exmore recognizes the need to conserve and effectively manage its water resources. Only by optimizing water use efficiently and reducing water loss can the Town satisfy its projected water demands over the next five to ten years. While additional long-term supplies are required, every effort will be made to efficiently use currently available supplies.

1.2 REGULATORY REQUIREMENTS

The Groundwater Management Act of 1992 (House Bill 488) was approved in April 1992. It requires a Groundwater Withdrawal Permit (GWP) for certain groundwater withdrawals within declared Groundwater Management Areas (GMAs). Groundwater Withdrawal Regulations adopted in June 1993 (VR 680-13-07) require that applications for new GWPs within GMAs include a water conservation plan approved by the Virginia Department of Environmental Quality, Division of Water (DOW). An approved conservation program must include:

- Use of water-saving plumbing and processes including, where appropriate, the use of water-saving fixtures in new and renovated plumbing as provided under the Uniform Statewide Building Code (USBC).
- A water loss reduction program.
- A water use education program.
- An evaluation of potential water reuse options.
- Requirements for mandatory use reductions during water shortage emergencies, including, where appropriate, ordinances prohibiting the waste of water.

1.3 PLAN OBJECTIVES

The primary objectives of this ***Water Conservation and Management Plan*** are to provide a documented, effective conservation strategy designed to reduce demand within the Town of Exmore and to demonstrate compliance with the Groundwater Management Act of 1992. This Plan will provide methods by which water use can be increased as well as procedures to guide the Town and its customers through water supply emergencies. Updates of this Plan are anticipated to be performed on an annual basis to document accomplishments and changes in individual conservation programs. A copy of the annual updates will be provided to the Department of Environmental Quality upon request.

Section 2.0 of this Plan describes the use of water-saving plumbing and processes within the service area. Water loss reduction, economic incentives, water use education, and water reuse are discussed in Sections 3.0 through 6.0. The final section of this report describes the Use Restrictions Plan for the Town of Exmore.

2.0 WATER-SAVING PLUMBING AND PROCESSES

2.1 UNIFORM STATEWIDE BUILDING CODE (USBC)

The Building Officials and Code Administrators (BOCA) organization is a non-profit organization, which developed a series of performance-related model codes (BOCA, 1990). These codes were adopted by the Commonwealth of Virginia as part of the Uniform Statewide Building Code (USBC) (DHCD, 1987). These codes directly specify the use of water conservation fixtures in commercial and residential applications.

The USBC applies to all new construction and some remodeling of existing structures. The USBC requires that:

> *When reconstruction, renovation, or repair of existing buildings is undertaken, existing materials and equipment may be replaced with equipment of similar kind or replaced with greater capacity equipment in the same location when not considered a hazard; however, when new systems, materials, and equipment that were not part of the original existing building are added, the new systems, materials, and equipment shall be subject to the edition of the USBC in effect at the time of their installation. Existing parts of such buildings not being reconstructed, renovated, or repaired need not be brought into compliance with the current edition of the USBC.*

The International Plumbing Code (IPC) sets maximum flow standards (Section 605.4) for a variety of fixtures and appliances. These standards are presented in the following table.

Plumbing Fixture or Fixture Setting	Maximum Flow Rate or Quantity [1]
Water Closet	1.6 gallons per flushing cycle
Urinal	1.0 gallon per flushing cycle
Shower Head	2.5 gpm at 80 psi
Lavatory, Private	2.5 gpm at 80 psi
Lavatory, Public	0.5 gpm at 80 psi
Lavatory, Public, metering or self-closing	0.25 gallons per metering cycle
Sink Faucet	2.5 gpm at 60 psi

[1] gpm = gallons per minute

The current standards set a maximum limit of 2.5 gallons per minute (gpm) at 80 pounds per square inch (psi) for showers and private lavatories. Water closets are limited to 1.6 gallons per flushing cycle, and urinals are limited to 1.0 gallons per cycle. In addition, lavatories in public facilities are limited to 0.5 gpm for those with standard valve or spring faucets and 0.25 gallons per cycle for self-closing metering valves (IPC, 1996).

The USBC in Virginia was adopted from the International Plumbing Code. States are permitted to develop plumbing codes that implement stricter measures than those imposed by the National Plumbing Code. However, localities in Virginia must obtain State authorization to develop a stricter code.

2.2 COMPLIANCE WITH USBC

The Town of Exmore currently enforces the 1996 regulations. The Town will also evaluate incentive programs to encourage existing households to retrofit their homes with low-flow devices. An additional requirement will apply to car washes. Effective January 1999, all car washes must be equipped with an approved water recycling system.

3.0 WATER-LOSS REDUCTION PROGRAM

3.1 WATER-LOSS AUDIT

At the beginning of each fiscal year (July 1), a water-loss audit will be conducted by the Town of Exmore to determine the volume and nature of lost and unaccounted-for water within the Town's water supply system. The purpose of this audit is to identify sources of demand that would normally escape detection by the metering system. This type of demand includes:

- *Fire Fighting.* The Fire Department will submit an estimate of all water used on a monthly basis including water used for fire-fighting and for hydrant flushing.
- *Main Flushing.* All main flushing performed by the Town will require the submittal of a water consumption estimate.
- *Theft.* Any observed theft will be reported to the Town and the appropriate action will be taken. An estimate of the volume of water stolen will be submitted as part of the annual water-loss audit.
- *Main Breaks.* All main breaks will require the reporting by Town personnel of the estimated volume of water lost.
- *Tank Drainage.* All draining of storage tanks in the main distribution system will be reported.
- *Unmetered Services.* Every effort will be made to install meters on any portion of the system that is not yet metered, as soon as funding become available. Grants will be solicited to provide funding.
- *Leaks.* Upon completion of the first water-loss audit, the Town will develop a leak detection program, which will have as it goal, the complete survey of all distribution pipes and mains within the Town, to be phased in over the next five years.
- *Meter Errors.* The Town will replace meters at a rate such that a complete Town-wide meter turnover takes place every fifteen years, which is the typical warranty period for water meters. The size of meters requested by commercial and industrial customers will be evaluated and the developer will be consulted to help in determining the appropriate meter size for a particular site based on water use and the anticipated demand. Preventing the installation of oversized meters minimizes unwarranted waste of water.
- *Equipment Calibration.* All meters at the well heads will be calibrated on an annual basis. There will be service to check inaccurate meters. Large customer meters that are accessible will be field calibrated yearly. An on-going maintenance program will be implemented to locate and repair plant pipe leaks at the water treatment facilities.

All forms for reporting leaks and unaccounted-for water loss will be maintained by the Town. These forms will be reviewed by Town personnel on a daily basis so that measures can be taken to reduce unaccounted-for water loss.

3.2 LEAK REPAIR PROGRAM

The owner of any residential unit, commercial establishment, or industrial establishment who is found, based on the water-loss audit or by other methods, to be an excessive user of water due to leakage from water lines or plumbing fixtures on the premises, will be notified by the Town. These owners will be required to repair and stop such leakage within a reasonable period of time, or will be subjected to financial penalties.

4.0 ECONOMIC INCENTIVES PROGRAM

4.1 EXISTING PROGRAM ELEMENTS

Bills are currently issued bi-monthly by the Town. Bi-monthly billing allows more frequent and timely distribution of water conservation educational brochures to customers. It also helps customers become aware of leaks more quickly and recognize the cost of high seasonal water use. In addition, bi-monthly billing is useful in providing feedback on customer conservation efforts.

A one-block rate schedule has been implemented. This schedule encourages conservation by not providing a lower rate to high-volume water users. By charging large and small water users the same rate, large users have a greater incentive to conserve.

4.2 PLANNED PROGRAM ELEMENTS

The Town will analyze its water rates annually. Rate setting goals will be as follows:

- Perpetuating Public Utilities self-sufficiency while maintaining the highest water quality standards.
- Recommending appropriate rates for water usage and special service charges that are equitable to all customers.
- Continuing a comprehensive water conservation policy by using public information and charges, which will discourage non-essential use of water.

5.0 WATER USE EDUCATION PROGRAM

5.1 PLANNED PROGRAM ELEMENTS

Public education concerning the importance of water conservation is a key factor in reducing excessive water use. Educational programs should include information about how drinking water is produced and why it is important to conserve. Providing customers with a better understanding of the reasons conservation is necessary allows them to better appreciate and participate in conservation activities.

The public education program planned by the Town will include the following components:

- *Billing Inserts*. Inserts will be included with water bills on a quarterly basis. The inserts will include information concerning water conservation techniques and leak detection strategies.
- *Brochures*. Water conservation brochures and pamphlets will be made available to the public at Town government buildings and at exhibits set up during public events.
- *Video Tapes*. A variety of water conservation tapes will be available from the Town, free of charge. They will be made available to the general public, to schools for classroom instruction, and for public meetings. The videos will also be provided to cable television companies for showing on government channels.
- *Water Conservation Hot Line*. A telephone number will be available, through which residents can have their conservation questions answered by a knowledgeable Town employee. In addition, requests for information on various water conservation topics, speakers, or other personal contacts will be coordinated through this telephone line.
- *News Releases*. News releases to the print media, radio, and television will keep the public informed. This process will be used not only during emergencies, but also on a regular basis to keep the public informed about conservation-related issues.
- *School Education*. Programs will be available for presentation by Town staff at local schools. Programs will be targeted to specific age groups. Assistance will be made available for teachers who wish to develop their own water-awareness programs.
- *Speakers*. Town staff will be available for speaking engagements or personal contacts. These individuals will work with local clubs and organizations to develop public awareness concerning the need to conserve water along with other topics related to the water supply industry.
- *Irrigation*. Support of groundwater wells for irrigation of lawns and landscaping by residents, businesses, and industries within the service area. The use of well water for these activities helps to minimize the use of potable drinking water for uses which do not require it.

6.0 WATER RE-USE EDUCATION PROGRAM

Water reuse may be either direct or indirect for potable or non-potable uses. Direct reuse involves introducing highly-treated, reclaimed water directly to a potable water distribution system. Indirect reuse involves returning treated wastewater to the environment for dilution and natural purification, and subsequent withdrawal for water supply. Potable reuse (which is referred to as "recycled" by the Virginia Department of Health [VDH]) is the specific use of treated wastewater as a drinking water source.

Indirect potable reuse occurs widely in the United States, each time treated wastewater effluent is discharged to a natural waterway upstream of a water supply intake. In most cases, it is unintentional. Past experience indicates that indirect reuse was acceptable because the application of water and wastewater treatment techniques the near-universal use of some form of disinfectant, and the natural dilution and purification that occurs in natural waterways of adequately treated water. However, in recent years the effectiveness of these measures in protecting against viral and trace organic contaminants has come under increasing scrutiny.

6.1 PLANNED PROGRAM ELEMENTS

6.1.1 POTABLE REUSE

The Virginia Department of Health has prepared a ***Recycle Issues*** paper dated November 24, 1992. The VDH stated its opposition to both direct and indirect potable reuse projects when naturally occurring sources of water are available. The VDH insists that the highest quality, best source of water be selected when alternatives are available. The VDH also listed several other requirements, which would apply to a potable reuse project, pertaining to independent monitoring, dilution, liability, removal of biological hazards and toxics, and utilization of natural purification processes. Given the current position of the VDH, reuse of wastewater treatment plant effluent for potable purposes is not deemed a practicable reuse alternative.

6.1.2 NON-POTABLE REUSE

Many industrial water demands are for non-potable uses. One method of reducing demands on potable water sources is to supply non-potable demands using treated wastewater plant effluent. Detailed regulations for implementation of a water reuse project do not exist in the Commonwealth of Virginia. Permitting a water reuse project would most likely involve both the VDH and the Virginia Department of Environmental Quality (VDEQ). In addition, a Virginia Pollution Discharge Elimination System (VPDES) Permit would be required for discharge to State waters if the flow is not contaminated during its use; if it is contaminated, the approval of VDH and/or VDEQ would be required.

Several states including California, Arizona, Texas, Utah and Florida have developed regulations and state statutes that specify the required minimum quality of reclaimed water, depending on the intended use of the water. In general, the requirements become more stringent as the likelihood of public contact increases. In California, if treated reclaimed water for industrial use meets the state's standards for full body contact recreation, workers are not required to avoid contact with the water or to wear protective clothing. However, precautions are required should the treated reclaimed water fail to meet these criteria. With the approval of State and local health departments, reclaimed water can be used for soil compaction, dust control, and other construction purposes.

As mentioned previously, recycling will be required in all new car washes and existing car washes will be required to be retrofitted. In addition, required recycling systems are being considered for all new construction and all repair or replacement of continuous flow devices, including any water connector, device, or appliance which requires a continuous flow of 5 gallons per minute or more.

Typically, non-potable markets for reused water include irrigation uses, industrial uses, and creation of recreational lakes. Many factors affect the market for reused water, including:

- Size and location of demand.
- Water quality requirements.
- Degree of treatment required for discharge.
- Cost of reclaimed water.
- Cost and availability of alternative supplies.

It is likely that additional reuse methodologies will be evaluated in the future. Industries within the service area that use large quantities of water are continually evaluating their processes and looking for ways to lower production costs. For these industries, water represents one of their greatest operating expenses. It is in the best interest of these industries to stay abreast of the latest reuse technologies and employ them whenever feasible.

6.2 FUTURE PROGRAM ELEMENTS

The Public Utilities Department will evaluate its water conservation programs on a continual basis. As part of this process, new water reuse technologies will be researched and evaluated to determine their applicability in the service area. Continued communication with large water users will create possibilities for more efficient use of water resources.

7.0 WATER USE RESTRICTIONS

7.1 EMERGENCY USE RESTRICTION PLAN

Emergency situations, such as severe drought, may threaten the regional water supply. During these times, the implementation of use restrictions is necessary to protect the water supply from further depletion. Use restrictions are considered a form of conservation because they result in demand reductions, but they are implemented only during periods when the regional water supply is threatened. Such restrictions are reserved as contingency measures for emergency situations and are more restrictive than normal conservation measures, which are used continually to reduce demands. Use restrictions are commonly implemented using a tiered approach and are activated in relation to specific storage levels of a system's raw water supply.

The Town of Exmore adopted a Water Emergency ordinance in October, 2008 to prepare for water shortages. In the event of an actual or anticipated water shortage exists, the Town Manager, with the approval of the Mayor and Council or its subsequent ratification within 48 hours is authorized to declare water emergencies in the Town, as a whole or portions thereof, affecting the use of water. Mandatory water use restrictions with penalties may also be implemented during water shortage emergencies. The four tiers ("Conditions") of use restrictions are as follows:

- *Condition 1 – Voluntary Use Restrictions:* Voluntary Use Restrictions are employed as a first stage in reducing water demands during a potential water shortage. These restrictions are encouraged by the water utility, but compliance is not required. When Tier 1 is in effect, the public will be asked to employ restraint in water usage and to conserve water voluntarily by whatever methods available.

- *Condition 2 – Mandatory Use Restrictions:* Mandatory Use Restrictions are put into effect when very limited supplies of water are available. These restrictions focus on the eliminations of outdoor, non-essential uses of water. In Tier 2, compliance is mandated by a local ordinance and the restrictions are enforced with penalties for violations.

- *Condition 3 – Mandatory Reductions:* Mandatory Reductions in water use will be used to further reduce water usage under the most severe drought conditions. Non-residential users will be allotted a percentage reduction based on their average monthly and/or previous bi-monthly consumption. Residential customers will be limited to a specific volume or percentage reduction of water per quarter. A surcharge of ten dollars for every 100 cubic foot of water consumed above the allotted volume will be applied.

- *Condition 4 – Water Rationing:* When only crucial supplies of water are available, the Public Utilities Department will restrict water use to the purposes that are essential to life, health and safety.

When determining the level of use restriction to be implemented, the Town Manager will consider water levels, available storage, drawdown rates, projected supply capability, system purification and pumping capacity, daily and projected water consumption, prevailing and forecasted weather conditions, fire service requirements, pipeline conditions, supplementary source data, estimates of minimum essential supplies to reserve public health and safety, and other pertinent data. The restrictions do not apply to any governmental activity, institution, business, or industry which is declared by the Town Manager to be necessary for public health, safety or welfare, or on which the restrictions would place severe economic hardship or cause substantial loss of employment.

7.2 ENFORCEMENT

Any person convicted of violation of the provisions of the Water Emergency ordinance, or any of the conservation regulations promulgated by the Town shal be suject to a fine of $250.00. Each act or each day of a continued violation will be considered a separate offense. In addition, the Town Manager can suspend water service to any person violating the use restrictions. If water service is terminated, a reconnection fee of $50.00, plus all outstanding fees and fines must be paid before service is restored.

8.0 SUMMARY OF CONSERVATION PLAN

The Conservation Management Plan will aid the Town in meeting its water supply needs over the next decade. The conservation plan includes a variety of elements to be implemented on a regular basis. Water saving plumbing, as described in the USBC, will be required. Economic incentives will encourage conservation. Annual water-loss audits and a leak reduction program will reduce water loss. An educational program will help the public to understand the importance of conservation and methods by which conservation can be achieved. Evaluation of the potential for reuse of treated wastewater, especially for industry, will be completed for all new facilities. In addition, a four-tiered approach to reducing water consumption during emergency conditions will protect the Town's water supplies during shortages.

A combination of the water conservation measures to be implemented under normal conditions and the emergency use restrictions described in this document will reduce finished water demand. Through a combination of new supply sources and water conservation, the Town will be able to supply predicted water demands into the future.

ATTACHMENT 2

LOCAL GOVERNMENT ORDINANCE FORM

ORDINANCE NO. 178

AN ORDINANCE TO ESTABLISH RULES AND REGULATIONS FOR WATER EMERGENCIES AND CONSERVATION

BE IT ORDAINED BY THE TOWN COUNCIL OF THE TOWN OF EXMORE, VIRGINIA THAT:

(a). Purpose and authority to declare water emergencies For purposes of this ordinance, unless the context clearly requires a contrary meaning, the term "water" shall mean potable water withdrawn from any water utility system that is owned and/or operated by the Town of Exmore.

In the event of an actual or anticipated shortage of potable water due to climatic, hydrological, mechanical and/or other extraordinary conditions, the Town of Exmore may determine that certain uses of water should be reduced, restricted, curtailed and/or prohibited. These reductions, restrictions, curtailments and/or prohibitions are intended to protect the health, safety and welfare of the residents of the Town of Exmore.

The Town Manager, with the approval of the Mayor and Council, or its subsequent ratification within forty-eight (48) hours is authorized to declare water emergencies in the town, as a whole or portions thereof, affecting the use of water.

(b). Water conservations measures. After the declaration of a water emergency and upon a determination by the Town Manager of the existence of the following one or more conditions, the Town Manager shall take the following actions which shall apply to any person whose water supply is furnished from the Town of Exmore public water utility system:

(1) *Condition 1.* When moderate but limited supplies of water are available, the Town Manager shall, through appropriate means, call upon the affected population and entities to employ prudent restraint in water usage and to conserve water voluntarily by whatever methods available.

(2) *Condition 2.* The Town Manager is hereby further authorized during the duration of a water emergency for which voluntary measures would be insufficient to order the restriction or prohibition of any or all of the following uses of the water supply.

   a. Watering of outside shrubbery, trees, lawns, grass, plants, home vegetable gardens, or any other vegetation except from a watering can or other container not exceeding five (5) gallons in capacity. This limitation shall not apply to commercial greenhouses, nursery stocks and sod growing, which may be watered in the minimum amount required to preserve plant life between 6:00 pm and 8:00 am.

   b. Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in licensed commercial vehicle wash facilities.

c. Washing of sidewalks, streets, driveways, parking lots, service station aprons, exteriors of homes or apartments, commercial or industrial buildings or any other outdoor surface, except where mandated by federal, state or local law.

d. The operation of any ornamental fountain or other structure making a similar use of water.

e. The filling of swimming or wading pools requiring more than five (5) gallons of water, or the refilling of swimming or wading pools that were drained after the effective date of the declaration of emergency, except that pools may be filled to a level of two (2) feet below normal, or water may be added to bring the level to two (2) feet below normal, or as necessary to protect the structure from hydrostatic damage.

f. The use of water during outdoor recreational activities. This limitation shall not apply to water utilized for drinking and sanitary purposes during such activities.

g. The use of water from fire hydrants for any purposes other than fire suppression and related training exercises, unless otherwise approved by the Town Manager.

h. The serving of drinking water in restaurants, except upon request.

i. The operation of any water-cooled comfort air conditioning that does not have water-conserving equipment in operation.

(3) Condition 3. In addition to the restrictions and prohibitions authorized under subsection 2 above, the Town Manager is hereby further authorized during the duration of a water emergency to implement any or all of the following.

a. Industrial, institutional, commercial, governmental, wholesale and all other nonresidential customers shall be allotted a percentage reduction based on that customers' average monthly water consumption for the same billing period of the previous calendar years' consumption.

b. Individual residential customers shall be limited to a specific volume or percentage reduction of water per month.

c. Declaration of a moratorium on new and expanded connections to the public water utility system, unless such connections are primarily intended and designed to provide fire protection and/or potable drinking water to lawfully permitted residential or nonresidential buildings that are existing or substantially constructed at the time that a water emergency is declared.

(4) *Condition 4.* When crucially limited supplies of water are available, the Town Manager shall restrict the use of water to purposes, which are absolutely essential to life, health and safety. Such permitted uses of water may include, but may not be limited to, the provision of limited quantities of water for drinking and sanitation purposes to residents, health care facility patients and/or emergency shelter evacuees, who are unable to utilize their potable water supplies due to the loss of electrical power, storm events or other natural or man-made causes.

(5) *Failure to address leaks.* It shall be unlawful for the owner of any residential Unit or units or the owner of any commercial or industrial establishment, which is found to be an excessive user of water due to leakage from waterlines or plumbing fixtures on the premises, to fail to take immediate action to repair and to stop such leakage after being so ordered by the Town Manager or his agent.

(6) *Effective date.* The imposition of the restrictions above shall become effective upon their being printed in any newspaper of general circulation in the Town of Exmore, or broadcast upon any radio or television station serving the Town of Exmore.

(7) *Appeals for exemptions.* Upon implementation of subsections (2), (3) or (4) above, the Town Manager shall establish an appeals procedure to review customer applications for exemptions from the provisions of subsections (2), (3) or (4) on a case-by-case basis and, if warranted, to make equitable adjustments to such provisions. The Town Manager shall also be empowered to establish regulations governing the granting of temporary exemptions applicable to all or some of the uses of the water supply set forth in subsections (2), (3) or (4). The Town Manager shall, in rendering a decision on such applications, balance economic and other hardships to the applicant resulting from the imposition of water use restrictions or allocations against the individual and cumulative impacts to the water supply resulting from the granting of such exemptions and may impose reasonable conditions to ensure compliance with the terms of the exemption.
Any person subject to a decision rendered by the Town Manager under this section may appeal such decision to the Mayor and Council. The appeal shall be in writing and shall be submitted to the Town Manager, as agent for and clerk to the Mayor and Council.

The Town Manager may issue temporary waivers or exemptions within the provisions of this section for such periods of time as may be necessary for the Mayor and Council to formally consider action on the appeal.

The Mayor and Council shall render on the appeal and may: affirm, with or without modification, the Town Manager's decision; or approve the requested exemption, with or without modification. The Mayor and Council may impose reasonable conditions to ensure compliance with the terms of any exemption granted hereunder.

Any decision rendered by the Mayor and Council shall be subject to remedies provided by statute.

(a.) Penalty for violation. Any person who shall violate any of the provisions of this ordinance, or of any of the conservation regulations promulgated by the Town of Exmore pursuant thereto, shall, upon conviction thereof, be subject to a fine of $250.00. Each act or each day's continuation of a violation shall be deemed a separate offense.

In addition to the foregoing, the Town Manager may suspend public water utility service to any person continuing to violate the provisions of this ordinance or the regulations promulgated hereunder.

If such public water utility service is terminated, the person shall pay a reconnection fee of fifty ($50.00) before service is restored.

(b). Declaration of end of water emergencies. The Town Manager shall notify the Mayor and Council when, in his opinion, the water emergency situation no longer exists. Upon concurrence of the Mayor and Council, the water emergency shall be declared to have ended.

ORDAINED by the Mayor and Council at its regular meeting held on October 20, 2008.

Approved this 20th day of October, 2008.

APPROVED: ______________
Guy Lawson, Mayor

At the meeting held on October 20, 2008, by the motion made by Vice-Mayor William Moore and seconded by Councilman Charles Massey to adopt the amended Ordinance No. 178.

____
Ethel Parks, Town Clerk

VIRGINIA DEPARTMENT OF HEALTH
ENGINEERING DESCRIPTION SHEET

DATE: June 7, 1984
REVISED: July 14, 1988; June 22, 1995; September 5, 1995

WATERWORKS NAME: Town of Exmore CERTIFIED CLASS: IV

COUNTY/CITY: Northampton County TYPE: Community

LOCATION: Well No. 1 and the 200,000 gallon elevated storage tank are located on the east side of State Route 693. Well No. 2 is located on the north side of State Route 687, approximately 1/4 mile east of Route 693.

OWNER: Town of Exmore
The Honorable Bruce Manuel, Mayor
P.O. Box 647
3239 Main Street
Exmore, Virginia 23350
804/442-3114

OPERATOR: Mr. Michael W. Thornes, Waterworks Operator (Class III)
P.O. Box 647
3239 Main Street
Exmore, Virginia 23350
804/442-3114

PERMIT NO.: 3131210

DATE ISSUED: June 30, 1977

TYPE OF TREATMENT: None

SOURCE: Two Wells

DESIGN CAPACITY: 1,000 ERC or 400,000 gpd

DESCRIPTION OF SYSTEM

This waterworks consists of two drilled wells, a 200,000 gallon elevated storage tank, and the distribution system.

Well No. 1 was drilled to a total depth of 270 feet on May 30, 1950. It was completed to a total depth of 200 feet, with 80 feet of 18-inch diameter steel casing and neat cement grout. Enclosed inside the casing is 160 feet of 8-inch diameter steel pipe followed by 30 feet of bronze screen. The annular space around the 8-inch pipe (and screen) is filled with gravel. The static water level was 34 feet and the well yielded 240 gpm for a drawdown of 13 feet during a drawdown test of unknown duration. This well is equipped with a turbine pump (20 H.P. electric motor) rated at 230 gpm at 206.5 feet TDH.

Well No. 2 was drilled to a total depth of 228 feet on May 12, 1965. It was completed to a total depth of 212 feet, with 89 feet of 20-inch casing and grout. Enclosed inside the casing is 150 feet of 8-inch diameter steel pipe followed by 62 feet of 8-inch stainless steel screen. The annular space around the 8-inch pipe (and screen) is filled with gravel. The static water level was 28 feet and the well yielded 285 gpm for a drawdown of 72 feet during a drawdown test of 25 hours. This well is equipped with a turbine pump (25 H.P. electric motor) rated at 285 gpm.

EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent residential connections (ERC). One ERC will utilize 400 gallons per day. This system's capacity is evaluated as follows:

I. Source Capacity

  A. Source Yield

    1. Number of Sources

      a. Required = 1 up to 49 ERC, more than 1 for 50 or more ERC
      b. Provided = 2 wells

    2. Well Yield: 240 gpm + 285 gpm = 525 gpm

    3. Pump Yield: 230 gpm + 285 gpm = 515 gpm

  B. Production Capacity

$$\frac{515 \text{ gpm}}{0.5 \text{ gpm/ERC}} = 1{,}030 \text{ ERC}$$

II. Storage Capacity

  A. Effective Storage = 200,000 gallons

  B. Storage Capacity

$$\frac{200{,}000 \text{ gal.}}{200 \text{ gal./ERC}} = 1{,}000 \text{ ERC}$$

III. Limiting Case

A. Storage Capacity = 1,000 ERC

B. Capacity Equivalent

1,000 ERC X 400 gpd/ERC = 400,000 gpd

Therefore, based on the critical values discussed above, this waterworks was issued an operation permit for a design capacity of 400,000 gpd or 1,000 ERC. It is stressed that the flow restriction is the limiting factor and that the permitted number of connections is only an indicator of when the flow restriction will be reached. Therefore, this system may exceed the permitted number of connections as long as the flow is within the limits as indicated by proper reporting, as determined by the Health Department engineers.

KOT/SSK/slh

Holiday Acres Mobile Home Park

3100-001 / NEW

VIRGINIA DEPARTMENT OF HEALTH
ENGINEERING DESCRIPTION SHEET

DATE:	November 16, 1978
REVISED:	December 27, 2002

WATERWORKS NAME: Holiday Acres Mobile Home Park   CERTIFIED: VI

COUNTY/CITY: Northampton County   TYPE: Community

LOCATION: Located on the west side of U.S. Route 13 at Weirwood approximately 2 miles south of Nassawadox.

OWNER: Mrs. Mary Riggin
P.O. Box 45
Marionville, Virginia 23408
(757) 442-9275

OPERATOR: Mrs. Mary Riggin
P.O. Box 45
Marionville, Virginia 23408
(757) 442-9275

PERMIT NO.: 3131300

DATE ISSUED: January 25, 1980

TYPE OF TREATMENT: None

SOURCE: One well (installed – 2nd well planned)

DESIGN CAPACITY: 75 Trailer Connections

DESCRIPTION OF SYSTEM

The system consists of one well, one ground storage tank, two transfer pumps, one hydropneumatic tank and the distribution system.

Well No. 1 is a 4-inch diameter well 178 feet deep with 4-inch diameter scrrens located from 158 feet to 178 feet. The well is equipped with a submersible pump with the intake set at 150 feet (rated at 30 gpm) which discharges to a 11,000 gallon water standpipe. Two booster pumps are provided, each capable of 110 gpm at 150 feet TDH, powered by a 7.5 H.P. electric motor. A 2,000 gallon pressure tank discharges to the distribution system consisting of 4-inch diameter PVC pipe.

The well was yield tested in May of 1978 at 25 gpm for 48 hours producing a draw down of 35.5 feet (20 ft. static – 55.5 ft dynamic). Specific yield = 0.7 gpm/sq.ft. Theoretical yield = 77 gpm [(158 – 20) x .8 x .7 gpm (depth to screens – static level) x usable depth x specific yield].

This system will be served by two wells in the future. The second well is to be drilled when the system reaches a service population of 50 connections.

EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent trailer connections (ETCs). One ETC will utilize 300 gallons per day. This system's capacity is evaluated as follows:

I. Source Capacity (Groundwater)

A. Source Yield

1. Number of Sources

a. Required = 1 up to 49 connections, more than 1 for 50 or more connections
b. Provided = 1 well

2. Well Yields: 25 gpm pump test (77 theoretical)

3. Pump Yields: 30 gpm

B. Source Capacity

30 gpm / .5 gpm/ETC = 60 ETC

II. Storage Capacity

A. Effective Storage

11,000 + 1/3 (2000) = 11,666

B. Storage Capacity

$$\frac{11{,}666 \text{ gal}}{150 \text{ gal/ETC}} = 77.8 \text{ trailer connections}$$

III. Limiting Case

A. Existing Situation = 50 Trailer Connections (current 1 well)

Therefore, based on the critical values discussed above, this waterworks was issued an operation permit for a design capacity of 75 Trailer Connections. The actual limiting case would be number of wells with a trailer limit of 50 with the understanding that a second well would be installed when 49 connections were made. Therefore, this system may not exceed the permitted number of connections.

DWT/mw

Kiptopeke Condominiums

3100-001 / NEW

Northampton County Government Complex

Virginia's Eastern Shore

MALCOLM PIRNIE

3100-001 / NEW

1. Water Demand Narrative and Documentation of Beneficial Use

The County of Northampton, Virginia, has constructed a new governmental complex complete with a new public non-transient water supply and wastewater treatment facility to serve the following:

1. One 325 inmate regional jail facility
2. One Social Services Building (55 employees and 70 clients per day).
3. One Court Building housing General District, Circuit, and Juvenile and Domestic Relations Courts
4. One Sheriff's Office with 24 officers
5. Ancillary offices: Registrar, Commonwealth's Attorney, Juvenile Probation, Clerk of Court, Clerk of the Works, Public Services Director, etc.

At capacity, this facility can be expected to utilize up to 35,732 gallons per day or 13,042,180 gallons per year. The average monthly maximum use is estimated to be 1086,848 gallons. Peak monthly gallonage is estimated to be 1,120,598 gallons (see Landscape Irrigation).

The major use of this water resource will be the new regional jail facility. Uses such as this one are well documented by the Virginia Department of Corrections (DOC) on similar facilities in Virginia. Representatives from the DOC furnished us the water use annual report, and recommended that we project water use at the Northampton facility based on water use data from the newer facilities in the Commonwealth. These facilities, including Red Onion State Prison, Wallens

Ridge State Prison, Cod Springs Correctional Unit 10, Fluvanna Correctional Center for Women, Haynesville Correctional Center, Sussex 1 State Prison and Sussex 2 State Prison, have water-saving devices installed and currently employ water-saving strategies. Normal water use is estimated by DOC as 120 gallons per day per inmate. This number is used for engineering estimates of infrastructure requirements and sizing. However, for the seven newer facilities, average annual water use was 97.5 gpd per inmate. It is also interesting to note that DOC recommends estimating staff water use as five employees equals one inmate. We have estimated employee use as 15 gpd, which is less than the comparable DOC estimate of 19.5 gpd (97.5 gpd/5 staff). According to Page 40 of the onsite Sewage handling and Disposal Regulations, the minimum flow rate for office facilities is 15 gallons per day per employee. However, understanding that the offices will only be open, on average, 5 days per week, we have updated all of the staff use by 5/7ths, or 71%. As such, staff use is estimated as 10.5 gpd fpr new facilities and 24.5 gpd for old facilities. Seven (7) day staff water use estimates remain unchanged. Visitor and Staff (5 and 7 day) usage totals are estimated to be 2,845 gpd or 8% of the total use.

There will be a small irrigation use for the courthouse green (< 2% of the total use when and if needed). There are 20 pop-up type sprinklers which will use 3.04167 gpm at normal system pressure. These sprinklers will be governed by timers which will allow for irrigation to occur during two one-half hour intervals (morning and evening) every other day during the 140 day irrigation season (typically May 21-October 7). There will be 70 days during this period that irrigation will take place if needed. Maximum water use during the irrigation period is expected to be approximately 255,500 gallons per year as shown in the following calculations.

LANDSCAPE IRRIGATION

Landscape irrigation will occur during a (roughly) 140 day period beginning May 21st and ending October 7th of each year. Actual irrigation will occur on 70 of those days (every other day) if needed and for a period of 1 hour per day. Peak monthly water use will occur during the summer months when landscape irrigation is taking place.

That peak monthly amount can be calculated as follows:

<u>Irrigation Gallonage Per Day (on days of operation)</u>

20 sprinklers X 3.04167 GPM X 60 minutes/day = 3650 gallons per day

<u>Irrigation Gallonage Per Year (based on 70 days of the 140 day season)</u>

20 sprinklers X 3.04167 GPM X 60 min/day X 70 days/yr = 255,500 gallons/year

<u>Irrigation Gallonage (yearly average GPD)</u>

255,500 gallons per year / 365 days per year = 700 gallons per day

<u>Irrigation Gallonage (monthly peak GPD for June, July, or August</u>

3650 gallons per day X 15 irrigation days = 54,750 gallons per month

<u>Peak Use Resulting From Landscape Irrigation Practices</u>

Monthly Water Use = 1,086,848 GPD

Irrigation Monthly Average Water Use = 700 GPD X 30 days/month
= 21,000 gallons per month

Irrigation Monthly Peak Water Use = 3650 gallons per day X 15 irrigation days
= 54,750 gallons per month

Peak Use = Monthly Water Use – Irr. Monthly Average + Irr. Peak

1,086,848 – 21,000 + 54,750 **= 1,120,598 gallons per month Peak Use**

<u>Irrigation Percentage of Total Use</u>

$$\frac{\text{255,500 gallons per year}}{\text{13,042,180 gallons per year}} = \text{2.1 \% of total water use}$$

The waste water treatment plant will use up to 500 gallons per day of potable water for foam control, general washdown, and laboratory purposes (<1.4% of total use when and if needed).

2. Water Demand Projections

Construction of the Northampton County Government Complex will be phased in over the next few years. The demand calculations are for the complex at full buildout and no further expansion is planned.

See the attached "Water Demand Estimates".

NORTHAMPTON COUNTY GOVERNMENT COMPLEX - WATER DEMAND ESTIMATES

	Staff				Visitor				Total Flow
	# people	Unit flow (gpd)	7 day Flow (gpd)	5 day Flow	# people	Unit flow (gpd)	7 day Flow (gpd)	5 day Flow	
Dept. of Social Services	55	10.5	0	577.5	70	3	0	210	787.5
Clerk of Court	7	10.5	0	73.5	3	3	0	9	82.5
Circuit Court	4	10.5	0	42	100	3	0	300	342
Gereral District Court	8	10.5	0	84	100	3	0	300	384
J&DR Court	4	10.5	0	42	80	3	0	240	282
Juvenile Probation	10	10.5	0	105	5	3	0	15	120
Commonwealth's Attorney	4	10.5	0	42	0	3	0	0	42
Registrar	4	10.5	0	42	5	3	0	15	57
Sheriff's Office	24	10.5	252	0	5	3	15		267
Jail	40	10.5	420	0	20	3	60		480
Jail (inmates) 325 capacity	325	97.5	31687.5	0	0	0	0		31687.5
Sub-Total			32359.5	1008			75	1089	34531.5
WWTP		500	500	0	0	0	0	0	500
Irrigation	20 heads	35	700	0	0	0	0		700
Total			33559.5	1008			75	1089	35731.5

Yearly water needs = 35,732 gpd X 365 days
'= 13,042,180 gallons per year

Northhampton County
Governmental Center
Master Plan
Wastewater Estimate

GMB File No. 2002124

Documentation of Beneficial Use

Water Demand Summary

	STAFF			VISITOR			STAFF + VISITOR
Building/Office	# people	Unit demand (gpd)	Demand (gpd)	# people	Unit demand (gpd)	Demand (gpd)	Demand (gpd)
Dept. of Social Services	55	10.5	578	70	3	210	788
Clerk of Court	7	10.5	74	3	3	9	83
Circuit Court	4	10.5	42	100	3	300	342
Gereral District Court	8	10.5	84	100	3	300	384
J&DR Court	4	10.5	42	80	3	240	282
Juvenile Probation	10	10.5	105	5	3	15	120
Commonwealth's Attorney	4	10.5	42	0	3	0	42
Registrar	4	10.5	42	5	3	15	57
Sheriff's Office	24	10.5	252	5	3	15	267
Jail	40	10.5	420	20	3	60	480
Jail (inmates)	325	97.5	31,688			0	31,688
Irrigation (Courthouse lawn)	20	35	700	0	0	0	700
Waste Water Treatment Plant	1	500	500	0	0	0	0
TOTAL			34,568			1,164	35,732

Average daily demand = 35,732 gal/day
Average monthly demand = 1,086,848 gal/month
Average yearly demand = 13,042,180 gal/year

Fire reserve storage is for onsite fire hydrants and sprinkler systems and routine use is not anticipated.

Water Demand Projections

Construction of the Northampton County Government Complex will be phased over the next few years. The demand calculations are for the complex at full buildout and no further expansion is planned.

Proposed Well Pumping Schedule

Rotating lead/lag/standby configuration for equal wear and runtime

	Well 165-459 (#1)			Well 165-460 (#2)			Well 165-461(#3)		
Month	use	lead or lag	gal/month	use	lead or lag	gal/month	use	lead or lag	gal/month
January	daily	lag	272,500	daily	**lead**	826,000	intermittent	n/a	< 1,000
February	intermittent	n/a	< 1,000	daily	lag	272,500	daily	**lead**	826,000
March	daily	**lead**	826,000	intermittent	n/a	< 1,000	daily	lag	272,500
April	daily	lag	272,500	daily	**lead**	826,000	intermittent	n/a	< 1,000
May	intermittent	n/a	< 1,000	daily	lag	272,500	daily	**lead**	826,000
June	daily	**lead**	826,000	intermittent	n/a	< 1,000	daily	lag	272,500
July	daily	lag	272,500	daily	**lead**	826,000	intermittent	n/a	< 1,000
August	intermittent	n/a	< 1,000	daily	lag	272,500	daily	**lead**	826,000
September	daily	**lead**	826,000	intermittent	n/a	< 1,000	daily	lag	272,500
October	daily	lag	272,500	daily	**lead**	826,000	intermittent	n/a	< 1,000
November	intermittent	n/a	< 1,000	daily	lag	272,500	daily	**lead**	826,000
December	daily	**lead**	826,000	intermittent	n/a	< 1,000	daily	lag	272,500
January	daily	lag	272,500	daily	**lead**	826,000	intermittent	n/a	< 1,000
February	intermittent	n/a	< 1,000	daily	lag	272,500	daily	**lead**	826,000
March	daily	**lead**	826,000	intermittent	n/a	< 1,000	daily	lag	272,500
April	daily	lag	272,500	daily	**lead**	826,000	intermittent	n/a	< 1,000
May	intermittent	n/a	< 1,000	daily	lag	272,500	daily	**lead**	826,000
June	daily	**lead**	826,000	intermittent	n/a	< 1,000	daily	lag	272,500
July	daily	lag	272,500	daily	**lead**	826,000	intermittent	n/a	< 1,000
August	intermittent	n/a	< 1,000	daily	lag	272,500	daily	**lead**	826,000
September	daily	**lead**	826,000	intermittent	n/a	< 1,000	daily	lag	272,500
October	daily	lag	272,500	daily	**lead**	826,000	intermittent	n/a	< 1,000
November	intermittent	n/a	< 1,000	daily	lag	272,500	daily	**lead**	826,000
December	daily	**lead**	826,000	intermittent	n/a	< 1,000	daily	lag	272,500

Intermittent use is designated for maintenance of lead or lag well and or associated equipment.

SLM

VIRGINIA DEPARTMENT OF CORRECTIONS

ENVIRONMENTAL SERVICES UNIT

MAJOR INSTITUTIONS

FIELD UNITS

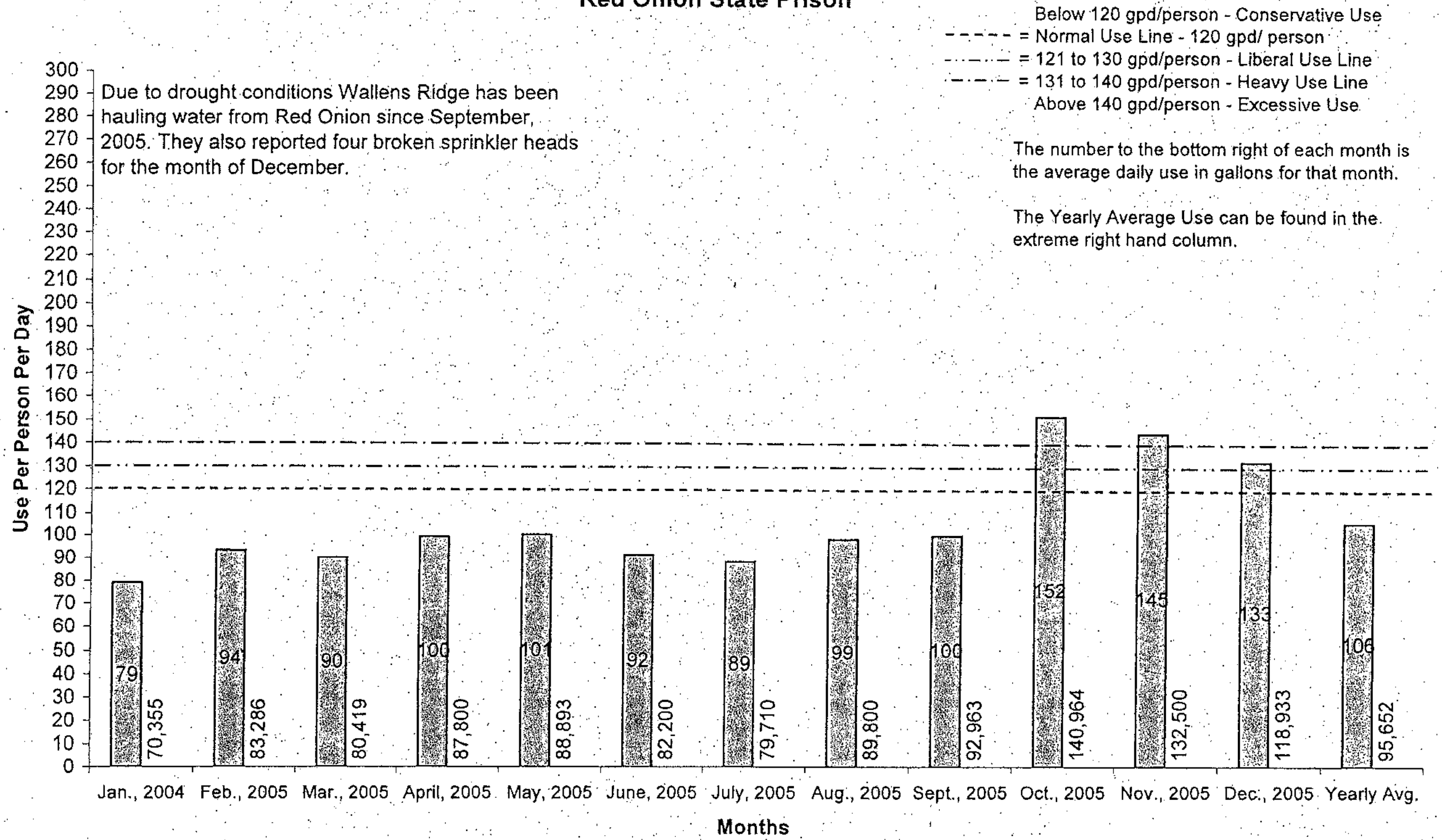
ADULT COMMUNITY CENTERS

WATER USE REPORT

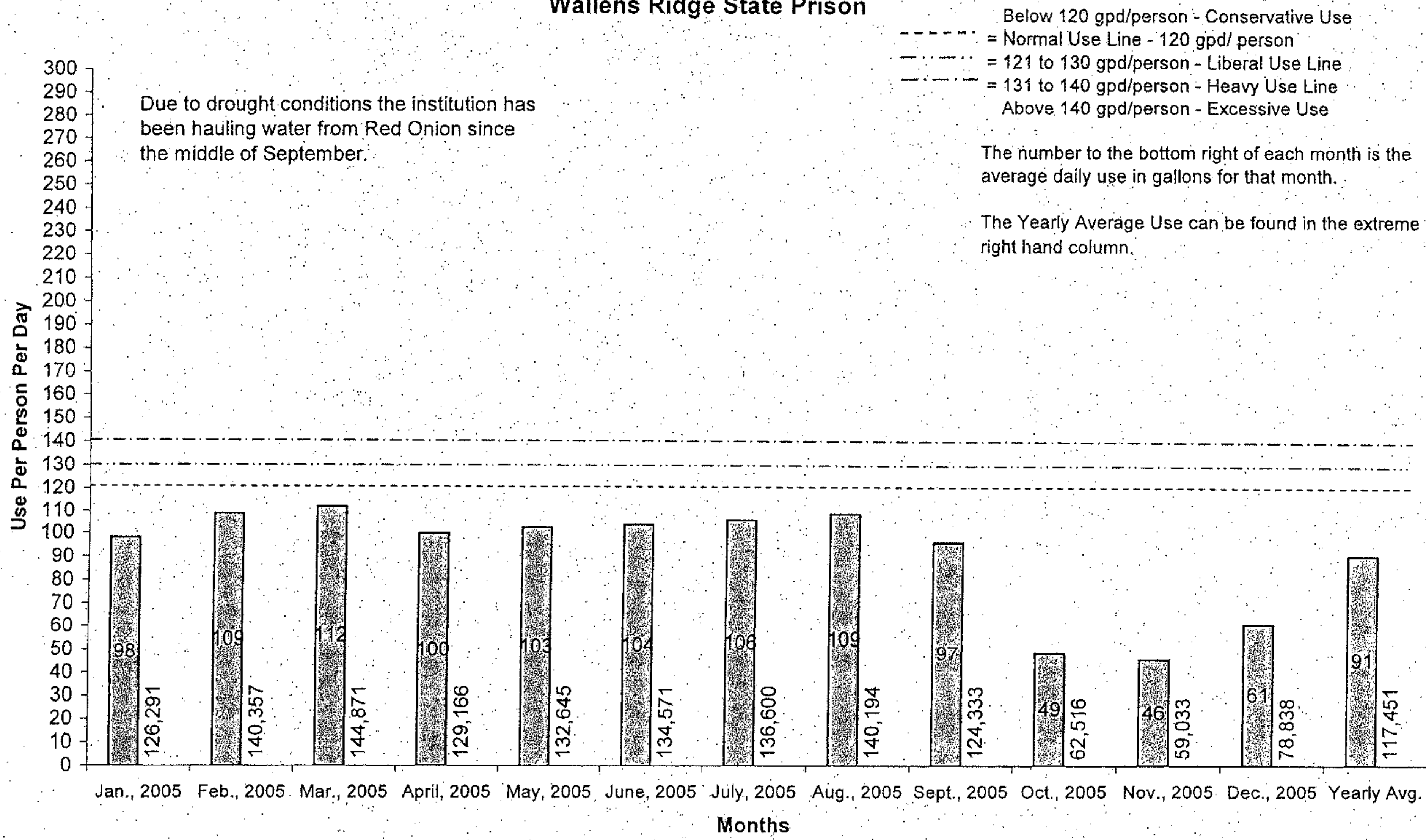
FOR THE MONTH of DECEMBER, 2005

(Includes 2005 Yearly Report)

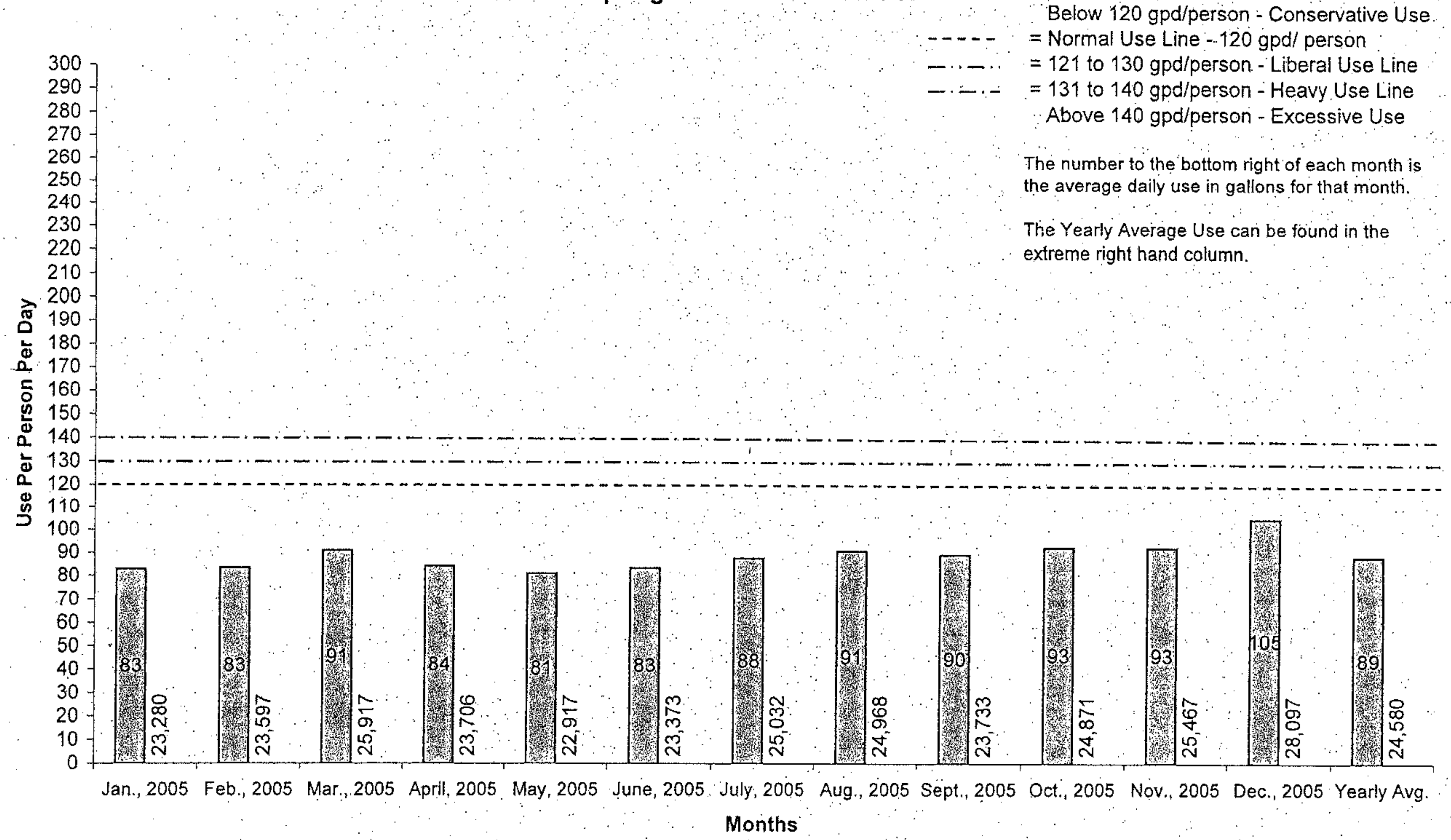
Water Use Per Person Trend Chart - West Service Area
Red Onion State Prison



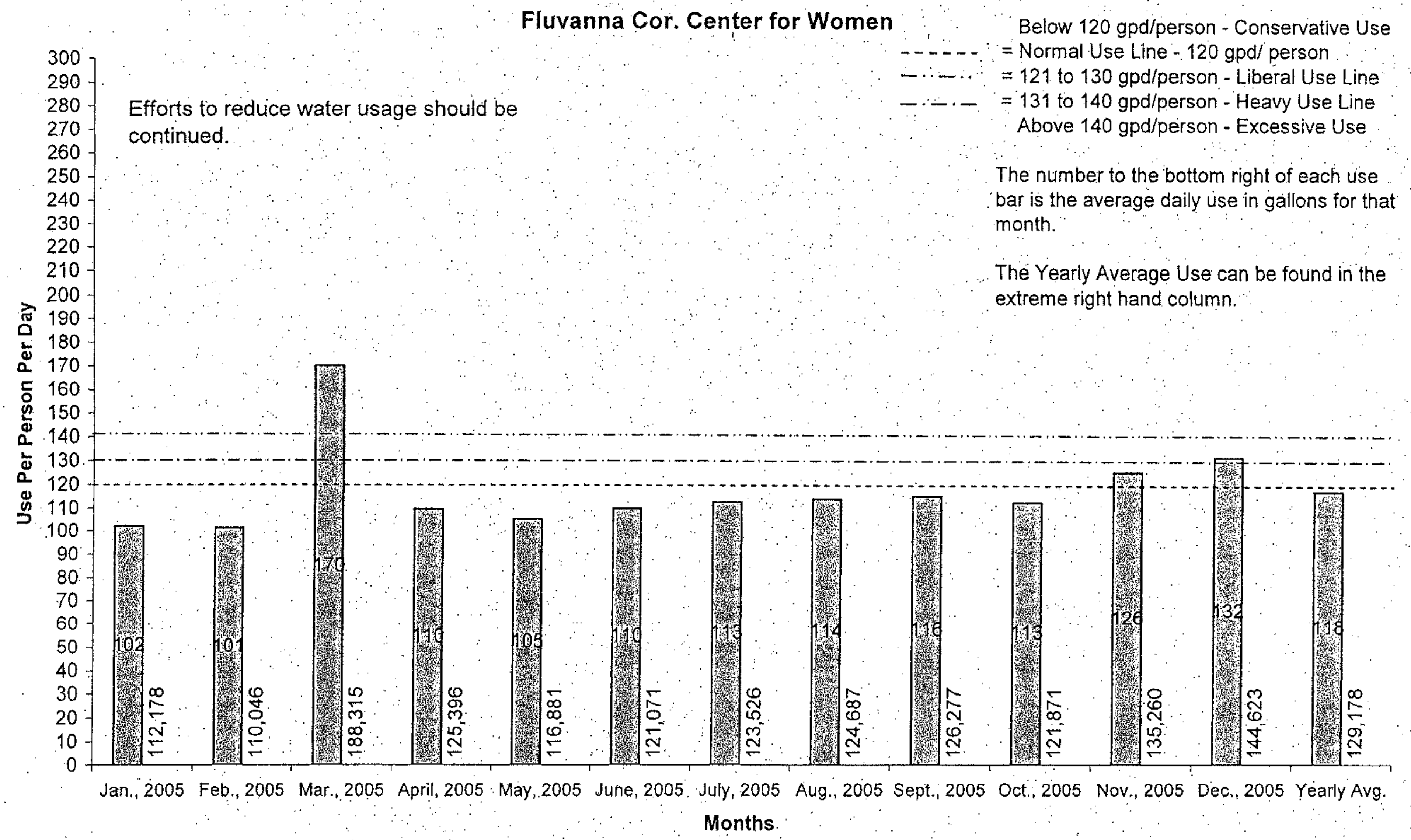
Water Use Per Person Trend Chart - West Service Area
Wallens Ridge State Prison



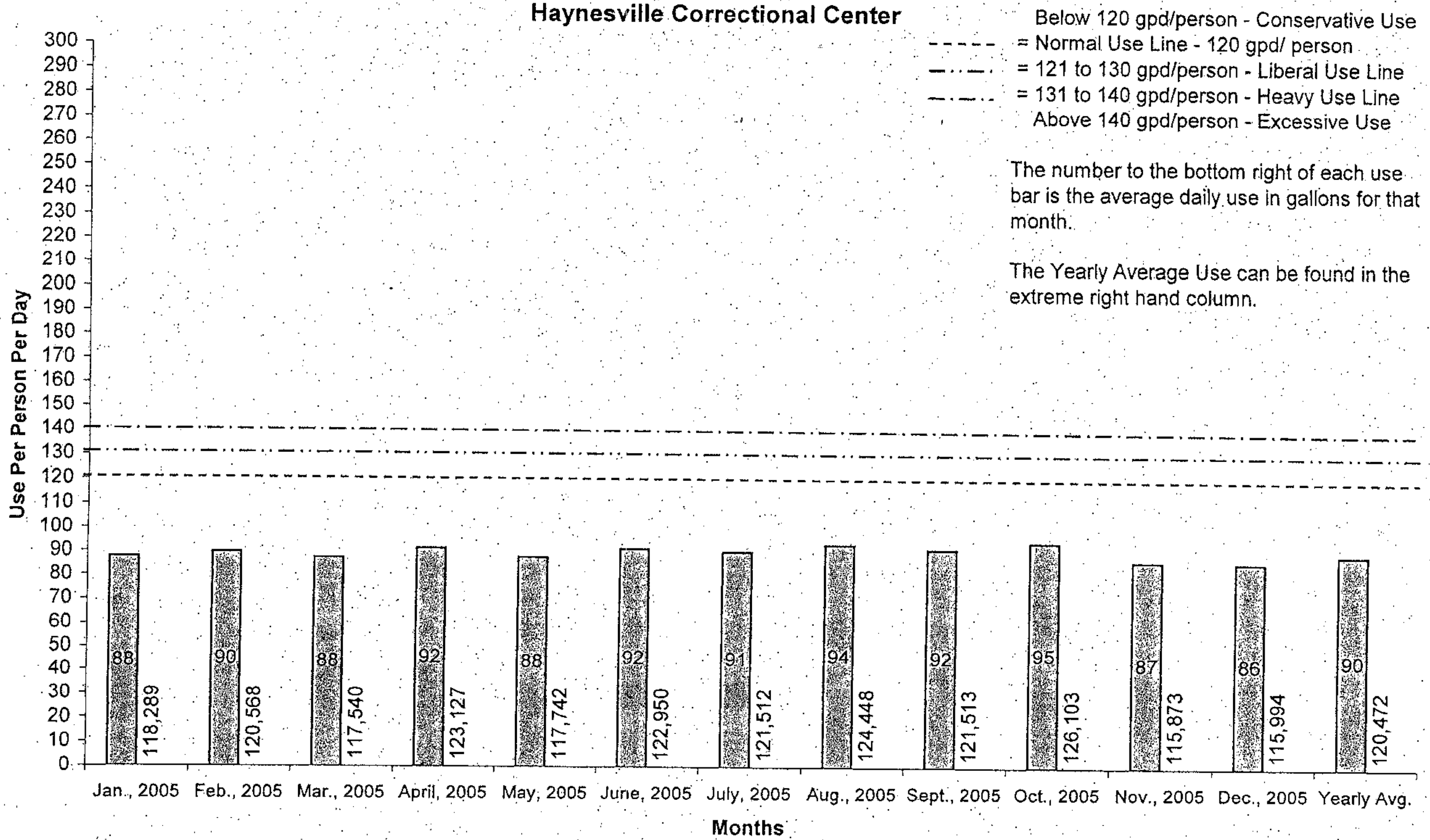
Water Use Per Person Trend Chart - North Service Area
Cold Springs Correctional Unit 10



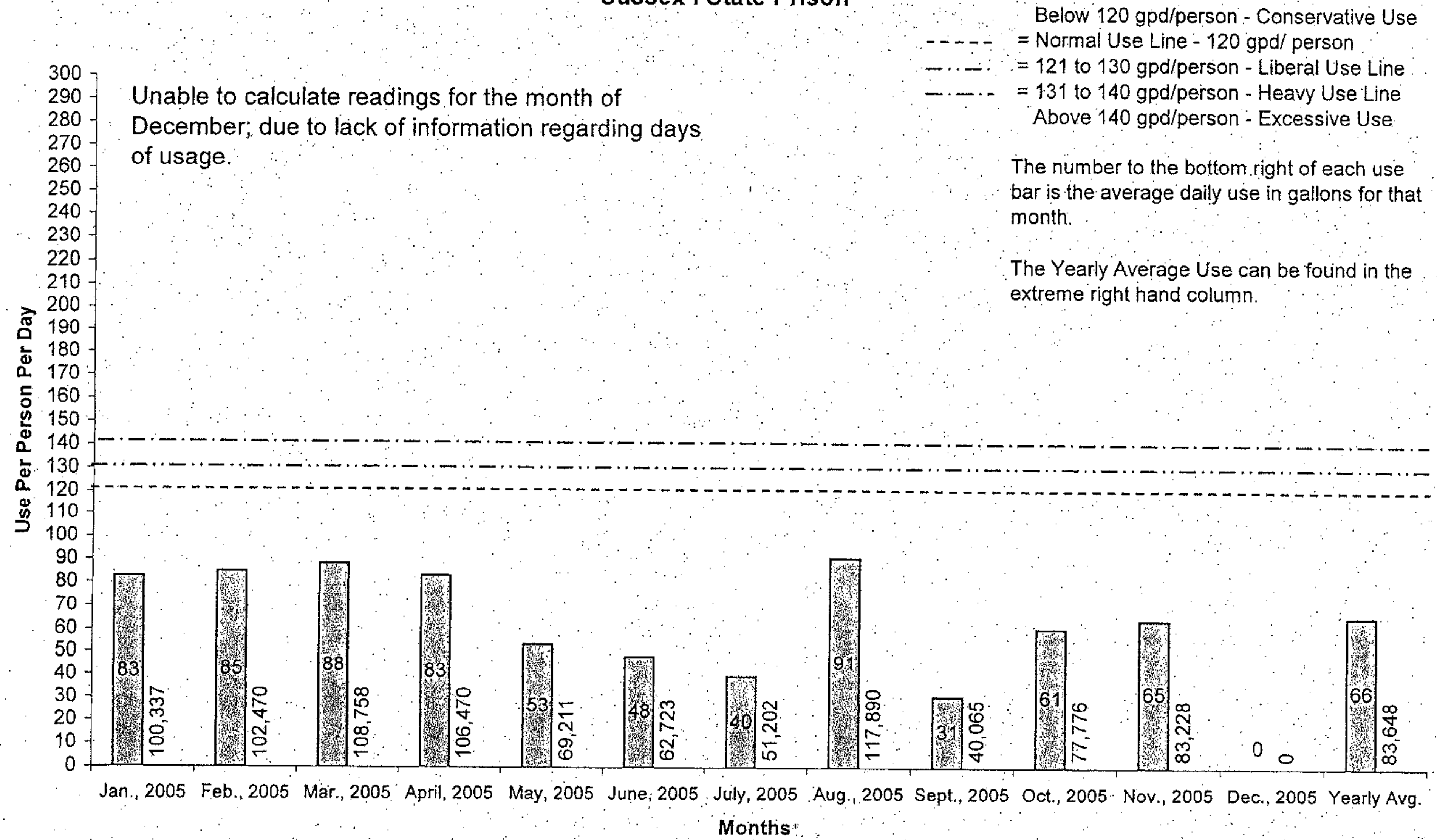
Water Use Per Person Trend Chart - North Service Area
Fluvanna Cor. Center for Women

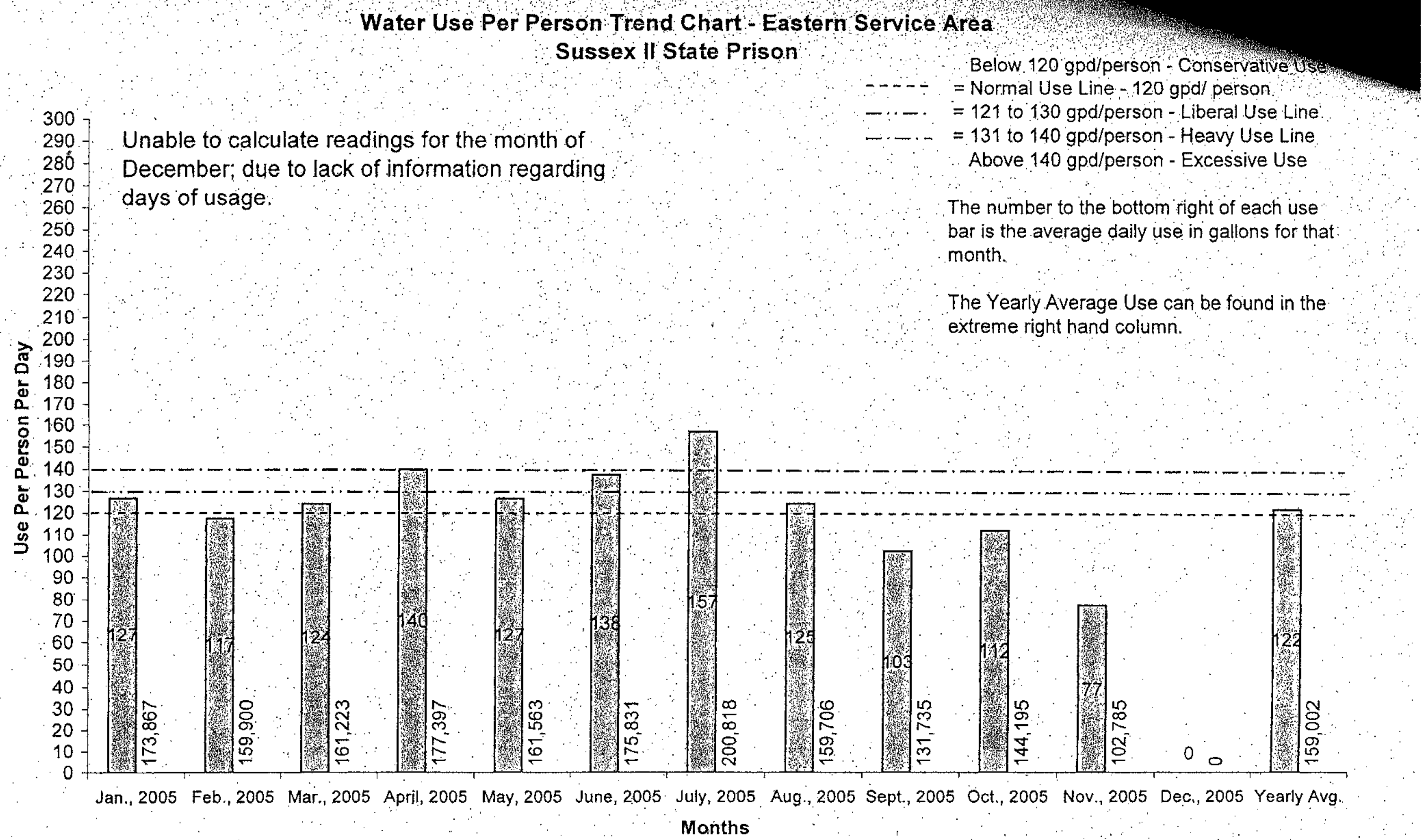


Water Use Per Person Trend Chart - Eastern Service Area
Haynesville Correctional Center



Water Use Per Person Trend Chart - Eastern Service Area
Sussex I State Prison




Water Use Per Person Trend Chart - Eastern Service Area
Sussex II State Prison
Below 120 gpd/person - Conservative Use
= Normal Use Line - 120 gpd/ person
= 121 to 130 gpd/person - Liberal Use Line
= 131 to 140 gpd/person - Heavy Use Line
Above 140 gpd/person - Excessive Use
The number to the bottom right of each use bar is the average daily use in gallons for that month.
The Yearly Average Use can be found in the extreme right hand column.
Unable to calculate readings for the month of December; due to lack of information regarding days of usage.
Use Per Person Per Day
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
127
173,867
117
159,900
124
161,223
140
177,397
127
161,563
138
175,831
157
200,818
125
159,706
103
131,735
112
144,195
77
102,785
0
0
122
159,002
Jan., 2005
Feb., 2005
Mar., 2005
April, 2005
May, 2005
June, 2005
July, 2005
Aug., 2005
Sept., 2005
Oct., 2005
Nov., 2005
Dec., 2005
Yearly Avg.
Months

Water Conservation and Management Plan

Northampton County Government Complex

County of Northampton
The Horns
Eastville, VA 23418

April 2006
Rev.October 2006

GMB FILE NO. 2002124.C

GEORGE, MILES & BUHR, LLC

ARCHITECTS/ENGINEERS

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SALISBURY/BALTIMORE/SEAFORD/LEWES/YORK/DOVER

TABLE OF CONTENTS

Water Conservation and Management Plan
DEQ Ground Water Withdrawal Permit
No. GW0049700

CHAPTER 1: INTRODUCTION

The water withdrawn under this permit will be used to serve the Northampton County Government Complex. This Complex will include a courthouse, a three-hundred twenty-five inmate regional jail facility, a sheriff's office and a social services building.

The administrative portion of the Northampton County Government Complex will be the direct responsibility of the Northampton County Administrator and her designee, the Director of Public Works.

Use of water in the sheriff's office and the regional jail will be administered by the Northampton County Sheriff and as dictated by this permit and in coordination with the County Director of Public Works.

Any recommended changes of procedures pertinent to the jail facility must meet the permit requirements of the Virginia Department of Corrections, the Virginia Department of Health/Office of Drinking Water and the Virginia Department of Environmental Quality.

CHAPTER 2: USE OF WATER SAVING PLUMBING PROCESSES

Since security and public safety are the highest priority at jails and prison facilities, water restricting plumbing devices are not generally used in such facilities. Water conservation fixtures which are used are those that specifically do not contain easily removable parts, such as hose bibs, shower heads and aerated faucet nozzles. Toilets will be designed with sufficient volume and pressure so as to prevent intentional stoppages.

A central control panel will allow the staff of this jail facility to have the capacity to control the frequency and duration of use of each inmate utilized fixture within the area of confinement, thereby enabling strict water conservation measures to be enacted and adhered to should there be the need.

2.1 INMATE HOUSING

A. Showers

Prolonged shower use will be prevented by installation of a dedicated water use control panel which will limit the duration, and, when needed, the frequency of use. In addition, restrictor devices will be installed where possible. The restrictor devices shall be installed such that special security tools are required for their removal.

B. Toilets

Restrictor devices will not be allowed on inmate toilets. Sufficient pressure and water volume is required to prevent stoppages. Water saving toilets will be utilized where security is not jeopardized. Devices will be installed on the toilets which will be designed to limit the gallonage utilized per flush without affecting the proper amount of water necessary for a full flush. Flush valves with no less than a 1.6 gpf requirement will be used. The frequency of use can be further limited and controlled via a central control panel.

C. Lavatory Sinks

The lavatory sink mixing valves shall be equipped with devices that limit prolonged water use. Aerators will not be used in areas where inmates can easily remove them. The duration and frequency of use can also be controlled via the central control panel.

D. Climate Control Facilities

Air-to-Air exchange climate control equipment will be utilized in lieu of Water-to-Air units and therefore will not be a consideration with regard to water use.

E. Water Coolers

Push-button or handicap push bar type single nozzle water coolers will be used in the courthouse facility.

F. Water-cooled ice makers

These devices generally use high amounts of water and shall not be installed. Air or refrigerant type ice machines will be used.

G. Hose Bibs or Single Faucet Sinks

Water saver fixtures, water restrictors and aerators will be used on these items.

2.2 FOOD PREPARATION AREAS AND MESS HALL

A. Hose bibs or single faucet sinks

Water saver fixtures, water restrictors and aerators will be manufactured into the hose bibs. Easily removable devices will not be used.

B. Toilets

Restrictor devices will not be allowed on inmate toilets. Sufficient pressure and water volume is required to prevent stoppages. Water saving toilets will be utilized where security is not jeopardized. Flushometers will be installed on the toilets which will be designed to lessen the amount of gallons per flush without affecting the proper amount of water necessary for full flush. Flush valves with no less than a 1.6 gpf requirement will be used.

Employee access toilets will be installed in areas with limited or no inmate access. These units will be self-contained tank type toilets. Flush valves with no less than a 1.6 gpf requirement will be used.

C. Lavatory Sinks

Mixing valves will be equipped with devices that limit prolonged use. Flow controllers, timers, motion detectors, or automatic shut on/off devices will be used. Aerators will not be installed in areas where they can be easily removed by inmates.

D. Water Coolers

Push-button or handicap push bar type single nozzle water coolers will be used in the jail facility.

E. Water-cooled ice makers

These devices generally use high amounts of water and shall not be installed. Air or refrigerant type ice machines will be used.

F. Miscellaneous Equipment

Water may be used to heat or cool food during preparation. The food preparation equipment will be evaluated by the Food Service Supervisor to determine water use. The equipment will be repaired or replaced if it is found to use more than the standard amount of water required for use.

All plumbing appliances will be equipped with water saver devices and back flow prevention devices. Toilet flush valves, hose bibs, and facets shall be maintained in good working order.

2.3 INDUSTRIES, MEDICAL, EDUCATIONAL AREAS

A. Toilets

Restrictor devices will not be allowed on inmate toilets. Sufficient pressure and water volume is required to prevent stoppages. Water saving toilets will be utilized where security is not jeopardized. Flushometers will be installed on the toilets which will be designed to lessen the amount of gallons per flush without affecting the proper amount of water necessary for full flush. Flush valves with no less than a 1.6 gpf requirement will be used.

Employee access toilets will be installed in areas with limited or no inmate access. These units will be self-contained tank type toilets. Flush valves with no less than a 1.6 gpf requirement will be used.

B. Showers

No water restriction devices will be used on showers that are specifically used as safety or chemical emergency use. These showers are specifically used for safety and will not be tampered with. If water safety devices will be used with the safety showers, these devices will be installed only in accordance with the safety aspect of the equipment.

C. Lavatory Sinks

Mixing valves will be equipped with devices that limit prolonged use. Flow controllers, timers, motion detectors, or automatic shut on/off devices will be used. Aerators will not be installed in areas where they can be easily removed by inmates.

D. Water Coolers

Push-button or handicap push bar type single nozzle water coolers will be used in the courthouse facility.

E. Water-cooled ice makers

These devices generally use high amounts of water and shall not be installed. Air or refrigerant type ice machines might be used.

F. Medical, Dental, X-Ray Equipment

All dental and medical equipment will be installed with water saving devices.

For X-Ray Equipment, reclaimable or recyclable equipment will be used where practical. Equipment that is replaced shall be designed for reclaimable or recyclable water use.

2.4 LAUNDRIES

Industrial and commercial equipment will be designed with low water use requirements. Full loads of laundry will be used rather than partial half loads so as to maximize the laundry load use. Personal washing machines will not be used.

2.5 ADMINISTRATIVE AND OUTSIDE THE SECURE PERIMETER BUILDINGS

A. Toilets

Tank type or self-contained toilet units with water saver devices will be used. Toilets with flush valves will have the control valve turned to minimum control.

B. Showers

Restrictor type showerheads will be used to limit shower times. Devices will be installed on the mixing valves to prevent prolonged water use.

C. Lavatories (sinks)

All sinks will be installed with water saving devices. Aerators may be used.

D. Water Coolers

Push-button or other handicapped accessible (push bar type) single nozzle water coolers will be used in the courthouse facility.

E. Hose Bibs

Water saver fixtures and water restrictor aerators will be used.

F. Washing Machines

Wash loads will be limited to once a week, full loads. Water saving devices will be installed on the machines.

G. Vehicle Maintenance Areas

Clean water will not be used to clean motors or parts. Water limiting steam jennys and / or high pressure washers will be used for cleaning. Functional spray nozzles will be used when water is used for cleaning.

2.6 OFFICE BUILDINGS

A. Toilets

Tank type or self-contained toilet units with water saver devices will be used. Toilets with flush valves will have the control valve turned to minimum control.

B. Showers

Restrictor type showerheads will be used to limit shower times. Devices will be installed on the mixing valves to prevent prolonged water use.

C. Lavatories (sinks)

All sinks will be installed with water saving devices. Aerators may be used.

D. Water Coolers

Push-button or handicapped accessible (push bar type) single nozzle water coolers will be used in the courthouse facility.

E. Hose Bibs

Water saver fixtures and water restrictor aerators will be used.

F. Cafeterias

All plumbing appliances will be equipped with water saver devices. Toilet flush valves, hose bibs, and facets shall be maintained in good working order. Thawing of frozen food by running or still water shall not be permitted. Advance thawing of foods under refrigeration or by microwave oven is required.

G. Irrigation

Timed automatic on/off devices shall only be used. Irrigation timers shall be set to operate during non-peak demand periods, the early morning, and late afternoon hours.

CHAPTER 3: WATER LOSS REDUCTION PROGRAM

3.1 Water Distribution and System Leaks

The Northampton County Public Works Department will read and record the main water meters on a monthly basis. The main water meters will alert the Department to excessive water use. Excessive use will be use of water above the daily design rate. High use of water will be investigated immediately. Water system leaks will be repaired mmediately. Frost proof yard hydrants will be installed to reduce burst pipe susceptibility.

3.2 Observation of Inmate Bath Areas

The corrections staff will observe the bath areas to prevent excessive water use by shower length, and when sinks and lavatories are left running.

3.3 Food Preparation

The kitchen staff will utilize water saving methods during food preparation and cleanup activities. In lieu of a full sink of water, use a half-full sink of water and wash smaller volumes of equipment at any one time. Schedule wash times. Kitchen staff will notify the jailer if high water use or water leaks are observed.

Presoak utensils in basins of water, rather than in running water.

Replace automatic shut-off spray nozzles, which can use as much as 4.5 gallons of water each minute, with low-volume nozzles using 2.0 gallons per minute.

Wash everything that can be washed in the dishwashers. Wash only full loads. Once the unit is filled for operation, the only water wasted is the rinse water or about one gallon per cycle.

Turn off food preparation faucets that are not in use. Consider installing foot triggers.

Adjust ice machines to dispense less ice if ice is being wasted.

3.4 Miscellaneous Water Use

The Maintenance Director will assign a member of his staff to be responsible for the water system day to day operations, follow up on high water use issues, and water conservation methods.

3.5 Water reuse

Water reuse will be implemented where it does not adversely affect the health and safety of the employees and inmates. The reuse of domestic water is limited in its capabilities.

CHAPTER 4: DROUGHT CONDITION WATER USE

Chapter 3 provided general information and guidance to conserve water, which should be followed during normal water use. This Chapter (4) concerns conditions when a drought has been declared. Drought conditions bring about concerns over water supplies and it is in the best interest of all users to curtail water use over what normal or day-to-day conservation requires.

Drought conditions in the Commonwealth are monitored by the Drought Monitoring Task Force, which is headed up by the Department of Environmental Quality in conjunction with the State Climatologist. Recommendations for curtailment of water use are a result of drought conditions as reported by this task force. The task force does not demand the curtailment of water use but advises the waterworks owner of conditions which may warrant concern. The representative for the owner in the Department of Corrections is the Director. The Director has directed the Environmental Services Unit to advise him on drought conditions base on information they receive from the Drought Monitoring Task Force and will be recommending what level of drought severity to employ.

The County will comply as directed by the Director of the Virginia Department of Environmental Quality to any requirements for mandatory water use reductions during water shortage emergencies including ordinances prohibiting the waste of water generally and requirements for mandatory water use restrictions, with penalties during water use emergencies.

The Task Force has developed a Drought Monitor. The drought monitor ranges from a level of dry conditions to exceptionally dry conditions. For the purposes of this Water Conservation and Management Plan, the severity codes will be based on the Drought Monitor.

Drought conditions vary in severity. Depending on the drought severity level, the action taken could range from no action to drastic water curtailment steps. Also, because drought severity can differ from county to county and in different sections of the state, an announced code condition could differ for each institution.

The following severity codes are to be followed when initiated by the Director after having been advised by the Environmental Services Unit.

4.1. Code Blue Drought Condition (an abnormally dry situation)

Code Blue drought conditions persist when the Drought Monitor stipulates a "DO" or abnormally dry situation. This is a situation where the Drought Task Force would recommend voluntary curtailment of water use but be more concerned with outdoor fires. The following steps shall be taken when a "Code Blue" severity level is announced.

A. Water will be conserved by voluntary curtailment of water use, see section 2.0 of this water conservation plan.

B. Voluntary water curtailment should be limited to reduced floor, sidewalk washing, irrigation, vehicle washing, etc.

4.2. Code Yellow Drought Condition (moderate and severe drought)

Code Yellow drought conditions persist when the Drought Monitor stipulates a "D1" and "D2" which means a moderate and severe drought, respectively. The Drought Monitoring Task Force would elevate the level of voluntary curtailment to stricter limits on the water use as follows:

A. Water will be conserved by voluntary curtailment of water use, see section 2.0 of this water conservation plan.

B. Vehicle washing is limited to once a week. Automatic water cutoff devices will be installed on all hoses.

C. Irrigation of lawns, flowers, shrubbery will be limited to once a week. Irrigation will be conducted only during periods of low flow. Spray nozzles will be used for hand watering. Sprinklers will not be used to irrigate flowers lawns, and shrubbery.

D. Water will be restricted for required wash downs of floors, walls, loading docks, etc. Limited daily use and automatic cut off devices will be used.

E. Washing machines used in the institution will be used only once a week with full loads only.

F. Special attention will be paid to system leaks. Repairs will be conducted as soon as possible.

G. Office personnel will be reminded to be cognizant of faucets left on, constantly flushing toilets, and wet areas on floors and lawns. These observations will be reported to maintenance.

4.3. Code Red Drought Condition (extreme and exceptional drought)

Code Red drought conditions persist when the drought monitor stipulates a "D3" and "D4" which means an extreme and exceptional drought, respectively. It is the most serious level of drought conditions that persists. The Drought Monitoring Task Force would elevate the level of recommended mandatory curtailment of the use of water as follows:

A. The respective Regional Office, Central Office and ESU will be notified.

B. Emergency services will be informed if the facility is in short supply or out of water for fire suppression. Emergency services will then be put on stand by.

C. Irrigation and washing of vehicles will cease.

D. Washing of floors, walls, loading docks, etc. will be stopped unless in violation of sanitation concerns. The respective Enviromental Health Specialist will be consulted for guidance pertaining to food sanitation concerns.

E. In the event of a water shortage, commercial restaurant operations will be required to cease operations until such water shortage has ended or by other acquisition of some additional and permanent water supply.

F. All laundry operations will cease. Clothes will be sent out for cleaning if necessary.

G. Inmate showering will be further restricted. Inmates will be placed on a scheduled shower time of every third day. Showering will be held to a 10 minute maximum.

H. Food services shall provide "cold plate" meals.

I. Vendors will be contacted for delivery of tank, bottled water and portable toilets. A list of vendors is provided in Appendix A.

CHAPTER 5: WATER USE EMERGENCIES

This water outage plan will be used during emergency water outages brought about by fires, mechanical failure or Code Red drought conditions. An emergency condition is declared when the day-to-day operation of the facility is seriously affected by the loss of water use.

5.1 Water Outage Emergency Plan

A. Immediate notification of the Maintenance Director/Water Conservation Manager, County Administrator, County Sheriff, Clerk of the Works, Assistant County Administrator, Environmental Health Supervisor, or Regional Health Director is required.

B. Notify emergency services that the facility is in short supply or out of water for fire suppression. Have these services standby for emergency situations.

C. Shut off master valves to specific buildings so as to prevent low pressure flush valve malfunction.

D. Shut off the master valve to the water storage tank. This will leave the tank full for an emergency situation, and prevent the loss of stored water. If the water source is shut off, facility personnel will maintain a constant lookout for fire and turn the water back on in the event of a fire.

E. Vendors will be contacted for delivery of tank, bottled water and portable toilets. A list of vendors is provided in the Appendix.

F. Water use that is non-essential for the operation of the facility will be ceased. Such water uses include, general cleaning, vehicle washing, irrigation, washing machines, etc.

G. Food services shall provide "cold plate" meals.

Chapter 6: Water Use Education Program

6.1 Assignment of Duties

The Public Works Director will assign the duties of Water Conservation Manager to existing staff. This staff member should have some experience with plumbing and plumbing fixtures, experience with making repairs to water distribution systems, and a general knowledge and dedication to water conservation.

6.2 Duties and Responsibilities

The staff member whom is assigned the duty of managing and overseeing water conservation will develop and maintain an education program to assure continual water conservation based on, but not limited to, the following criteria.

A. Enforce this Water Conservation and Management Plan and report any non-conformance and misuse of water resources to the Public Works Director.

B. Keep informed of water conservation means and methods by attending National, State, Local and Private seminars, meetings and events. This includes membership to magazines, papers, newsletters, etc., that pertain to water saving system equipment and conservation.

C. Routinely (at the discretion of the Public Works Director) hold meetings with the Institutional staff or office staff (office buildings) to keep them informed of the latest in water conservation technology and inform them of any amendments to this Water Conservation and Management Plan.

D. Maintain a posting system of newsletters, reports, drought reports, etc. where all staff can see and have access to. Maintain sufficient copies of reports for staff to study and read at their leisure.

E. Conduct meetings and in-house seminars with all Institutional staff to keep them informed of water conservation efforts, latest equipment technology and discuss issues of existing water conservation efforts in and around the Institution or office.

F. Quarterly, audit the water system and report findings concerning compliance with this Water Conservation and Management Plan to the Public Works Director. The report should not only report on non-compliance but provide recommendations to prevent future non-compliance.

6.3 Public Works Director Responsibilities

The Public Works Director will be tasked with Administering the Water Conservation and Management Plan. This includes the initial drafting of this plan, implementation and amendments. The Water Conservation Manager will copy the Public Works Director on all reports to keep the Public Works Director informed of accomplishments, non-conformances and other issues.

The Public Works Director will routinely meet with the Water Conservation Manager during institution visits to discuss progress. The Public Works Director will assist the Water Conservation Manager with implementation of this plan including the water use education program, assistance and advice for equipment and any support for mandated actions

VIRGINIA DEPARTMENT OF HEALTH
ENGINEERING DESCRIPTION SHEET

DATE: August 20, 2004

WATERWORKS NAME:	Northampton County Government Complex	CERTIFIED CLASS: V
COUNTY/CITY:	Northampton County	TYPE: Community
LOCATION:	This waterworks is located on off state route T1604 (Debedeavon Lane) approximately 1/4 mile west of Business Route 13 at Eastville.	
OWNER:	Northampton County P.O. Box 66 Eastville, VA 23347 (757) 678-0440	
OPERATOR:	Mr. John Parker (Class IV) c/o Northampton County Schools P. O. Box 360 Machipongo, VA 23405 (757) 331-1840	
PERMIT NO.:	304904	
DATE ISSUED:	August 20, 2004	
TYPE OF TREATMENT:	None	
SOURCE:	Groundwater (one well)	
DESIGN CAPACITY:	12,000 GPD	

DESCRIPTION OF PROPOSED PROJECT

The proposed waterworks project consists of one well, a 1,600-gallon hydropneumatic tank, and water lines connecting the well to the tank and then to the temporary housing unit.

The well was drilled starting on December 17, 2003, and was completed on December 18, 2003. The well bore is 220 feet deep, with cement grout extending from the surface to 60 feet. The PVC well casing is 8-inches in diameter and extends to 180 feet, extending to 200 feet of 6-inch PVC screen (10 slot). Gravel pack is installed from 180 feet to 200 feet. The well is equipped with a submersible pump (rated at 55 gpm at 210 feet TDH) driven by a 5 HP motor. The pump intake is set at 140 feet. The well ha s a tested yield of 60 gpm, over a 48-hour period from May 7, 2004 to May 9, 2004, with the water level dropping from 8-3/4 feet (static condition) to 119-1/3 feet (dynamic condition).

Storage is provided by a 1,600 gallon (effective capacity 523 gallons) hydropneumatic tank.

EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent residential connections (ERCs). One ERC for will utilize 400 gallons per day. This system's capacity is evaluated as follows:

I. Source Capacity

A. Source Yield

1. Number of Sources

a. Required = 1 up to 49 ERCs, more than 1 for 50 or more ERCs
b. Provided = 1 well

2. Well Yield:

60 gpm — 60 gpm / 0.5 gpm / ERC = 120 ERC
120 ERC * 400 gpd / ERC = 48,000 gpd

B. Well Pump Capacity:

55 gpm — 55 gpm * 1440 minutes / day = 79,000 gpd

II. Storage Capacity

A. Total Storage = 1,570 gallons ÷ 3 = 523 gallons effective storage

B. Storage Capacity = $\frac{523 \text{ gallons}}{200 \text{ gal./ERC}}$ = 2.165 ERCs

III. Peak Hour Capacity:
Estimated delivery capacity during one hour –

Pump 55 gpm * 60 minutes per hour =	3,300 gallons
Tank supply = 1,570 gallons / 3 =	523 gallons
Total	3,600 gallons

Peak hour demand of 1,098 gallons is less than the 3,600 gallons available, therefore peak hour demand can be met.

IV. Limiting Case

A. Storage Capacity = 2.61 ERCs

B. Exchanging 3 ERC production capacity for 1 ERC storage capacity can bring the capacity up to 30 ERCS – per approved design exception.

C. Capacity Equivalent = 30 ERCs x 400 gpd/ERC = 12,000 gpd

Therefore, based on the critical values discussed above, the proposed waterworks has a design capacity of 12,000 gpd.

DWT/mw

Shore Memorial Hospital

3100-001 / NEW

VIRGINIA DEPARTMENT OF HEALTH
ENGINEERING DESCRIPTION SHEET

DATE: July 20, 2006

WATERWORKS NAME:	Northampton Co. Government Complex	CERTIFIED CLASS: V
COUNTY/CITY:	Northampton County	TYPE: Community

LOCATION: This waterworks is located on off state route T1604 (Debedeavon Lane) approximately 1/4 mile west of Business Route 13 at Eastville.

OWNER: Northampton County
P.O. Box 66
Eastville, VA 23347
(757) 678-0440

OPERATOR: Mr. Michael Thornes
9181 Thoreau Drive
Birdsnest, Virginia 23307

PERMIT NO.: 302506

DATE ISSUED: July 20, 2006

TYPE OF TREATMENT: None

SOURCE: Groundwater (one well existing, two proposed)

DESIGN CAPACITY: 19,600 GPD

DESCRIPTION OF PROPOSED PROJECT

The proposed waterworks project consists of one elevated tank and distribution piping.

Storage is currently provided by a 1,600 gallon (effective capacity 523 gallons) hydropneumatic tank. This project will replace the hydropneumatic tank with an elevated tank. The effective capacity of the elevated tank is 74,798 gallons (75,000 nominal volume). This project also includes about 1,300 feet of 4-inch diameter, 1,050 feet of 6-inch diameter and 470 feet of 8-inch diameter waterlines.

EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent residential connections (ERCs). One ERC will utilize 400 gallons per day. This system's capacity is evaluated as follows:

I. Source Capacity

A. Source Yield

1. Number of Sources

a. Required = 1 up to 49 ERCs, more than 1 for 50 or more ERCs
b. Provided = 1 well
c. Proposed = 2 wells (total of three wells)

2. Well Yield:

60 gpm — 60 gpm / 0.5 gpm / ERC = 120 ERC
120 ERC * 400 gpd / ERC = 48,000 gpd

B. Well Pump Capacity:

55 gpm — 55 gpm * 1440 minutes / day = 79,000 gpd

II. Storage Capacity

A. Total Storage = 74,798 gallons (elevated)

B. Storage Capacity = $\frac{74{,}798 \text{ gallons}}{200 \text{ gal./ERC}}$ = 374 ERCs

III. Peak Hour Capacity:
Estimated delivery capacity during one hour –

Pump 55 gpm * 60 minutes per hour =	3,300 gallons
Tank supply = 74,798 =	74,798 gallons
Total	78,098 gallons

Peak hour demand of 3,900 gallons is less than the 78,098 gallons available, therefore peak hour demand can be met.

IV. Limiting Case

A. Number of wells = 49 ERCs

B. Capacity Equivalent = 49 ERCs x 400 gpd/ERC = 19,600 gpd

Therefore, based on the critical values discussed above, the modified waterworks will have a design capacity of 19,600 gpd.

DWT/mw

COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

APPLICATION FOR A GROUND WATER WITHDRAWAL PERMIT
(FOR USE IN GROUND WATER MANAGEMENT AREAS)

PREAPPLICATION CONFERENCE DATE: 10/20/04

1. **APPLICANT INFORMATION:**

FIN/SSN: ______________

Applicant: Northampton County

Phone: (757) 678-1282 ext: 282

Applicant Address: 5265 The Hornes Eastville, VA 23347
(Street, City, State, Zip Code)

2. **FACILITY INFORMATION:**

Facility/System Name: Northampton County Government Complex

Facility Address: 5265 The Hornes Eastville, VA 23347
(If Applicable, Street, City, State, Zip Code)

Contact Name: Jim Chapman Title: Clerk of the Works Phone: 757-678-1282 ext:282

Fax: 757-678-1284

Location of Withdrawal Well or Well System: Northampton County
(County/City)

3. **TYPE OF APPLICATION:**

This application is for:

( ) Existing withdrawal, not previously permitted
(✓) New withdrawal
( ) Expand or enlarge existing permit No. ______
( ) Modification of permit No. ______
( ) Minor amendment of permit No. ______
( ) Renewal of existing permit No. ______ with modification
( ) Renewal of existing permit No. ______ without modification

Existing withdrawal permit amount N/A gallons per N/A (Day,Month,Year)

Date of expiration of existing Ground Water Withdrawal Permit N/A

Requested withdrawal amount 16,206,000 / 17,565,000 gallons per year, 1,350,500 / 2,025,750 gallons per month (average) (peak)

4. **TYPE OF USE:** (Check all that apply)

USE	%USE		%USE
(✓) Public Water Supply	100	( ) Aquaculture	
( ) Industrial		( ) Golf Course Irrigation	
( ) Commercial		( ) Landscape Irrigation	
(✓) Fire Protection	Emergency Only	( ) Nursery	
( ) Drought Relief		( ) Crop Irrigation	
( ) Livestock Watering		( ) Other ______	

If type of use is public water supply;

Estimate the percentage of the withdrawal for human consumptive use 95 %;

Attach a complete copy of the Virginia Department of Health Water Works Operation Permit and Engineering Description Sheets or equivalent.

OFFICE USE ONLY

Date Application Received ______ Date Fee Received ______ Application # ______

Notice Date ______ LGOF Date ______ Returned ______ Amount ______ Date Complete ______

5. **JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED:**

Briefly describe the nature of the activity and the proposed beneficial use of ground water.

Water supply (potable) for new Northampton County Government Complex in Eastville. Complex will include a new Sheriff's office, Courthouse, Social Services Center and Regional Jail.

Documentation of beneficial use: Attach documentation demonstrating that the annual and monthly amount of ground water withdrawal requested is the smallest amount of withdrawal necessary to support the proposed beneficial use and that the amount is representative to support similar uses when adequate conservation measures are employed.

Include a description of the product produced or the service provided, the unit of measure (acres, lbs.,bushels, etc.) of the product or service, the unit of time that the product or service is produced (day, month, year), the amount of water (gallons) required to produce a unit of product or service, and the quantity of the product or service. Include calculations showing the total amount of water required to produce a product or provide a service.

Attach a line drawing showing the water flow through the facility/system. Indicate wells, meter locations, sources of surface intake, and treatment, or other operations generating wastewater. Construct a water balance on the line drawing by showing average flows between intakes, treatment units and discharge points.

Water demand projections: Include documentation to support the intended beneficial use over a ten year permit cycle such as population and water demand projections and expansion plans. Describe special treatment (i.e. RO, EDR) when proposed.

Apportionment of withdrawal to individual wells: Attach an operational pumping schedule for applications with multiple wells. Indicate whether the withdrawal from each well is daily, seasonal or intermittent. Describe the frequency of use and pumping volume for each well for each month in a calendar year.

6. **WASTEWATER TREATMENT AND DISPOSAL:**

Will wastewater be generated as a result of the withdrawal of ground water?
Yes (Yes/No) If yes, check the appropriate box below.

(✓) Septic Tank and Drainfield

( ) Public Sewer ______________________
(Name of system)

( ) State Waters ______________________
(Name of water body)

Discharge Permit # ______________

( ) Have applied for a discharge permit from the Department of Environmental Quality.

7. **WELL LOCATION(S):**

Locate all wells (existing, proposed, abandoned, out of service), facility property boundaries and/or water supply service area associated with the application on a (1) United States Geological Survey 7 1/2 minute topographic map, or copies of such maps, and (2) detailed location map of each existing and proposed well. The detailed location map must be of sufficient detail such that all wells may be easily located for site inspection.

Documentation of Beneficial Use

Water Demand Summary

Building/Office	STAFF # people	STAFF Unit demand (gpd)	STAFF Demand (gpd)	VISITOR # people	VISITOR Unit demand (gpd)	VISITOR Demand (gpd)	STAFF + VISITOR Demand (gpd)
County Administration	48	35	1,680	30	5	150	1,830
Dept. of Social Services	55	15	825	70	3	210	1,035
Clerk of Court	7	15	105	3	3	9	114
Circuit Court	4	15	60	100	3	300	360
Gereral District Court	8	15	120	100	3	300	420
J&DR Court	4	15	60	80	3	240	300
Juvenile Probation	10	15	150	5	3	15	165
Commonwealth's Attorney	4	15	60	0	3	0	60
Registrar	4	15	60	5	3	15	75
Sheriff's Office	24	15	360	5	3	15	375
Jail	40	15	600	20	3	60	660
Jail (inmates)	325	120	39,000			0	39,000
TOTAL			43,080			1,314	**44,394**

Average daily demand =	**44,400**	**gal/day**
Average monthly demand =	**1,350,500**	**gal/month**
Average yearly demand =	**16,206,000**	**gal/year**
Peak monthly demand =	**2,025,750**	**gal/month**
Yearly demand w/ 2 months peak =	**17,556,500**	**gal/year**
Domestic Storage =	**22,200**	**gallons**
Fire reserve storage =	**48,000**	**gallons**
Total Storage Required =	**70,200**	**gallons**
Elevated Storage Provided =	**75,000**	**gallons**

Fire reserve storage is for onsite fire hydrants and sprinkler systems and routine use is not anticipated.

Water Demand Projections

Construction of the Northampton County Government Complex will be phased over the next few years. The demand calculations are for the complex at full buildout and no further expansion is planned.

Proposed Well Pumping Schedule

Rotating lead/lag/standby configuration for equal wear and runtime

Month	Well 165-459 (#1) use	lead or lag	gal/month	Well 165-460 (#2) use	lead or lag	gal/month	Well 165-461(#3) use	lead or lag	gal/month
January	daily	lag	335,000	daily	**lead**	1,014,500	intermittent	n/a	< 1,000
February	intermittent	n/a	< 1,000	daily	lag	335,000	daily	**lead**	1,014,500
March	daily	**lead**	1,014,500	intermittent	n/a	< 1,000	daily	lag	335,000
April	daily	lag	335,000	daily	**lead**	1,014,500	intermittent	n/a	< 1,000
May	intermittent	n/a	< 1,000	daily	lag	335,000	daily	**lead**	1,014,500
June	daily	**lead**	1,014,500*	intermittent	n/a	< 1,000	daily	lag	335,000
July	daily	lag	335,000	daily	**lead**	1,014,500	intermittent	n/a	< 1,000
August	intermittent	n/a	< 1,000	daily	lag	335,000	daily	**lead**	1,014,500
September	daily	**lead**	1,014,500	intermittent	n/a	< 1,000	daily	lag	335,000
October	daily	lag	335,000	daily	**lead**	1,014,500	intermittent	n/a	< 1,000
November	intermittent	n/a	< 1,000	daily	lag	335,000	daily	**lead**	1,014,500
December	daily	**lead**	1,014,500*	intermittent	n/a	< 1,000	daily	lag	335,000
January	daily	lag	335,000	daily	**lead**	1,014,500	intermittent	n/a	< 1,000
February	intermittent	n/a	< 1,000	daily	lag	335,000	daily	**lead**	1,014,500
March	daily	**lead**	1,014,500	intermittent	n/a	< 1,000	daily	lag	335,000
April	daily	lag	335,000	daily	**lead**	1,014,500	intermittent	n/a	< 1,000
May	intermittent	n/a	< 1,000	daily	lag	335,000	daily	**lead**	1,014,500
June	daily	**lead**	1,014,500*	intermittent	n/a	< 1,000	daily	lag	335,000
July	daily	lag	335,000	daily	**lead**	1,014,500	intermittent	n/a	< 1,000
August	intermittent	n/a	< 1,000	daily	lag	335,000	daily	**lead**	1,014,500
September	daily	**lead**	1,014,500	intermittent	n/a	< 1,000	daily	lag	335,000
October	daily	lag	335,000	daily	**lead**	1,014,500	intermittent	n/a	< 1,000
November	intermittent	n/a	< 1,000	daily	lag	335,000	daily	**lead**	1,014,500
December	daily	**lead**	1,014,500*	intermittent	n/a	< 1,000	daily	lag	335,000

Intermittent use is designated for maintenance of lead or lag well and or associated equipment.

* Estimated 2,025,750 monthly demand for peak months.

DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER DIVISION
PERMIT APPLICATION FEE
EFFECTIVE JULY 1, 2002

INSTRUCTIONS

Applicants for individual Virginia Pollutant Discharge Elimination System (VPDES), Virginia Pollution Abatement (VPA), Virginia Water Protection (VWP), Surface Water Withdrawal (SWW), and Ground Water Withdrawal (GWW) Permits are required to pay permit application fees except farming operations engaged in production for market. Fees are also required for registration for coverage under General Permits except for the general permits for sewage treatment systems with discharges of 1,000 gallons per day (GPD) or less and for Corrective Action Plans for leaking underground storage tanks. Except for VWP permits, fees must be paid when applications for permit issuance, reissuance or modification are submitted. Applicants for VWP permits will be notified by the DEQ of the fee due. Applications will be considered incomplete if the proper fee is not paid and will not be processed until the fee is received.

The permit fee schedule is included with this form. Fees for permit issuance or reissuance and for permit modification are included. Once you have determined the fee for the type of application you are submitting, complete this form. The original copy of the form and your check or money order payable to "Treasurer of Virginia" should be mailed to the Department of Environmental Quality, Receipts Control, P.O. Box 10150, Richmond, VA 23240. A copy of the form and a copy of your check or money order should accompany the permit application. You should retain a copy for your records. Please direct any questions regarding this form or fee payment to the DEQ Office to which you are submitting your application.

APPLICANT NAME: Northampton County SSN/FIN: 54-6001468

ADDRESS: Clerk of the Works DAYTIME PHONE: (757) 678-1282
Area Code

P.O. Box 1227

Eastville, VA 23347

FACILITY/ACTIVITY NAME: Northampton County Government Center

LOCATION: The Hornes, Eastville, VA

TYPE OF PERMIT APPLIED FOR
(from Fee Schedule): GWW Permit for new/expanded withdrawl

TYPE OF ACTION: ✓ New Issuance ____ Reissuance ____ Modification

AMOUNT OF FEE SUBMITTED
(from Fee Schedule): $6000.00

EXISTING PERMIT NUMBER (if applicable): ____

DEQ OFFICE TO WHICH APPLICATION SUBMITTED (check one)

- ☐ Abingdon/SWRO
- ☐ Harrisonburg/VRO
- ☐ Kilmarnock/KO
- ☐ Woodbridge/NVRO
- ☐ Lynchburg/SCRO
- ☐ Richmond/PRO
- ☐ Richmond/Headquarters
- ☐ Roanoke/WCRO
- ☒ Virginia Beach/TRO

FOR DEQ USE ONLY

Date: ____
DC #: ____

Original Form and Check - DEQ Accounting Office
Copy of Form and Copy of Check - DEQ Regional or Permit Program Office

GMB
GEORGE, MILES & BUHR, LLC

ARCHITECTS
ENGINEERS

206 WEST MAIN STREET
SALISBURY, MD 21801
PH: 410.742.3115
PH: 800.789.4462
FAX: 410.548.5790

SALISBURY
BALTIMORE
SEAFORD
LEWES
YORK
DOVER

www.gmbnet.com

October 11, 2005

Virginia Department of Environmental Quality
Tidewater Regional Office
5636 Southern Blvd.
Virginia Beach, VA 23462

Attn: Henry L. Ghittino
Groundwater Permits Group Leader

Re: Northampton County Government Complex
GMB Project No. 2002124C
Ground Water Withdrawal Permit Application GW 0049700

Dear Hank:

Kindly reference your comment letter dated September 12, 2005 for the referenced project. I apologize for the delay in getting back to you, but Steve Kvech, who wrote the permit application, has moved from the area and I needed to get his input on a few of the items.

Concerning your comments on Section 5 – Justification for the Amount of Withdrawal Requested, I offer the following responses:

1. The unit demands for staff were based on the absolute minimum allowed in the Virginia Department of Health. Visitor flows were estimated based on one trip to the restroom facilities for each visitor. Projected flows for inmates were based on historical data from prison complexes in Princess Anne and Hagerstown, Maryland. Although most of the services provided in the complex were previously supplied by the Town of Eastville, we believe that historical data would not accurately reflect the projected use. The existing buildings are old, do not have any low flow fixtures, and are inefficient. The proposed buildings in the new Government Complex have low flow fixtures.

2. We have modified the permit application and monthly demand computations by adding additional information about "peak" monthly demands. We have computed the peak monthly demand by adding 50% to the average monthly demand. This should allow for some more flexibility in operating the system. For the yearly total, then, we have assumed that there will be two months of the year that require the additional demand.

3. We have modified the proposed well pumping schedule to match the projected annual average demand. We have added notes concerning potential peak monthly flows.

File w/ Water File

GEORGE, MILES & BUHR, LLC

Concerning your comments regarding Section 13 – Water Conservation and Management Plan, please see the following document that can then be attached to the Permit Application.

Please insert the enclosed revisions in the appropriate sections of the application.

As we discussed, I look forward to your comments on the aquifer test plan.

Please contact me at 410 742 3115 with any questions or concerns.

Sincerely,

Steve Marsh, P.E.

CC: Northampton County
Attn: Jim Chapman, Clerk of the Works (w/ encl.)

GMB

GEORGE, MILES & BUHR, LLC

WATER CONSERVATION AND MANAGEMENT PLAN.

Proposed buildings are being designed and constructed in accordance with the Uniform Statewide Building Code. Water saving fixtures in the restroom facilities are specified throughout the complex. All urinals in the proposed Courthouse, Social Services Building and Eastern Shore Regional Jail are low consumption type with 1.0 gallons per flush. All water closets are low consumption type with 1.6 gallons per flush.

A significant percentage of total water use for the site is in the proposed Jail, where water usage can be electronically controlled in case of mandatory water use restrictions. Duration and frequency of showers, restroom flushes, and sink use can be electronically controlled.

There are no irrigation sprinklers on the site. Wastewater on site undergoes tertiary treatment for nitrogen removal and is directed to a subsurface disposal system, thereby recharging the water table (unconfined) aquifer. Currently, other than the subsurface disposal wastewater system, there is no potential for water reuse on site.

Prison staff will be trained on the use of the electronic controls of the water system. The inmates' use of water will likely be minimized by the staff rather than through their own efforts. As such, water use training and education programs will focus on the staff.

Concerning water loss reduction, there are no irrigation sprinklers on site. County staff can check water meter records to see if a leak has gone undetected. The plumbing fixtures for the prison are rated as vandal proof, but because of their potential for damage, the facilities will be checked continuously by prison staff for leak detection.

Any mandatory water use reductions during water shortage emergencies declared by the local governing body or the Director of DEQ will be followed, with the understanding fines will be issued for non-compliance. Because there are no irrigation sprinklers on-site, and because the prison staff has the direct ability to control water usage electronically, the government complex should have an easier time meeting mandatory water use reductions than many other locations.

Mike Thornes
Director Public Works
Northampton. Co.
P. O. Box 66
Eastville, VA 23347

COMMONWEALTH of VIRGINIA

ROBERT B. STROUBE, M.D., M.P.H.
STATE HEALTH COMMISSIONER

Department of Health
OFFICE OF DRINKING WATER
SOUTHEAST VIRGINIA ENGINEERING FIELD OFFICE

830 SOUTHAMPTON AVENUE, ROOM 2058
NORFOLK, VIRGINIA 23510-1001
PHONE (757) 683-2000
FAX (757) 683-2007

SUBJECT: NORTHAMPTON COUNTY
Water - Northampton County Government Complex
PWSID: 3131554

Source Water Assessment

Ms. Katherine H. Nunez, County Administrator
Northampton County
P. O. Box 66
Eastville, VA 23347

Dear Ms. Nunez:

The Southeast Virginia Field Office of 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 take a few minutes to look over your copy. The availability of the Source Water Assessment Report is the first step in assisting in the preparation of a Source Water Protection Program (SWPP). The Virginia Department of Health is available to provide technical assistance to waterworks in developing a SWPP for your waterworks. Please contact me if you have any questions concerning this assessment. Please note that the susceptibility class assigned is relative and not intended to be a definitive determination.

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

> "The Virginia Department of Health conducted a Source Water Assessment of the Northampton County Government Complex Waterworks in 2006. The first well (Well 1) was determined to be of low susceptibility to contamination using the criteria developed by the state in its approved Source Water Assessment Program. The assessment report consists of maps showing the Source Water Assessment area, an inventory of known Land Use Activities utilized at Land Use Activity Sites in Zone 1, Susceptibility Explanation Chart, and Definitions of Key Terms. The report is available by contacting your waterworks system owner/operator at the phone number and/or address listed in this document."

Sincerely,

Dixon W. Tucker

Dixon W. Tucker, P.E.
District Engineer

KMH/DWT/mw
Enclosure

pc: VDH – Office of Drinking Water

R:\DIST22\Northampton\Northampton Gov Cmplx\SWAP\SWA owner letter.doc

VIRGINIA DEPARTMENT OF HEALTH
SOURCE WATER ASSESSMENT REPORT

DATE:	February 13, 2006
PWSID:	3131554
WATER:	Northampton County Government Complex
OWNER:	Northampton County
SUBJECT:	Northampton County
TYPE:	Community

For the source serving the subject waterworks this report includes, map(s) showing the source water assessment area (divided into Zones 1 and 2 with Zone 1 having greater influence on the source), an inventory of known Land Use Activities of Concern and Potential Conduits to Ground Water within the assessment area, a rudimentary determination of its relative susceptibility to contamination, and documentation of any known contamination within the last 5 years. 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 1	Low	Properly constructed ground water source located in an area that tends to inhibit contaminant migration, is protected with an appropriate aquitard, and has had no known detection of contamination within the last 5 years with potential conduits to ground water in the Zone 1 assessment area

The criteria utilized for placement into a particular susceptibility class is included on the attached Source Water Susceptibility Determination Form (Form A or Form A2). Explanations for selection of a susceptibility class are included on Chart A. 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 Chart B.

There are Potential Conduits to Ground Water] located in Zone 1 for Well 1. The Potential Conduits to Ground Water are shown in Zone 1 and inventoried on the "Potential Conduits to Ground Water Inventory Form (Form F)" for this source.

No Land Use Activities of concern or Potential Sources of Contamination are known to exist in Zone 1 and Zone 2 for the source.

There has been no known contamination of the source within the last 5 years.

The source waters for this waterworks have been categorized in accordance with the following table:

Source Name	Source Water Type
Well 1	Ground Water

Based on the source type, the following assessment area delineation has been assigned in accordance with the guidance of the Virginia Source Water Assessment Program and are shown on the attached maps prepared for each source:

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

VIRGINIA DEPARTMENT OF HEALTH
SOURCE WATER ASSESSMENT REPORT

The following attachments are part of this report (one for each source):

[✓] Assessment Area Map(s)
[ ] Source Water Susceptibility Determination Form (Form A)
[✓] Ground Water Coastal Plain Source Water Susceptibility Determination Form (Form A2)
[✓] Known Contamination Documentation Form (Form B)
[ ] Potential Sources of Contamination in Zones 1 and 2 Form (Form D)
[ ] Ranking of Land Use Activity and Potential Sources of Contamination Form (Form E)
[ ] Area Features Documentation Form (Form E2)
[✓] Potential Conduits to Ground Water Inventory Form (Form F)
[ ] Best Management Practice Documentation Form (Form G)
[✓] Chart A (Susceptibility Explanations)
[✓] Chart B (Key Definitions)

PWSID: 3131554

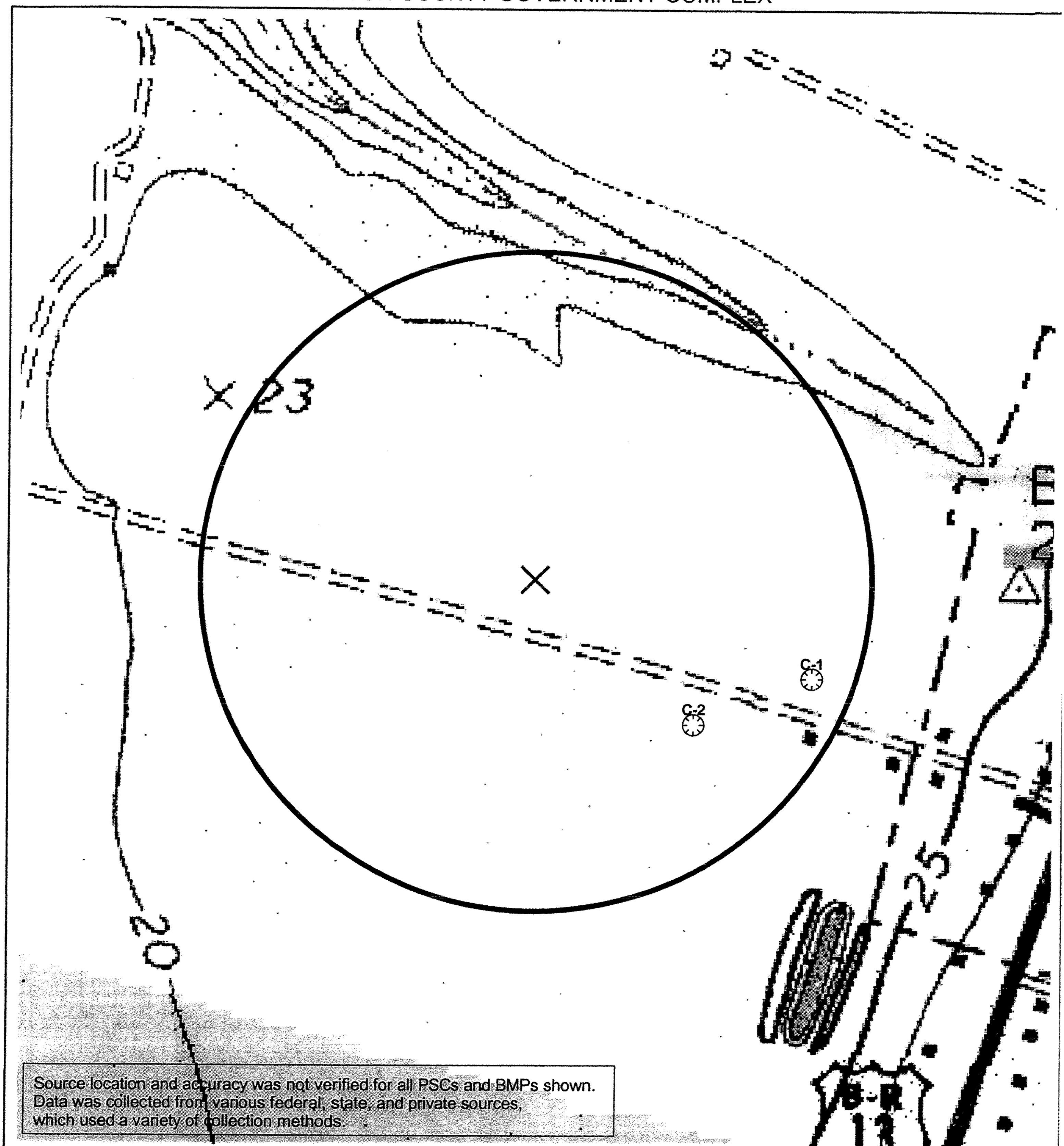
SWAP Zone 1 Map

ISTRICT 22

FACILITY: WELL 1

COUNTY/CITY: NORTHAMPTON

WATERWORKS: NORTHAMPTON COUNTY GOVERNMENT COMPLEX



Ground Water Sources
Selected Water Source
LUA Polygons
PC Polygons
Land Use Activities (L-#)
Potential Conduits (C-#)
Best Management Practices (B-#)

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

Office of Drinking Water

N

200 0 200 400 Feet

Print Date: January 2006

Potential Sources of Contamination (P-#)

Landfills
Discharge -- No Discharge Facilities
Discharge
No Discharge
DEQSWRO -- Storage Tank Releases
Active
Closed

Airports
Industrial Sites
Superfund Sites
Golf Courses
Underground Injection Wells
Hazardous and RCRA Sites
Hospitals
Tire Piles

PWSID: 3131554

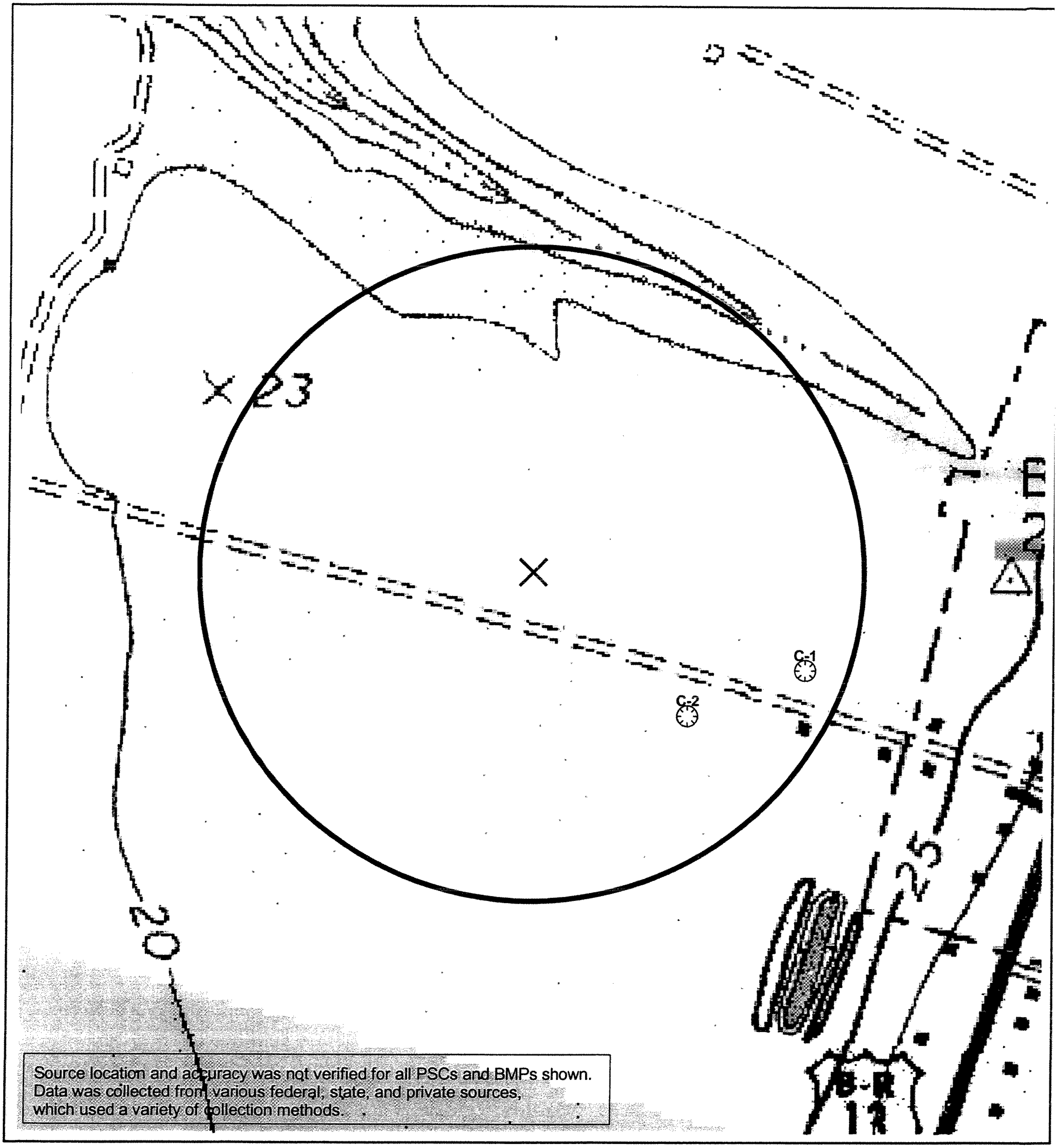
SWAP Zone 1 Map

DISTRICT 22

FACILITY: WELL 1

COUNTY/CITY: NORTHAMPTON

WATERWORKS: NORTHAMPTON COUNTY GOVERNMENT COMPLEX



Ground Water Sources

Selected Water Source

LUA Polygons

PC Polygons

Land Use Activities (L-#)

Potential Conduits (C-#)

Best Management Practices (B-#)

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

Office of Drinking Water

N

200 0 200 400 Feet

Print Date: January 2006

Potential Sources of Contamination (P-#)

Landfills

Discharge – No Discharge Facilities

Discharge

No Discharge

DEQSWRO – Storage Tank Releases

Active

Closed

Airports

Industrial Sites

Superfund Sites

Golf Courses

Underground Injection Wells

Hazardous and RCRA Sites

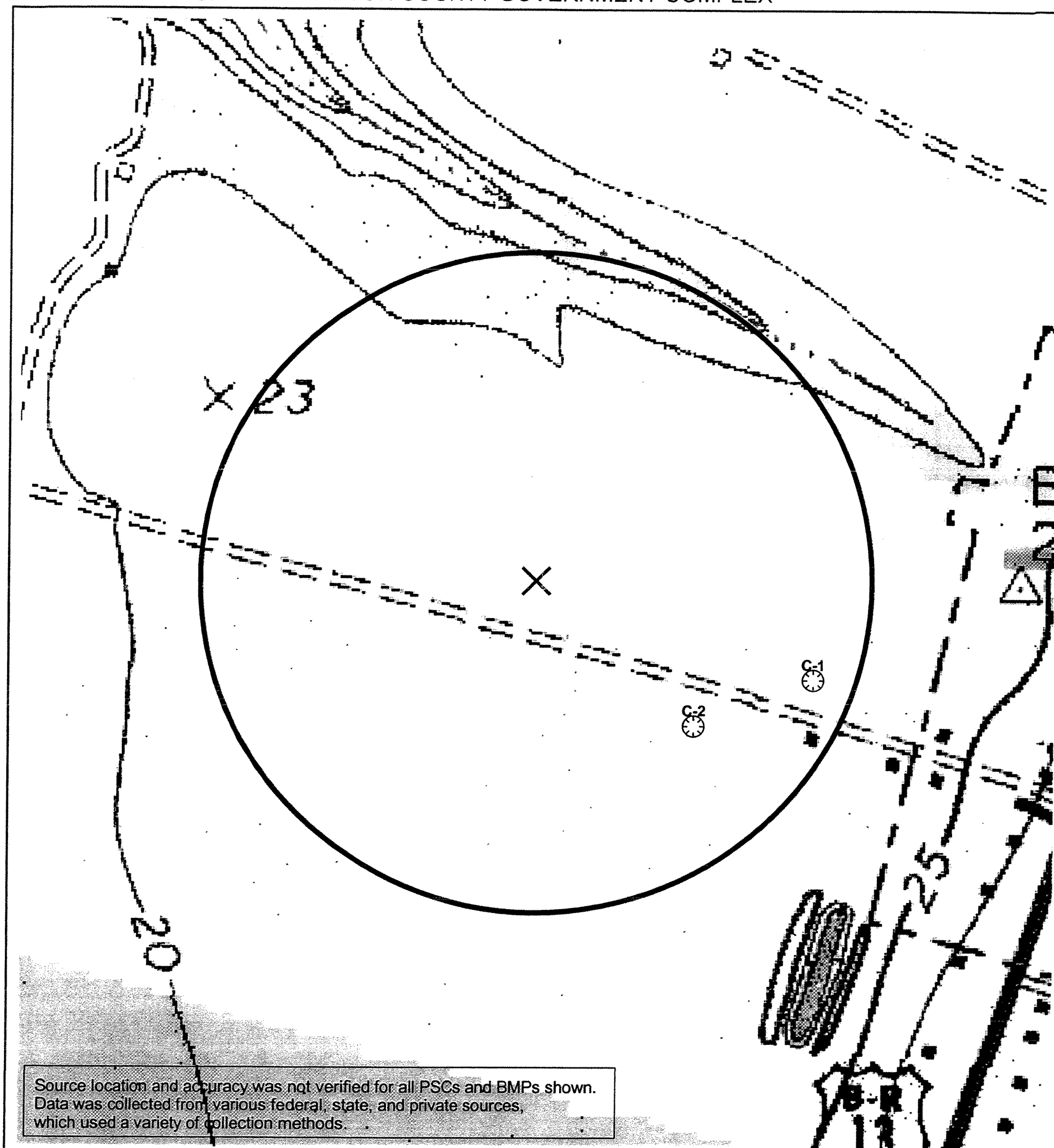
Hospitals

Tire Piles

SWAP Zone 1 Map

PWSID: 3131554
FACILITY: WELL 1
WATERWORKS: NORTHAMPTON COUNTY GOVERNMENT COMPLEX

DISTRICT 22
COUNTY/CITY: NORTHAMPTON



Ground Water Sources
Selected Water Source
LUA Polygons
PC Polygons
Land Use Activities (L-#)
Potential Conduits (C-#)
Best Management Practices (B-#)

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

Office of Drinking Water

N

200 0 200 400 Feet

Print Date: January 2006

Potential Sources of Contamination (P-#)

Landfills
Discharge -- No Discharge Facilities
Discharge
No Discharge
DEQSWRO -- Storage Tank Releases
Active
Closed

Airports
Industrial Sites
Superfund Sites
Golf Courses
Underground Injection Wells
Hazardous and RCRA Sites
Hospitals
Tire Piles

PWSID:3131554

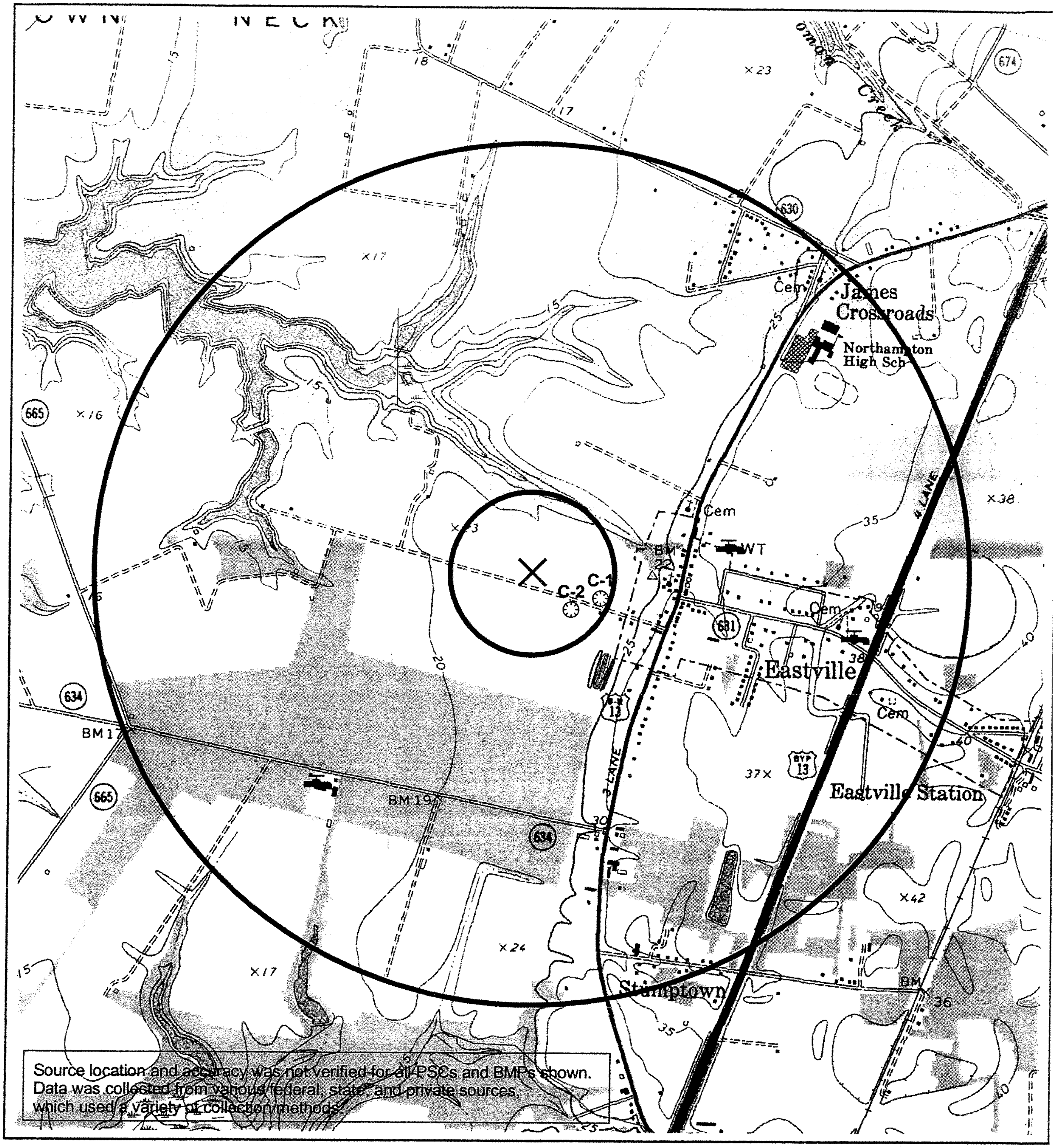
SWAP Zone 2 Map

)ISTRICT 22

FACILITY:WELL 1

COUNTY/CITY: NORTHAMPTON

WATERWORKS:NORTHAMPTON COUNTY GOVERNMENT COMPLEX



Ground Water Sources

Selected Water Source

LUA Polygons

PC Polygons

Land Use Activities (L-#)

Potential Conduits (C-#)

Best Management Practices (B-#)

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

Office of Drinking Water

N

800 0 800 1600 Feet

Print Date:January 2006

Potential Sources of Contamination (P-#)

Landfills

Discharge – No Discharge Facilities

Discharge

No Discharge

DEQSWRO – Storage Tank Releases

Active

Closed

Airports

Industrial Sites

Superfund Sites

Golf Courses

Underground Injection Wells

Hazardous and RCRA Sites

Hospitals

Tire Piles

PWSID: 3131554

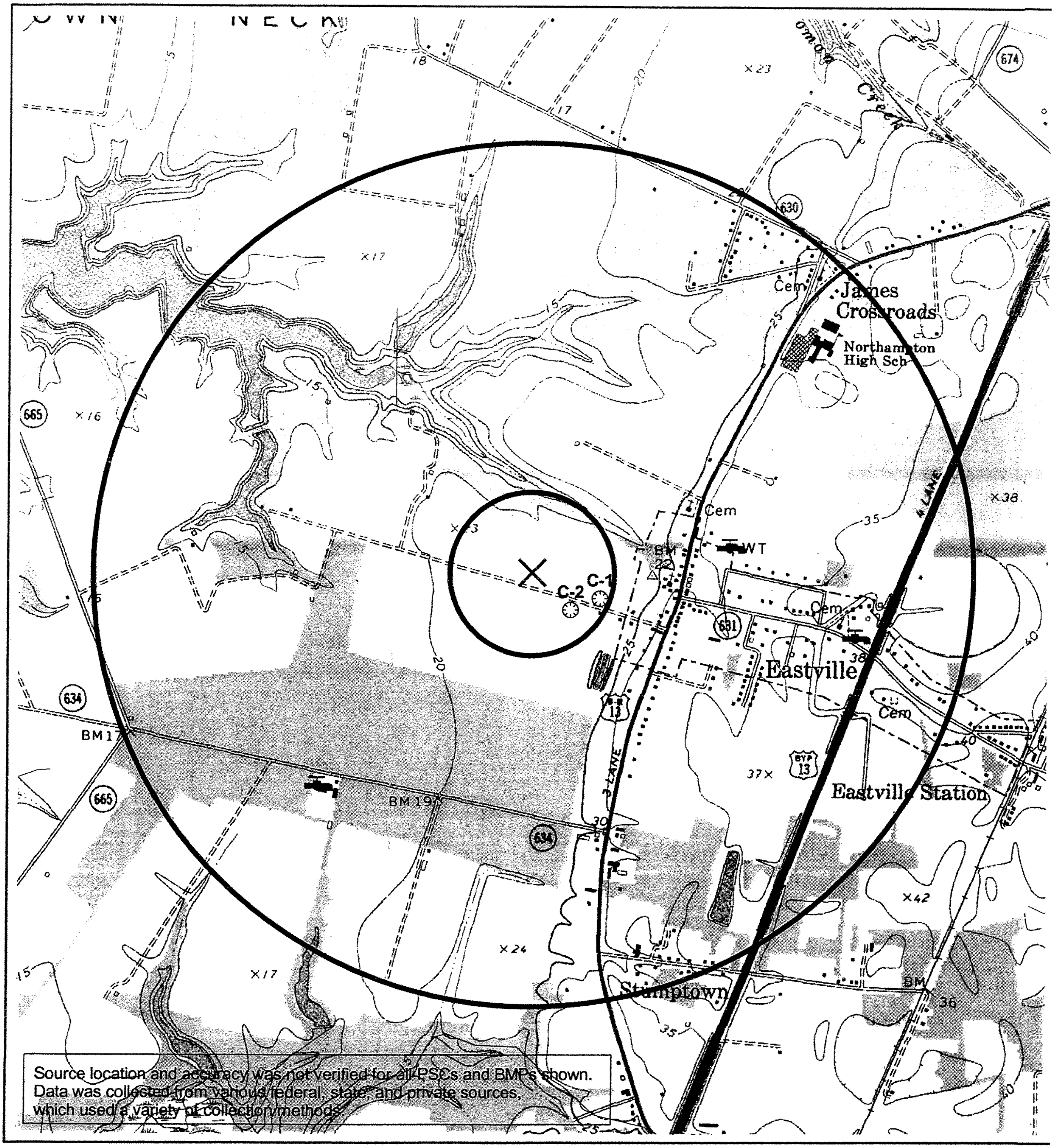
SWAP Zone 2 Map

DISTRICT 22

FACILITY: WELL 1

COUNTY/CITY: NORTHAMPTON

WATERWORKS: NORTHAMPTON COUNTY GOVERNMENT COMPLEX



Potential Sources of Contamination (P-#)

Ground Water Sources	Land Use Activities (L-#)
Selected Water Source	Potential Conduits (C-#)
LUA Polygons	Best Management Practices (B-#)
PC Polygons	

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

Office of Drinking Water

N

800 0 800 1600 Feet

Print Date: January 2006

Landfills

Discharge – No Discharge Facilities

- Discharge
- No Discharge

DEQSWRO – Storage Tank Releases

- Active
- Closed

Airports

Industrial Sites

Superfund Sites

Golf Courses

Underground Injection Wells

Hazardous and RCRA Sites

Hospitals

Tire Piles

PWSID:3131554

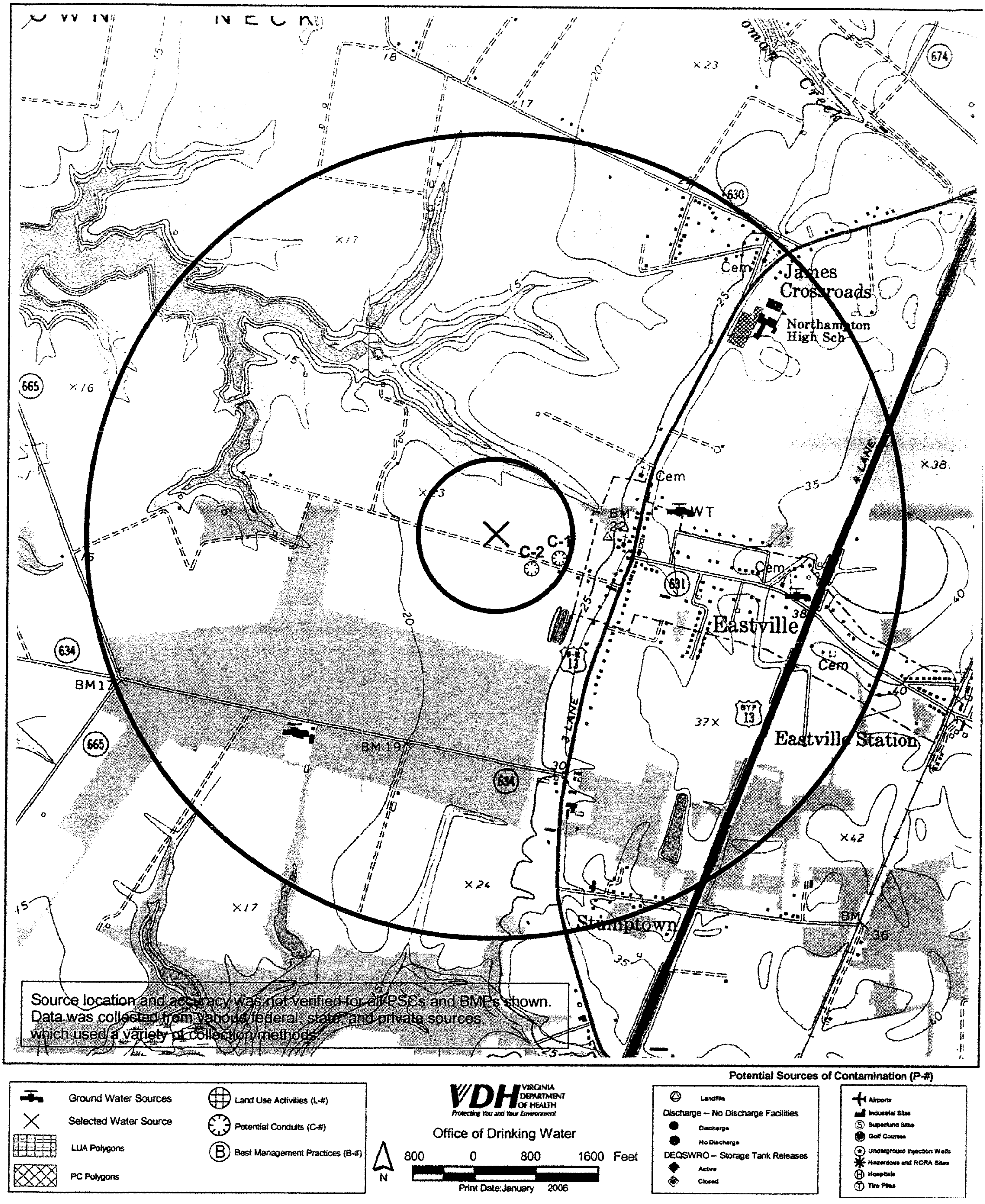
SWAP Zone 2 Map

)ISTRICT 22

FACILITY:WELL 1

COUNTY/CITY: NORTHAMPTON

WATERWORKS:NORTHAMPTON COUNTY GOVERNMENT COMPLEX



VIRGINIA DEPARTMENT OF HEALTH – OFFICE OF DRINKING WATER

Ground Water Coastal Plain Source Water Susceptibility Determination (Form A2) Appendix A-2

County/City:	Waterworks:	PWSID#:	Facility:
NORTHAMPTON	NORTHAMPTON COUNTY GOV'T COMPLEX	3131554	WELL 1
Evaluated by: MARTY MALONE	**Date:** 12/19/2005	**Reviewed by:** Gary W. Tucker	**Date:** 2-15-6

Step	Complete Entire Worksheet	CIRCLE ANSWER	
1	Is the source a Class IIB (or better) well constructed in accordance with the Waterworks Regulations?	YES	NO
2	Does a well driller's log, the U.S. Geological Survey Aquifer Susceptibility Study, or an independent geologic study clearly indicate that an aquitard is present within the first 100 ft. below surface elevation and depth of well screen is greater than 100 ft. deep? If unknown, answer 'NO'.	YES	NO
3	**<u>Answers to Step 3 should be based on knowledge that presence is due to a non naturally occurring situation</u>.** Is the geometric mean > 3 TC/100 ml in 20 or more source (raw) water samples collected in the last 5 years? Have fecal coliform been detected in 2 or more source samples collected in the past 5 years?	(If any are) YES	(If both are) NO
4	Does the most recent sanitary survey confirm that the source construction conforms to the construction standards of the Waterworks Regulations?	YES	NO
5	**<u>Answers to Step 5 should be based on knowledge that presence is due to a non naturally occurring situation</u>.** Has a nitrate concentration > 5 mg/L been detected in the past 5 years? Has a nitrite concentration > 0.5 mg/L been detected in the past 5 years? Has a combined Radium 226 and Radium 228 concentration > 5 pCi/L in 2 or more samples been detected in past 5 years? Has detection of Uranium > 30 µg/L in 2 or more samples been detected in past 5 years? Has detection of any IOC contaminant exceeded the PMCL in 2 or more samples in the past 5 years?	(If any are) YES	(If none are) NO
6	Have any SOC/VOC contaminants (excluding TTHM's) been detected in the past 5 years?	YES	NO
7	List detected contaminant(s) and sample dates on Form B List of Known Contamination Documentation Form.	Go to step 8	
8	[Source ***IS*** Sensitive if answered 'NO' to **one** or **more** of the following steps: 1, 2, and 4. Source ***IS*** Sensitive if answered 'YES' to one or more of the following steps: 3, 5, or 6.] [Source ***IS NOT*** Sensitive if answered 'YES' to **all** of the following steps: 1, 2, and 4 and 'NO' to steps 3, 5 and 6.]	Sensitive	Not Sensitive
9	DETERMINE THE SUSCEPTIBILITY OF THE SOURCE BY COMPLETING THE CHART BELOW. WORK FROM LEFT TO RIGHT ACROSS THE ROWS.		

<u>Sensitive Source</u>	**For Sensitive Ground Water sources, does a LUA exist in Zone 1 or does a PSC exist in Zone 1or 2?**	**Do any identified PCs (Other Wells in Use or Abandoned Wells) to Ground Water penetrate the aquitard referred to in Step 2? If unknown, answer 'Yes'.**	**<u>Susceptibility</u>**
NO →		NO →	Very Low
		YES →	Low
YES →	NO →	NO →	Moderate
	YES →		
	NO →	YES →	
	YES →	YES →	High

VIRGINIA DEPARTMENT OF HEALTH – OFFICE OF DRINKING WATER

Known Contamination Documentation Form (Form B) APPENDIX 15B

County/City: NORTHAMPTON **Waterworks:** NH COUNTY GOV'T COMPLEX **PWSID#:** 3131554 **Facility:** WELL 1

Compiled by: MARTY MALONE **Date:** 12/20/2005 **Reviewed by:** [signature] **Date:** 2-15-6

Where applicable, circle 'yes' or 'no'. **Note**: listing is based on last 5 years of data

MICROBIAL CONTAMINATION

a. Has a geometric mean determination for 20 or more total coliform samples been conducted in the past 5 years? YES NO
b. Does the geometric mean exceed 3 col./ 100 ml? If 'yes', what was the geometric mean? ~~col./100 ml.~~ NO
c. Have fecal coliform bacteria been detected in 2 or more samples collected in the past 5 years? YES NO
d. If 'yes', list the laboratory sample identification number(s) and sample collection date(s): N/A

NITRATE CONTAMINATION*

a. Has the nitrate concentration in any sample collected in the past 5 years exceeded 5 mg/L? YES NO
b. If 'yes', list the laboratory sample identification number(s), sample collection date(s) and nitrate concentration(s):

c. Was the 10 mg/L MCL exceeded? YES NO

NITRITE CONTAMINATION*

a. Has the nitrite concentration in any sample collected in the past 5 years exceeded 0.5 mg/L? YES NO
b. If 'yes', list the laboratory sample identification number(s), sample collection date(s) and nitrate concentration(s):

c. Was the 1 mg/L MCL exceeded? YES NO

SOC/VOC CONTAMINATION*

a. Have any SOC/VOC contaminants been detected in the past 5 years? YES NO
b. If 'yes', list the laboratory sample identification number(s), sample collection date(s), SOC/VOC contaminant(s) and SOC/VOC concentration(s) under line 'c'.
c. Was any SOC/VOC MCL exceeded? YES NO If yes, circle samples which exceeded the MCL.

RADIUM 226 AND RADIUM 228 CONTAMINATION*

a. Has a combined Radium 226 and Radium 228 concentration exceeded 5pCi/L in 2 or more samples collected in the past 5 years? YES NO
b. If 'yes', list the laboratory sample identification number(s), sample collection date(s) and Radium 226 and Radium 228 concentration(s) under line 'c'.
c. Was the Radium 226 and Radium 228 MCL exceeded? YES NO If yes, circle samples which exceeded the MCL.

URANIUM CONTAMINATION*

a. Has detection of Uranium > 30 μg/L in 2 or more samples been detected in past 5 years? YES NO
b. If 'yes', list the laboratory sample identification number(s), sample collection date(s) and calculated uranium concentration(s):
c. Was the Uranium MCL exceeded? YES NO If yes, circle samples which exceeded the MCL.

INORGANIC CHEMICAL CONTAMINATION*

a. Has any inorganic chemical contaminant in any sample collected in the past 5 years equaled or exceeded its' respective PMCL? YES NO
b. If 'yes', list the laboratory sample identification number(s), sample collection date(s) and contaminant concentration(s):

***Contamination refers to situation whereby source quality was degraded by human activity.**

VIRGINIA DEPARTMENT OF HEALTH -- OFFICE OF DRINKING WATER

Potential Conduits to Groundwater Inventory Form (Form F)

County/City: NORTHAMPTON **Waterworks:** NORTHAMPTON COUNTY GOVERNMENT COMPLEX **PWSID#:** 3131554 **Facility:** WELL 1

Compiled by: Marty Malone **Date:** 12/19/05 **Reviewed by:** Dixon W. Tucker **Date:** 2-15-6

Map ID #	Type of Conduit	Estimated Distance from Well (feet)	Comments
C-2	Caves/Sinkholes	640	small sinkhole
C-1	Ponds, streams	873	Pond (Stormwater Retention)

Chart A

Susceptibility Classes

Susceptibility	Explanation
Very low	Properly constructed ground water source located in an area that tends to inhibit contaminant migration, is protected with an appropriate aquitard, and has had no known detection of contamination within the last 5 years with no land use activities of concern or potential conduits to ground water in the Zone 1 assessment area nor potential sources of contamination in the Zone 1 or Zone 2 assessment areas
Low	Properly constructed ground water source located in an area that tends to inhibit contaminant migration, is protected with an appropriate aquitard, and has had no known detection of contamination within the last 5 years with [choose] [land use activities of concern][and][potential conduits to ground water] in the Zone 1 assessment area][and][potential sources of contamination in the Zone 1 or Zone 2 assessment areas]
Moderate	[choose] [Ground water source constructed in an area that tends to promote migration of contaminants] [or] [Ground water source located in an area that tends to inhibit contaminant migration but unprotected [choose] [because of unknown or inadequate well construction][and][by an appropriate aquitard] [or] [Properly constructed ground water source located in an area that tends to inhibit contaminant migration in which contaminants have been detected within the last five years] [or] [Ground water source located in an area that tends to inhibit contaminant migration but an identified potential conduit to ground water penetrates the aquitard in the assessment area
High	[choose] [Ground water source constructed in an area that tends to promote migration of contaminants with [choose] [land use activities of concern][and][potential conduits to ground water] in the Zone 1 assessment area][potential sources of contamination in the Zone 1 or Zone 2 assessment areas]] [or] [Ground water source construction is unknown or inadequate with [choose] [land use activities of concern][and][potential conduits to ground water] in the Zone 1 assessment area][and][potential sources of contamination in the Zone 1 or Zone 2 assessment areas]] [or] [Ground water source located in an area that tends to inhibit contaminant migration but is unprotected [choose] [because of unknown or inadequate well construction][and]by an appropriate aquitard with [choose] [land use activities of concern][and][potential conduits to ground water] in the Zone 1 assessment area][and][potential sources of contamination in the Zone 1 or Zone 2 assessment areas]] [or] [Ground water source located in an area that tends to inhibit contaminant migration in which contaminants have been detected within the last five years] with [choose] [land use activities of concern][and][potential conduits to ground water] in the Zone 1 assessment area][and][potential sources of contamination in the Zone 1 or Zone 2 assessment areas]
Moderate	[choose] [Surface water] [or] [Ground water under the direct influence of surface water source] exposed to an inconsistent array of contaminants at varying concentrations due to changing hydrologic, hydraulic and atmospheric conditions with no land use activities or potential sources of contamination of concern in the Zone 1 assessment area
High	[choose] [Surface water] [or] [Ground water under the direct influence of surface water source] exposed to an inconsistent array of contaminants at varying concentrations due to changing hydrologic, hydraulic and atmospheric conditions with land use activities or potential sources of contamination of concern in the Zone 1 assessment area .

Chart B: Definitions of Key Terms

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.
Best Management Practices:	Practices utilized by the owner and/or operator of land use activities in attempts to reduce or eliminate contamination of the environment.
Community Waterworks:	A waterworks which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.
Confined or Nonsensitive Aquifer:	An aquifer that is bounded by impervious confining layers both at the top and the bottom. Also referred to as an artesian aquifer.
Contaminant:	Any chemical element or compound or cause of change in physical properties that renders water unfit for a given use. In the subsurface, this may be thought of as the presence of any chemical element or compound at a level and in a form that may cause damage to human or environmental receptors.
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:	Water that is found below the surface, which has accumulated in pore spaces of geologic material.
Ground Water Under the Direct Influence of Surface Water:	A ground water with (i) significant occurrence of insects, microorganisms, algae, or pathogens, or (ii) significant and relatively rapid shifts in water characteristics which closely correlate to climatological or surface water conditions. The Virginia Department of Health designates a ground water source meeting certain conditions as a Ground Water Under the Direct Influence of Surface Water in accordance with 12 VAC 5-590-430 of the *Waterworks Regulations*.
Identified Flowing Surface Leaking Source: verified	A surface water stream that enters the ground water by flowing into a sinkhole, through the bottom of a stream bed, or by other means and which has been 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'
Impoundment Source Intake:	A raw water intake that feeds from a surface water consisting of a reservoir or other type of impoundment.
Land Use Activity:	An activity that stores, uses, or produces chemicals or biological pathogens and that have the potential to release such contaminants within the source water assessment area.

Chart B: Definitions of Key Terms

Non-Community Waterworks:	A waterworks that is not a community waterworks but serves any 25 or more persons for 60 or more days per year.
Non-Tidal Source Intake:	A raw water intake that feeds from surface water that is not influenced by tidal action and possesses a stream flow, which travels downgradient.
Non-Transient Non-Community Waterworks:	A waterworks that is not a community waterworks but that regularly serves at least 25 of the same persons for 6 months or more per year.
Potential Conduits to Ground Water:	A fracture, sinkhole, drilled hole, well or any type of conduit through the ground that has the potential to carry surface water or surface runoff directly into a ground water.
Potential Sources of Contamination:	A land use activity whose presence and location have been identified in selected state, federal, or private databases during the assessment.
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:	Water open to atmosphere and subject to receiving 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.
Tidal Source Intake:	A raw water intake that feeds from a surface water that is influenced by tidal action resulting in a stream flow that travels in either direction based on the rise or fall of moon or wind driven tides.
Upgradient:	The directions from a source in which ground elevation rises with distance. Opposite is downgradient. Water will flow downgradient.
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.

VIRGINIA DEPARTMENT OF HEALTH
ENGINEERING DESCRIPTION SHEET

DATE: September 15, 2005

WATERWORKS NAME:	Shore Memorial Hospital	CERTIFIED CLASS: IV
COUNTY/CITY:	Northampton County	TYPE: Community
LOCATION:	This waterworks is located on Hospital Avenue (State Route T-681) approximately 1/4 mile west of Lankford Highway (U.S. Route 13) in Nassawadox, Virginia.	
OWNER:	Shore Memorial Hospital P.O. Box 17 Nassawadox, Virginia 23413-0017 C/O Mr. Richard Brvenik, President (757) 414-8765 Fax 757-414-8614	
OPERATOR:	Mr. Maurice Chandler Water/Wastewater Plant Operator P.O. Box 17 9507 Hospital Avenue Nassawadox, Virginia 23413-0017 Phone: (757) 414-8796 Fax at wastewater lab 757-442-5720	
PERMIT NO.:	3131550	
DATE ISSUED:	September 15, 2005	
TYPE OF TREATMENT:	Chlorination and corrosion control	
SOURCE:	2 Wells	
DESIGN CAPACITY:	173,200 GPD	

DESCRIPTION OF WATERWORKS

The waterworks consists of two wells, a ground storage tank, an elevated tank, a hydropneumatic tank, booster pumps, two liquid chlorination systems, two corrosion control metering systems, appurtenances, and the distribution system.

Well No. 1 (Nursing Home Well, Old Hospital Well, DEQ number 165-025 or the Tower Well) has no construction information available on file. It was drilled starting on an unknown date. Information from DEQ indicates that the depth is 304 feet, with an unknown depth of grout. The material of the well casing is unknown. We don't have information on the location of the screens. DEQ indicates that the well is screened in the Upper, Middle and Lower Yorktown-Eastover aquifers. The size of the screen openings is unknown. The existence of a gravel pack is unknown. The well is equipped with a turbine pump (driven by a 15 H.P. motor) rated at 150 gpm. The well yield and drawdown are unknown. This well is located near the 75,000-gallon elevated tank and routinely supplies water to the Nursing Home, School of Nursing, Daycare, Renal Dialysis, and the new addition to the hospital building. However, this well can supply water to some of the hospital during an emergency.

Well No. 2 (Hospital Well, DEQ number 165-001 or Pressure Tank Well) was drilled starting on December 6, 1968, and the well was completed on February 13, 1969. The well bore is 305 feet deep, with cement grout extending from the surface to 75 feet. The 18-inch diameter outer casing is grouted with cement. An 8-inch well casing extends from 1.5 feet above ground to 159 feet. A 6-inch well casing extends from 170 to 305 feet with 6-inch (30 slot) screens set at

depths 160-170, 218-238, 271-286 and 296-301 feet. The well is equipped with a turbine pump (rated at 175 gpm at an unknown TDH) driven by a 30 H.P. motor. The well has a tested yield of 175 gpm, over a 12-hour period (from February 10, 1969 to February 11, 1969) with the water level dropping from 21 feet (static condition) to 139.4 feet (dynamic condition). This part of the system operates at a higher pressure than the Tower system.

Storage is provided by a 75,000-gallon elevated tank, a 10,000-gallon (effective capacity 8,272 gallons) ground storage tank and a 10,000-gallon (effective capacity 3,333 gallons) hydropneumatic tank. Duplicate booster pumps, each rated at 220 gpm at 155 feet TDH transfer water from the 10,000-gallon ground tank to the 10,000-gallon hydropneumatic tank. The booster pumps are provided with alternating and lead/lag controls.

Raw water MPN sampling indicates that the source water does not require disinfection. Chlorination is practiced for distribution system protection.

The Department of Environmental Quality has issued a Groundwater Withdrawal Permit (No. 0047900 covering this waterworks. Shore Memorial Hospital is entrusted with resource use responsibilities via that permit, and is advised to be aware of any compliance requirements of that permit

EVALUATION OF SYSTEM

This system is evaluated on the basis of equivalent residential connections (ERCs). One ERC will utilize 400 gallons per day. This system's capacity is evaluated as follows:

I. Source Capacity

A. Source Yield

1. Number of Sources

a. Required = 1 up to 49 ERCs, more than 1 for 50 or more ERCs
b. Provided = 2 wells

2. Yield:

Well Number	Well Yield (gpm)	Pump	Observed
1	Unknown (use 150)*	150	130
2	175	175	190
	Total = 325	Total =325 gpm	

* Grandfathered in, we do not have the original yield data.
325 gpm * 1,440 minutes / day = 468,000 gallons per day (gpd)

B. Production Capacity: $\frac{325 \text{ gpm}}{0.5 \text{ gpm/ERC}}$ = 650 ERCs

650 ERCs * 400 gpd/ERC = 260,000 gpd

II. Booster Pump Capacity

A. Total Pumping Capacity = 220 + 220 = 400 gpm (assume)

B. Capacity = $Q = 11.4\ N^{0.544}$
$400\ \text{gpm} = 11.4\ N^{0.544}$
N= 692 ERC

692 ERC * 400 gpd/ERC = 276,800 gpd

III. Storage Capacity

A. Total Storage = 75,000 gal. + 8,272 gal. + 3,333 gal. = 86,605 gallons
Elevated Ground Pressure Total

B. Storage Capacity = $\dfrac{\text{86,605 gallons}}{\text{200 gal./ERC}}$ = 433 ERCs

433 ERCs * 400 gpd/ERC = 173,200

IV. Limiting Case

A. Storage Capacity = 433 ERCs

B. Capacity Equivalent = 433 ERCs x 400 gpd/ERC = 173,200 gpd

Therefore, based on the critical values discussed above, this waterworks is issued an operation permit for a design capacity of 173,200 gpd.

DWT/mw

LARGE NON-AGRICULTURAL SELF-SUPPLIED WATER USERS

Virginia's Eastern Shore

MALCOLM PIRNIE

3100-001 / NEW

Bayshore Concrete Products

3100-001 / NEW

APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT
BAYSHORE CONCRETE PRODCUTS CORPORATION, CAPE CHARLES, VIRGINIA

ATTACHMENT (Section 5).

JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED

Nature of Activity Utilizing Water and Documentation of Beneficial Use

The Bayshore Concrete Products Corporation is primarily engaged in the manufacturing of structural concrete components. Items such as elevated bridging girders, cylindrical piles, and slabs. The facility manufactures its concrete products using a wet batching method. The standard industrial classification (SIC) code for this operation is 3272 (also NAICS 327390). Nearly all of the withdrawn water is used for production at the facility; water is used as an ingredient within concrete as well as a curing agent (steam accelerated curing). The remainder is used for other facility uses such as equipment wash out, aggregate cooling and area cleaning. The plant produces concrete at variable rates from year to year, so estimates of average annual quantities produced will also vary. A line diagram depicting the flow of water through the facility is attached for reference. The nature of these activities and the beneficial use are described below.

Concrete Ingredient This facility utilizes multiple aggregate and cements, which are varied by need. In general; aggregate materials (sand, stone, and gravel) are hauled to the facility by local suppliers and dumped into each of their respective holding bins until used. The aggregate components are to some extent, stored in bins atop of the mixer as well as assembled in the mixing cylinder directly. Cement and fly ash are brought to the facility by truck or rail and stored in their respective silos. This facility utilizes two, four cubic yard Eirich counter-current intensive mixers as a portion of the fully automated batching system manufactured by Erie-Strayer. Water added to the mixer is furnished by the facilities groundwater wells. The added water is temperature controlled using either geothermal unit or water heater.

Plant Wash Water Different washing processes utilize water at the plant. Compared to other concrete facilities, the washing practices at BCP are kept to a minimum. The main washing functions are mix-hopper washing and hauling-truck cleanout. In general: water is used to wash the mixers and are than emptied into a front loader, which transports the water to the settling basins/treatment area. Also, the trucks used to transport aggregate are rinsed at this same wash out basins. Water is withdrawn from well #3 to replenish the facilities aggreagte wash-out basin.

Landscape Irrigation The facility does not practice any landscape irrigation.

There is no municipal water supply that may be used in lieu of groundwater. There is no adequate onsite source of surface water that can be used. Groundwater has been historically withdrawn at this facility for the documented beneficial industrial use.

Water Demand Projections and Justification of Withdrawal Request

The Bayshore plant produces a variable amount of concrete per year. BCP, Inc. management has reviewed the current operation, water demand, and economy as it pertains to current operation and plans for future expansion of the facility. This review led to a projection of water needs over the next 10-years and the realization that the current permitted withdrawal is adequate to meet those demands. The following paragraphs outline the projected needs relative to the beneficial use described above.

Production at this facility is first and foremost limited by its Air Permit, which limits production to 270,000 tons per year. This is equivalent to approximately 133,333 Cubic yards per year. Year-to-year production volumes are a function of contractual obligations rather than by active marketing. Bayshore Concrete Products typically operates as a contracted entity. As such, their year-to-year production volume may fluctuate greatly. For example: in 2000, BCP, Inc. employed about 450 employees and produced 107,000 cubic yards of concrete products in support of the JFK elevated roadway project, resulting in a total withdrawal of 18.5 MG. In 2002, the facility only produced 50,000 cubic yards, resulting in a withdrawal of 11.5 MG.

In general, BCP, Inc. makes finished concrete products that are created onsite and assembled elsewhere (Piles, Bridge beams, and deck slabs). Bayshore Concrete Products differs from other ready-mix plants in that they actively cure their products to accelerate the engineered finished strengths in order to meet and/or exceed off-site construction deadlines. To achieve this acceleration, steam booths are used as temporary storage and curing stations. More water is used for steam than as an ingredient in concrete.

Calculation of unit-based water demand is complex. There are numerous variables that can contribute to the equation. Each finished product that BCP makes differs in initial water consumption. There are multiple shapes and sizes that the facility generates; as such, the water required for each product is different. The size of each product created requires different curing times; however, the design specifications of each piece created may have specific requirements dictated by the project engineer.

Considering the average groundwater withdrawn and the volume of produced concrete, the average unit-based rate of groundwater consumption (including water as a concrete ingredient, curing, cleaning, washing, and dust suppression and staff support) is approximately 200-gallons/cy. This rate is based on consumed groundwater and does not include the volume of recycled and reused water.

Due to anticipated demand for concrete from the facility, expansion of facility capacity is variable, however should not exceed the facilities permitted limit. The facility is expected to experience variable monthly production. Rates of concrete production could double from the current rate depending upon the contracted need. Current permitted withdrawals are sufficient to supply the water necessary for this demand and forecasted demand. Based upon current unit-based groundwater usage, the facility could produce as much as 135,000 cubic yards. Therefore the current permitted volume of 27,000,000 gallons is sufficient withdrawal to anticipate the maximum extent of future operations.

Annual and monthly maximums are not likely to be sustained year over year do to the nature of this facility. A lump-sum permit would be able to provide the necessary volume of water. The apportionment table below is modeled on the facilities peak production. As such the table provides an annual maximum total of 27.00 Million gallons per year and 3.00 Million gallons per month.

The proposed lump sum volumes previously determined by the DEQ shall be used in conjunction with the Maximums discussed in this section. The volumes are as follows:

TERM	Annual Maximum	Monthly Maximum
1 Maximum Year	20.00 MG / 20.00 MG	3.00 MG
3 High Use Years	16.00 MG / 48.00 MG	3.00 MG
6 Nominal Years	13.00 MG / 78.00 MG	3.00 MG
Total 10-year Volume	**146.00 MG**	

These amounts reflect the actual usage over the previous permit period in conjunction with maximums that could be experienced if maximum demand/production is experienced.

Apportionment of Withdrawal to Individual Wells (at maximum withdrawal)

The permitted yield will be produced from eleven of 13 existing production wells. Wells #2, 5b are out of service. Wells #8, #9, #10 do not exist. Review the following table for more information on apportionment.

[1]APPORTIONMENT OF WITHDRAWALS	Well #1	Well #3	Well #4	Well #5	Well #5c	Well #6	Well #7	Well #10a	Well #10b	Well #11	Well #12	[3]Totals
Schedule	[2]M – PRN											
January	202,500 gal	315,000 gal	103,500 gal	83,250 gal	83,250 gal	450,000 gal	562,500 gal	101,250 gal	101,250 gal	22,500 gal	225,000 gal	*2.25 MG*
February	202,500 gal	315,000 gal	103,500 gal	270,750 gal	270,750 gal	450,000 gal	562,500 gal	288,750 gal	288,750 gal	22,500 gal	225,000 gal	*3.00 MG*
March	202,500 gal	315,000 gal	103,500 gal	270,750 gal	270,750 gal	450,000 gal	562,500 gal	288,750 gal	288,750 gal	22,500 gal	225,000 gal	*3.00 MG*
April	202,500 gal	315,000 gal	103,500 gal	83,250 gal	83,250 gal	450,000 gal	562,500 gal	101,250 gal	101,250 gal	22,500 gal	225,000 gal	*2.25 MG*
May	172,500 gal	285,000 gal	73,500 gal	58,250 gal	58,250 gal	440,000 gal	522,500 gal	76,250 gal	76,250 gal	22,500 gal	165,000 gal	*1.95 MG*
June	172,500 gal	285,000 gal	73,500 gal	58,250 gal	58,250 gal	440,000 gal	522,500 gal	76,250 gal	76,250 gal	22,500 gal	165,000 gal	*1.95 MG*
July	172,500 gal	285,000 gal	73,500 gal	58,250 gal	58,250 gal	440,000 gal	522,500 gal	76,250 gal	76,250 gal	22,500 gal	165,000 gal	*1.95 MG*
August	172,500 gal	285,000 gal	73,500 gal	58,250 gal	58,250 gal	440,000 gal	522,500 gal	76,250 gal	76,250 gal	22,500 gal	165,000 gal	*1.95 MG*
September	172,500 gal	285,000 gal	73,500 gal	58,250 gal	58,250 gal	440,000 gal	522,500 gal	76,250 gal	76,250 gal	22,500 gal	165,000 gal	*1.95 MG*
October	202,500 gal	315,000 gal	103,500 gal	83,250 gal	83,250 gal	450,000 gal	562,500 gal	101,250 gal	101,250 gal	22,500 gal	225,000 gal	*2.25 MG*
November	202,500 gal	315,000 gal	103,500 gal	83,250 gal	83,250 gal	450,000 gal	562,500 gal	101,250 gal	101,250 gal	22,500 gal	225,000 gal	*2.25 MG*
December	202,500 gal	315,000 gal	103,500 gal	83,250 gal	83,250 gal	450,000 gal	562,500 gal	101,250 gal	101,250 gal	22,500 gal	225,000 gal	*2.25 MG*
Annual Estimated Usage												*27.00 MG/YR*

[1] Estimates of projected maximum water use in gallons. Actual use will vary.
[2] M-PRN = monthly withdrawal pumped as needed.
[3] Numbers rounded for simplicity.

APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT
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Plant Wash Water Different washing processes utilize water at the plant. Compared to other concrete facilities, the washing practices at BCP are kept to a minimum. The main washing functions are hopper washing and hauling truck cleanout. In general: water is used to wash the mixers and is than emptied into a front loader, which transports the water to the settling basins/treatment area. Also, the trucks used to transport aggregate are rinsed at this same site.

Landscape Irrigation The facility does not practice any landscape irrigation.

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Considering the average groundwater withdrawn and the volume of produced concrete, the average unit-based rate of groundwater consumption (including water as a concrete ingredient, curing, cleaning, washing, and dust suppression and staff support) is approximately 200-gallons/cy. This rate is based on consumed groundwater and does not include the volume of recycled and reused water.

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1 Maximum Year	27.00 MG / 27.00 MG	3.00 MG
3 High Use Years	16.00 MG / 48.00 MG	3.00 MG
6 Nominal Years	13.00 MG / 78.00 MG	3.00 MG
Total 10-year Volume	**153.00 MG**	

These amounts reflect the actual usage over the previous permit period in conjunction with maximums that could be experienced if maximum demand/production is experienced.

Apportionment of Withdrawal to Individual Wells (at maximum withdrawal)

The permitted yield will be produced from eleven of 13 existing production wells. Wells #2, 5b are out of service. Wells #8, #9, #10 do not exist. Review the following table for more information on apportionment.

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August	172,500 gal	285,000 gal	73,500 gal	58,250 gal	58,250 gal	440,000 gal	522,500 gal	76,250 gal	76,250 gal	22,500 gal	165,000 gal	*1.95 MG*
September	172,500 gal	285,000 gal	73,500 gal	58,250 gal	58,250 gal	440,000 gal	522,500 gal	76,250 gal	76,250 gal	22,500 gal	165,000 gal	*1.95 MG*
October	202,500 gal	315,000 gal	103,500 gal	83,250 gal	83,250 gal	450,000 gal	562,500 gal	101,250 gal	101,250 gal	22,500 gal	225,000 gal	*2.25 MG*
November	202,500 gal	315,000 gal	103,500 gal	83,250 gal	83,250 gal	450,000 gal	562,500 gal	101,250 gal	101,250 gal	22,500 gal	225,000 gal	*2.25 MG*
December	202,500 gal	315,000 gal	103,500 gal	83,250 gal	83,250 gal	450,000 gal	562,500 gal	101,250 gal	101,250 gal	22,500 gal	225,000 gal	*2.25 MG*
Annual Estimated Usage												*27.00 MG/YR*

[1] Estimates of projected maximum water use in gallons. Actual use will vary.
[2] M-PRN = monthly withdrawal pumped as needed.
[3] Numbers rounded for simplicity.

GROUNDWATER CONSERVATION AND MANAGEMENT PLAN

APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT: SECTION 13 ATTACHMENT

BAYSHORE CONCRETE PRODUCTS INCORPORATED
1134 BAYSHORE ROAD
CAPE CHARLES, VIRGINIA 23350

CAPE CHARLES, VIRGINIA
MARCH, 2007

Table of Contents

1.0 GENERAL INFORMATION

Bayshore Concrete Products, Inc., herein referred to as the "facility", is an industrial concrete fabrication manufacturer located in Cape Charles, Virginia. The standard industrial classification (SIC) code for this operation is 3272. 100% of the water withdrawals are used to support production and the staff.

Normal operation of the facility typically requires annual withdraws of variable amounts of groundwater that is withdrawn from its twelve production well and one geothermal well. Because this property is located within the Eastern Shore Groundwater Management Area – as defined by the Virginia Department of Environmental Quality [VDEQ] – a Water Conservation and Management Plan has been prepared in accordance with the Ground Water Management Act of 1992, Chapter 25 (§62.1-254 et seq.) of Title 62.1 of the Code of Virginia. The purpose of this document is to analyze water supply and demand issues facing the facility and develop a reasoned and justifiable response for water conservation and management. This document is intended to help guide the facilities management with respect to its responsibility for the operation and policy management decisions. Lastly, this document will meet the permit requirement by VDEQ for a water conservation and management plan. Water conservation measures are those physical facilities, equipment, or devices utilized with certain methods, techniques, policies, practices, and procedures, which reduce water consumption, improve water use efficiency, reduce water loss or waste, increase water recycling or reuse and ultimately result in a reduction of water demand. Water management consists of a plan to implement water conservation measures.

This Water Conservation and Management Plan, referred to herein as the "Plan" includes identification of water demand and water source and then provide guidance to implement water management and conservation measures.

2.0 WATER DEMAND

Water demand for the facility is driven by a concrete production. There are limited opportunities to conserve water wherever it is used and can be managed. The following paragraphs describe the water demand by reviewing the facilities use of it.

The water that is used in production is withdrawn directly from twelve on-site production wells (two of which are emergency stand-by wells). The water is directed through a series of filters, heaters, tanks, boilers, conditioners or any combination of the aforementioned. A significant percentage of the water withdrawn is heated to create steam. As such, less water is directed to waste management than is actually withdrawn.

The total maximum monthly consumption of groundwater from the target aquifers over the permitting period is 3.0 million gallons (MG), while the annual total over that duration will not exceed 27.0 MG as these values are maximums that could be expected over the lifetime of the facilities 146 Million Gallon lump Sum permit period. The month-to-month water use is nearly flat in terms of distribution. The facility does not appear to have increased consumption during any particular months of the year.

3.0 WATER SUPPLY

The following section presents a general overview of water resources available to the facility. There is no municipal supply pipeline from the Town of Cape Charles. All production water is withdrawn from the facilities wells.

Water need is a function of production demand. The facility operates at a variable rate, as their production demand is variable. The water withdrawn from the natural aquifer has been found to be of sufficient quality for continued use. Water withdrawals are on an as-needed basis and do not stagnate or remain in temporary storage for extended periods of time.

4.0 WATER CONSERVATION MEASURES

The following conservatory measures will be implemented with regard to the water supply including groundwater from the facilities' wells.

- No unnecessary groundwater withdrawal will be permitted.

- Facility management annually reviews water use and will implement changes where possible and practical to better manage water use and increase water conservation.

- Ground water withdraws are only implemented as needed.

- *Water Reuse Evaluation*: Due to the nature of use, significant reuse opportunities are limited. Due to the nature of production and the subsequent curing process, much of the withdrawn water cannot be reclaimed and reused. The sole reuse operation that is routinely practiced on-site is at the facilities washout basins. Water that is in the washout system is not discharged and new-water additions are derived from Well #3 as needed. The facility utilizes steam for accelerated concrete curing, most of the usable steam vapor is lost to the atmosphere during the curing process. Storm water is collected and used as Dust Suppression water as needed and if available. Bayshore Concrete will adopt other conservation (reuse/recycle) opportunities as technology develops.

- *Water Saving Plumbing and Processes*: Facility management has committed to the use of water saving plumbing, processes and fixtures where appropriate. All new or renovation construction involving the use of groundwater resources will include fixtures and equipment designed to conserve water use. Currently within the facility we are utilizing low-water usage toilets and bathroom fixtures in newer construction and where renovations have been completed.

5.0 WATER MANAGEMENT MEASURES

The following management measures will be implemented with regard to the water supply including groundwater from the facilities' wells:

- Water Loss Reduction:
  - (a) The facility conducts accurate monthly records review to discover excessive usage that may indicate a leak in the system or significant change in operations.
  - (b) The facility will conduct routine inspection of any above ground water piping systems and storage tanks for any indication of leaks. The Facility is obligated to repair any leaks that are discovered.
- Mandatory water use restrictions will be implemented during water shortage emergencies declared the local governing body, the Director of DEQ, or the Governor. The facility will comply with penalties for demonstrated failure to comply with mandatory water use restrictions.
- Water saving plumbing and processes will be implemented in accordance with the Uniform Statewide Building Code when upgrades to these systems are made. These items include, but are not limited to:
  - Water saving pluming such as 0.5 GPM faucets and 1.6 GPF toilets
  - Steam reclamation technologies as they become available
  - Increased stormwater retention/collection for enhanced dust suppression

- The Facility functions with water use education program for all field staffers and is to be reviewed and adhered to. As the majority of the water use is actually automated through the batching computer and curing requirements, it shall be generally accepted that the management directs the water use. Water use education shall be accomplished utilizing the existing weekly training sessions with the workforce, with dedicated sessions occurring annually. Components of the water use education include:
  - Withdrawn water is not used for general equipment cleaning and maintenance.
  - Withdrawn water is not to be used for irrigation.
  - Withdrawn water is only to be consumed from the source that has been approved by the Virginia Department of Health.

CONSERVATION AND MANAGEMENT PLAN
EMPLOYEE EDUCATION PROGRAM

BAYSHORE CONCRETE PRODUCTS INCORPORATED
1134 BAYSHORE ROAD
CAPE CHARLES, VIRGINIA 23350

CAPE CHARLES, VIRGINIA
OCTOBER, 2007

TRAINING OBJECTIVES:

- Identify the requirement for water conservation.
- Recognize Water Efficiency Improvement Best Management Practices.
- Identify restricted uses
- Practice in water conservation
- Report leaks

Identify the requirement for water conservation.

Bayshore Concrete Plant is located within the Eastern Shore Groundwater Management Area (GWMA). A region is designated as a GWMA when there is the concern that potential demands on ground water resources may not be sustainable. In compliance with the Ground Water Management Act of 1992 when an individual user of ground water, whether an agricultural, industrial or municipal user, withdraws over 300,000 gallons per month must have a permit to withdrawal water from the Virginia Department of Environmental Quality. BCP must maintain and preserve this right to use this resource and is obligated to actively analyze water supply issues and develop a plan for proactive water conservation and management.

The water that is used in production is withdrawn directly from the facilities network of production wells. The water is directed through a series of filters, heaters, tanks, boilers, conditioners or any combination of these processes to a user endpoint. **NOTE:** Water for human consumption may only be withdrawn from wells that have been approved by the Virginia Department of Health.

The maximum monthly consumption of groundwater permitted at BCP is 3.0 million gallons. Additionally, the total annual consumption must not exceed 27.0 million gallons.

Recognize Water Efficiency Improvement Best Management Practices

The EPA has identified Water Efficiency Improvement Best Management Practices (BMPs) in ten possible areas. Of these ten areas identified for improvement, four are related to BCP operations. All related BMPs are implemented. These water efficiency BMPs are:

> **Public Information and Education Programs** – BCP has a continuing education program to maintain awareness of water conservation. *Employees are required to attend training sessions and are encouraged to make suggestions that might lead to additional conservation of water resources.*
>
> **Distribution System Audits, Leak Detection and Repair** – BCP conducts monthly

records reviews to discover excessive usage that may indicate a leak in the system or significant change in operations. Managers also conduct routine physical inspections of any above ground water piping systems and storage tanks for any indication of leaks. The Facility is obligated to repair any leaks that are discovered immediately. *Employees should report any and all water leaks to the appropriate manager when discovered.*

Toilets, Urinals, and Faucets - Facility management has committed to the use of water saving plumbing, processes and fixtures where appropriate. All new or renovation construction where appropriate will include fixtures and equipment designed to conserve water use.

Miscellaneous High Water-Using Processes - As the majority of the water use is actually automated through the batching computer it is generally accepted that the management already maintains efficient use of water for high-use-processes.

Water Reuse

Due to the nature of BCP operations, opportunities to reuse water is limited as most process water used as a mix ingredient, lost to the atmosphere, or lost as steam vapor during the curing process. The sole reuse operation that is routinely practiced on-site is at the facilities washout basins. Water utilized in the washout system is recirculated within the basins for reuse. BCP will adopt other conservation (reuse/recycle) opportunities for water reuse, such as steam reclamation technologies, may be used as they become available.

Additional Water Conservations Measures

Additional water use savings can be realized through the utilization of storm water and administrative policy to restrict non-beneficial and unnecessary utilization of water.

Storm water is collected and used for dust suppression as needed and if available. When upgrades to this system are made, attention to increasing onsite detention volume of storm water will be made in order to enhance dust suppression.

By administrative policy the following water uses are not authorized by BCP:

- Ground water is generally not used for daily equipment cleaning and wash down in work and curing areas unless safety is compromised.
- Ground water is not to be used for irrigation.
- Mandatory water use restrictions will be implemented during water shortage emergencies as declared by the Director of DEQ or by the Governor.

Best Western Sunset Beach Resorts

3100-001 / NEW

Projected Water Use Evaluation

Attached are two evaluations prepared in support of the withdrawal request. The first evaluation was prepared in an effort to determine a factor "X" associated with use based on the demand centers at the facility described as the RV Park (X use per site) the Motel and Restaurant (1.3 * X) and Pub use evaluated as $10/food patron and $7.50/beverage patron and a patron use of 5 gpd assumed.

For the evaluation the occupancy rates of the Motel and RV Park and the cash revenue for the pub were used to predict Room days and RV site days. Using the record water usage and subtracting anticipated pub use (based on receipts) a use figure for the motel and RV Park was then used to determine the X factor in gpd. The determination was made for 2003, 2004 and 2005. Based on the average "X" determined during the period a projected full occupancy determination was made. This full occupancy prediction used highest revenue for the pub of record and the average "X" to predict Motel + RV usage. The average "X" determined was 223.4 gpd This represents the predicted gpd for an RV site and 1.3 * 223.4 = 290.42 is the predicted value for a room (REMEMBER THE RESTAURANT AND ALL OTHER ACCESSORY USES ARE LUMPED IN THIS VALUE). The full occupancy figure predicted a peak month of 1,077560 gallons.

In an effort to predict an annual use figure, anticipated growth for the next 10 year period was assumed to be an occupancy of 65% for the motel and 55% for the RV Park on an annual basis. Pub use was projected based on an annual revenue of $325,000.00.

Based on this analysis, an annual use which may be anticipated during the next 10 years was determined to be 7,646,624 gallons.

Since the above analysis was a bit confusing, a second evaluation was initiated. In the second evaluation an overall "occupancy rate" was evaluated. In this evaluation the reported occupancy rates were converted to daily rates – the number of rooms occupied per day by month and the number of RV Sites occupied by day per month. Since there are a total of 127 available (73 Rooms + 54 Sites) the overall % occupied was determined. Pub use was again evaluated based on revenue. A monthly use was assigned based on predicted patrons (determined from revenue breakdown) and a patron evaluated at 5 gpd.

The pub use was subtracted from the reported monthly usage (2003 – 2005 to date period) and a monthly use per % occupancy was determined.

Based on the historic occupancy record a "GOAL" occupancy by month was determined for the coming 10 year period. The prediction is an overall occupancy of 60%. To use the same "occupancy" or use figures for the pub, it was necessary to determine what might be a 100% Pub day – a revenue of $2500/Day (or a water use figure of 1500 gpd) was used.

This overall occupancy "GOAL" determination resulted in a prediction of 6,859,070 gallons. To allow for potential expansion (possible expansion of RV Park) during the 10 year period a contingency of 10% was assumed. The contingency should also address any occupancy >60% overall or the addition of other special events similar to Harvest Fest. The predicted value is an annual use of 7,544,977 gallons with a predicted peak month of 1,093,399 gallons.

Both of the evaluations result in a potential annual value very close to the existing permitted value of 7,650,000 gallons. The request is thus for a continuation of the existing allowed withdrawal values (7.65 MG/Yr and a peak month value of 1.42 MG).

The predictions for the annual use requested are both below what may be the 100% potential of the facility. It is assumed that a reasonable occupancy goal should be adequate for the coming 10 years. The peak month is requested to be maintained at the current level so that "special" events which may be planned or scheduled would not result in a permit violation. The peak monthly usage value is not an expected "normal" occurrence however it is a figure that should allow the facility some leeway in its potential marketing efforts (reach 100% consistently for a period of time) or add additional festival or other special events at the site.

WATER CONSERVATION PLAN
BEST WESTERN SUNSET BEACH RESORT

Best Western Sunset Beach Resort includes a full service motel with 73 rooms and a 100 seat restaurant. In addition there is an RV park with 54 full service hookups on the property. The resort also has the Pelican Pub located on the beach which also serves food and beverages. There are outdoor recreation areas provided for the use of facility guests. The facility is served by a water system supplied by multiple wells. It is also noted that the facility is served by a wastewater treatment plant located on the property. The final step of the wastewater treatment plant is a terminal wetland which provides infiltration of the treated effluent into the ground.

In an effort to conserve water, the following measures have been taken at Best Western Sunset Beach Resort:

1. All plumbing modifications, additions or renovations will incorporate the use of water saving fixtures
2. Water usage is routinely monitored (daily meter readings) to allow an assessment of water usage, loss or leakage. In addition, since the facility is a commercial establishment, occupancy and facility usage is known. Water usage can be gauged based upon facility occupancy/patronage. Water loss or excessive usage can be determined based upon a noted high use not associated with high occupancy/patronage or a known water demand. All leaks are repaired when detected. The housekeeping staff monitors the motel rooms for faulty or problem plumbing (running toilets or dripping faucets). Problems are reported to the main desk and repairs are made to fixtures when a problem is noted. It would be difficult to rent a room with faulty plumbing.

   If there is a system distribution problem exterior to the motel which requires repair that cannot be addressed by onsite staff, a local contractor is contacted and the repair scheduled for immediate attention.
3. Employees of Best Western Sunset Beach Resort have been instructed regarding water saving techniques. In particular, the grounds crew is encouraged to always use mechanical procedures when cleaning outside (sweeping, scraping, etc.) rather than water assisted methods. Similarly, maintenance at the STP should be performed using mechanical methods (skimming and scraping) as opposed to relying on a hose to ease operations. The Best Western Sunset Beach Resort water supply system is not routinely used for landscape watering. Minimal, landscape maintenance use of the onsite system is performed (spot reseeding of bare areas or infill planting). There is no routine irrigation of landscape features at the facility.

In the restaurant, conservation practices include washing full loads of dishes, providing water upon request and minimizing the use of "extra" dishes which have no beneficial purpose.

At the Pelican Pub, plastic/paper utensils and dishes are utilized for food/beverage service to customers.

The motel encourages guests staying more than one night to recycle towels. Guests are provided a card which indicates that towels may remain for reuse if desired. Guests may choose to elect this option if they desire.

A notice is posted behind the main desk indicating the facility is located in the Eastern Shore Ground Water Management Area and that water conservation practices are necessary.

During "festivals" which take place at the facility, portable toilets are utilized to reduce water consumption. The site has been provided with several areas for outdoor recreation for the enjoyment of guests which minimize reliance on the site water system (picnic/barbecue areas, beach, natural areas).

4. The primary use of water at Best Western Sunset Beach Resort is for domestic purposes associated with the operation of the motel, restaurant, RV park and Pub. As noted above, all of the wastewater from the facility is treated onsite in the facility STP which relies on the terminal wetland for final management. This is the only water reuse option currently available at the site. Water supplied to guests of the facility must conform to established Health Department criteria.
5. During water shortage emergencies declared by the local governing body or by the director of the Department of Environmental Quality, Best Western Sunset Beach Resort patrons will be notified that there is a water shortage emergency and that water use must be minimized. Customers will be asked to please shorten showers and to use water conservation practices.

Cherrystone Family Camping Resort

3100-001 / NEW

ATTACHMENT 3

METHODOLOGY FOR FLOW PROJECTIONS

Total Year 2002 usage was 8.057 million gallons which will be used as historic usage. With 732 campsites this results in a usage of 11,000 gallons per year per campsite. The maximum month was July with a usage of 2.347 million gallons or 3206 gallons per campsite. These numbers are not accurate for any particular campsite as not all are occupied on any given day. Occupancy rates have been increasing in recent years and it is anticipated that over the next 10 years the occupancy rate will increase at least another 5%. Therefore, we will use 11,000 x 1.05 = 11,550 gallons/campsite/year for future projection and 3206 x 1.05 = 3366 gallons/campsite/month for the maximum month.

ATTACHMENT 4

ANTICIPATED WATER USAGE THROUGH 2012

There are presently 732 campsites. It is anticipated that some 200 additional sites of the "Pull Through" type will be added in the next few years. These types of sites are increasingly in demand but not currently available. Also, a new 70,000 gallon pool is anticipated which will require approximately 100,000 gallons per year accounting for evaporation and spillage.

Annual Usage

1.	Historic Usage		8,057,000 gal./yr.
2.	Unmetered Usage		169,000 gal./yr.
3.	Five (5) percent occupancy increase		402,850 gal./yr.
4.	200 new campsites @ 11,550 gal/yr. =		2,310,000 gal./yr.
5.	New Pool		100,000 gal./yr.
			11,038,850 gal./yr.
		Say	11,100,000 gal./yr.

Monthly Usage

1.	Historic Maximum Usage		2,347,000 gal./mo.
2.	Unmetered Usage		68,000 gal./mo.
3.	Five (5) percent occupancy increase		117,350 gal./mo.
4.	200 new campsites @ 3366 gal./mo.		673,200 gal./mo.
5.	New Pool		100,000 gal./mo.
			3,305,550 gal./mo.
		Say	3,310,000 gal./mo.

AUGUST 29, 2003

Erin Tisdale
DEQ-TRO
5636 Southern Blvd.
Va. Beach, VA 23462

Dear Ms. Tisdale

Provided is a list of well apportionments we are submitting for your approval. We are requesting that wells 1 and 4 share the percentage shown. These two wells are to be rotated on a monthly schedule. Usually, one of the wells is held in reserve as a precautionary measure. If we were to have a well that needed repair or suddenly broke down, the other well could be placed into service while repairs were being made.

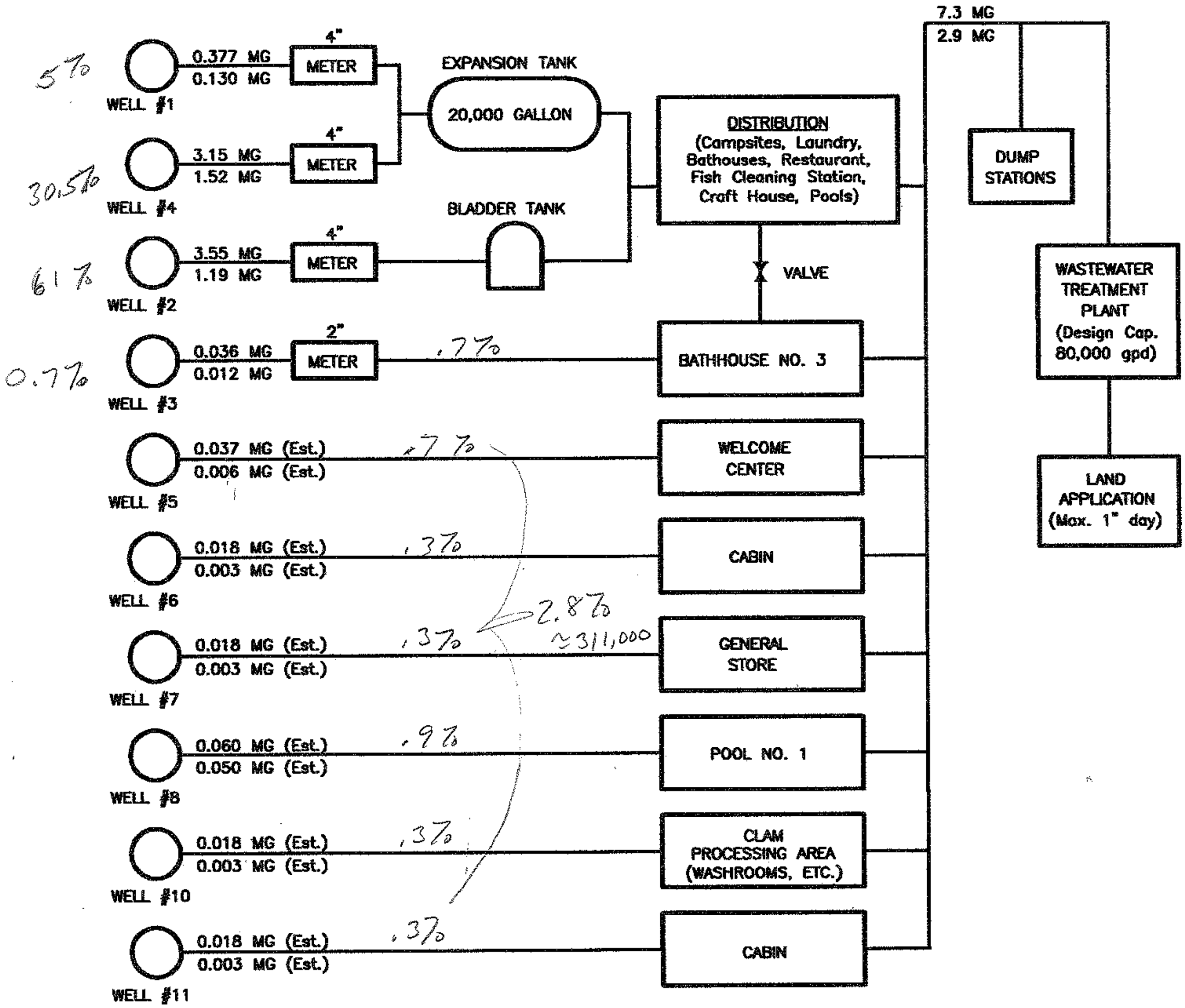
	Well number	Percentage	Million Gallons*	
	1 & 4	32.9%	3.6519	
	2	63.0%	6.9930	
	3	.9%	.0999	
	5	.5%	.0555	
	6	.3%	.0333	
	7	.3%	.0333	
	8	1.4%	.1554	
	10	.3%	.0333	– clams
	11	.4%	.0444	
Totals:		100%	11.1000	

*All figures shown are for yearly withdrawals. Monthly withdrawals will vary according to use and weather conditions.

I hope this report meets with your satisfaction and if you have any questions please feel free to call.

Sincerely,

James Hopkins
General Manager
Cherrystone Family Camping Resort



LEGEND

3.15 MG = MILLION GALLONS / YEAR
1.52 MG = MILLION GALLONS / MAX. MONTH

NOTE: FLOWS ARE FOR YEAR 2001

CHERRYSTONE CAMPGROUND
WATER FLOW LINE DIAGRAM

R. KENNETH WEEKS ENGINEERS
2733 TIDEWATER DRIVE
NORFOLK, VIRGINIA 23509

– Use for wells 1+4 has been corrected here.

ATTACHMENT 12

WATER CONSERVATION AND MANAGEMENT PLAN

1. Use of Water Saving Plumbing and Processes

   The use of water saving plumbing and processes including, where appropriate, the use of water saving fixtures in new and renovated plumbing as provided in the Uniform Statewide Building Code will be followed.

2. Water Loss Reduction Program

   The water system will be visually inspected for leaks by full-time maintenance staff on a weekly basis. Monthly water meter readings will also be reviewed in terms of excessive withdrawal which may be indicative of a leak. If a leak is detected, that part of the water system will be shut down immediately and repaired. The staff will be instructed to note areas where changes will help to conserve water, or reduce losses. In addition, groundwater use will be audited during the first two years of the permit cycle and a leak detection and repair program will be implemented within one year of completion of the audit.

3. Line Replacement

   Water line replacement in Area 1 has been completed. Area 2 water lines will be replaced over the next (5) years, or sooner if significant leaks are found. Remaining areas will be monitored and lines replaced if warranted.

4. Water Use Education Program

   Employees will receive instruction as to the important of efficient water use and conservation methods during their orientation. Campers will also receive instruction concerning efficient water use and conservation upon arrival at the campground. Placards promoting water conservation methods will be posted in appropriate areas, and campers will be requested to promptly notify staff of any problems with the water system such as plumbing leaks or dripping fixtures.

5. Evaluation of Potential Water Reuse Options

   There are no practical options for water reuse.

6. Requirements for Mandatory Water Use Reductions

   The campground will comply with any mandatory water use reduction during water shortage emergencies declared by the local governing body or the Director of DEQ and with any penalties for failure to comply. This will include provisions of requirements for mandatory water use restrictions to seasonable and year-round employees, prohibiting all non-essential uses such as lawn and ornamental irrigation or vehicle washing at the campground.

Kuzzens KMC Camp

3100-001 / NEW

APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT
KUZZENS KMC CAMP, CHERITON – NORTHAMPTON COUNTY, VA

ATTACHMENT (Section 5)

<u>JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED</u>

Nature of Activity Utilizing Water and Documentation of Beneficial Use

The Kuzzens KMC camp is located approximately three quarters of one mile east-northeast of the town Cheriton, Virginia and has been a camp since 1947. The property was originally owned by Webster and KMC canning. The camp has 11 dormitories, 1 crew leaders home, two combined laundry/bath houses, and 2 water supply/pump houses. The maximum capacity of the camp is 336. Expansion of the camp is not planned at this time.

Data Acquisition and Reliability

No sufficient data has been generated or is available at this facility. Actual consumption rates can not be calculated as there is no such data available. Flow totalizers have been installed but one occupancy season hat yet to elapse. At the end of the 2007 season sufficient data will have been generated to establish a consumption rate.

Despite the lack of data, there are other facilities within the ESGMA area that have been evaluated and deemed acceptable for permitting. A value of 55 gallons per person per day was generated during that evaluation which had a need basis of 336 seasonal occupants. Although it would be ideal to have tangible data to address the specific demands generated at this facility, the aforementioned value of 55 gallons per person per day will be used. Permit #GW0004300 operates a 14 unit Migrant Labor Camp (MLC) which houses a maximum 336 migrants. Those 14 units at peak occupancy have been approved to withdrawal a total of 560,000 gallons per month. This equates to a per-occupant value of 55 gallons per occupant per day.

Demand and Beneficial Use

This camp houses migrant laborers six months per year. The facility is reported to begin occupancy in mid June and can be fully occupied though mid October. Occasionally, occupancy may extend into November or at the end of the agricultural season. During this time period, the maximum occupancy is approximately 336 individuals per week as the facility can only has 336 beds.

Water withdrawn at the camp is used for sanitary and domestic purposes. Water is used for food preparation, cleaning, bathing, drinking, and laundry. Water for personal irrigation is not permitted at this. There is no other water demand at this site.

Due to the previously mentioned lack of data a few assumptions must be made to calculate a reasonable demand volume. An evaluation of payroll records was made. There are 7 Labor Crews that routinely share the opportunity to utilize the KMC camp. The KMC camp is located in Cheriton it is centrally located to Kuzzen's operations. Because of this central location, the facility is chosen to be filled to occupancy before crew members are directed to other camps. Because of this, the KMC camp is the first to be used and the last to be vacated.

An evaluation of payroll records from the beginning of 2003 through 2007 was performed. Considering the abovementioned housing practice, a statistical method has been applied to the needs assessment. The attached calculation pages (Table 1.a and 1.b) have been included to demonstrate the occupancy need. The evaluation revealed the following information:

Percentage Occupied by month:

Month	Percentage Occupied	Crew Count
January	0 %	0
February	0 %	0
March	0 %	0
April	0 %	0
May	0 %	0
June	23.5 %	79
July	100 %	336
August	100 %	336
September	100 %	336
October	100 %	336
November	21.1 %	71
December	0 %	0

The specific day of occupancy can not be determined at the growing and picking seasons may be surpressed or accelerated due to climate variations. It will be assumed that the statistical percentages of occupancy begins on June 1 and ends on November 30.

The total days used for estimation is as follows:

	Days
June	15
July	31
August	31
September	30
October	26
November	15
Total	148

Each month's consumption rate can be calculated with the following formula:

$$55_{gallons}/_{per\_occupant\_per\_day} * X_{days}/_{month} * Y_{occupants} = X_{gallons}/_{month}$$

	Days	Crew Count	Total consumption
June	15	79	65,175
July	31	336	572,880
August	31	336	572,880
September	30	336	554,400
October	26	336	480,480
November	15	71	58,575
Total	148		2,304,390

Based on these calculations the facility requires 2.30 million gallons per year with a maximum monthly withdrawal of 0.572 million gallons per month. The facility now operates two wells for this system. The newest well was installed to supplement the waning production of the original well and as a preventative measure in the event the aged well becomes irreparable. These two wells will be used in concert. Apportionment of these wells will be discussed on the following page.

Apportionment of Withdrawal to Individual Wells

As there is no withdrawal data available for this facility yet, the apportionment will be assumed to be 50% / 50%. This may be revised in the future as data is generated. *
The apportionment table below depicts the contribution of withdrawal from each well.

*Will be single well w/d - Well #1 to be ABN BCB

[1]APPORTIONMENT OF WITHDRAWALS	~~Well #1~~ (DEQ #165-23)	Well #2 (DEQ #165-491)	Total
January	0	0	0
February	0	0	0
March	0	0	0
April	0	0	0
May	0	0	0
June	32,587	32,588	65,175
July	286,440	286,440	572,880
August	286,440	286,440	572,880
September	277,200	277,200	554,400
October	240,240	240,240	480,480
November	29,287	29,288	58,575
December	0	0	0
Annual Estimated Usage	**1,152,195**	**1,152,195**	**2,304,390**

** Included herein is the 2003-2007 payroll inventory and Calculation tables

Year	Month	Crew 637	Crew 640	Crew 641	Crew 682	Crew 683	Crew 684	Crew 694
2003	April	0	0	0	0	0	0	0
	May	0	0	0	0	0	0	0
	June	0	0	0	0	0	0	0
	July	188	0	0	222	92	170	0
	August	172	0	0	124	122	130	0
	September	163	0	0	166	113	130	0
	October	134	0	0	128	106	160	0
	November	0	0	0	0	0	0	0
2004	April	0	0	0	0	0	0	0
	May	0	0	0	0	0	0	0
	June	98	108	0	0	76	82	0
	July	89	142	0	156	110	146	0
	August	103	135	0	110	181	185	0
	September	64	128	0	110	160	114	0
	October	0	65	0	104	153	64	0
	November	0	0	0	96	89	0	0
2005	April	0	0	0	0	0	0	0
	May	0	0	0	0	0	0	0
	June	0	0	0	0	0	0	0
	July	99	161	255	168	0	0	55
	August	143	89	206	139	0	0	0
	September	84	138	209	87	0	0	0
	October	0	103	163	93	0	0	0
	November	0	0	115	58	0	0	0
2006	April	0	0	0	0	0	0	0
	May	0	0	0	0	0	0	0
	June	0	0	33	0	0	0	0
	July	88	0	243	125	0	0	0
	August	90	0	190	126	0	0	0
	September	92	0	160	116	0	0	0
	October	85	0	156	65	0	0	0
	November	0	0	0	0	0	0	0
2007	April	0	0	0	0	0	0	0
	May	0	0	0	0	0	0	0
	June	0	0	0	0	0	0	0
	July	0	0	205	114	0	0	118
	August	0	0	183	112	0	0	110
	September	0	0	167	144	0	0	86
	October	0	0	120	206	0	0	45
	November	0	0	57	0	0	0	0

** Transcribed from accounting records

TABLE 1a. SITE OCCUPANCY

VADEQ GROUNDWATER WITHDRAWAL
Kuzzens KMC Migrant Labor Camp
Cheriton, Virginia

MSA, P.C.
ENVIRONMENTAL SCIENCES, PLANNING, SURVEYING
ENGINEERING & LANDSCAPE ARCHITECTURE
5033 ROUSE DRIVE
VIRGINIA BEACH, VIRGINIA 23462
(757) 490 - 9264 FAX (757) 490 - 0634
www.msaonline.com

DATE:	SCALE:	MSA JOB #:
5/11/2007	**Relative**	**02833C**

Year	Month	Total
2003	April	0
	May	0
	June	0
	July	672
	August	548
	September	572
	October	528
	November	0
2004	April	0
	May	0
	June	364
	July	643
	August	714
	September	576
	October	386
	November	185
2005	April	0
	May	0
	June	0
	July	738
	August	577
	September	518
	October	359
	November	173
2006	April	0
	May	0
	June	33
	July	456
	August	406
	September	368
	October	306
	November	0
2007	April	0
	May	0
	June	0
	July	437
	August	405
	September	397
	October	371
	November	57

5- Year Average

	Total	KMC Occpancy	Overage	% Occupied
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	0	0	0	0
May	0	0	0	0
June	79	79	0	24%
July	589	336	253	100%
August	530	336	194	100%
September	486	336	150	100%
October	390	336	54	100%
November	83	71	12	21%
December	0	0	0	0

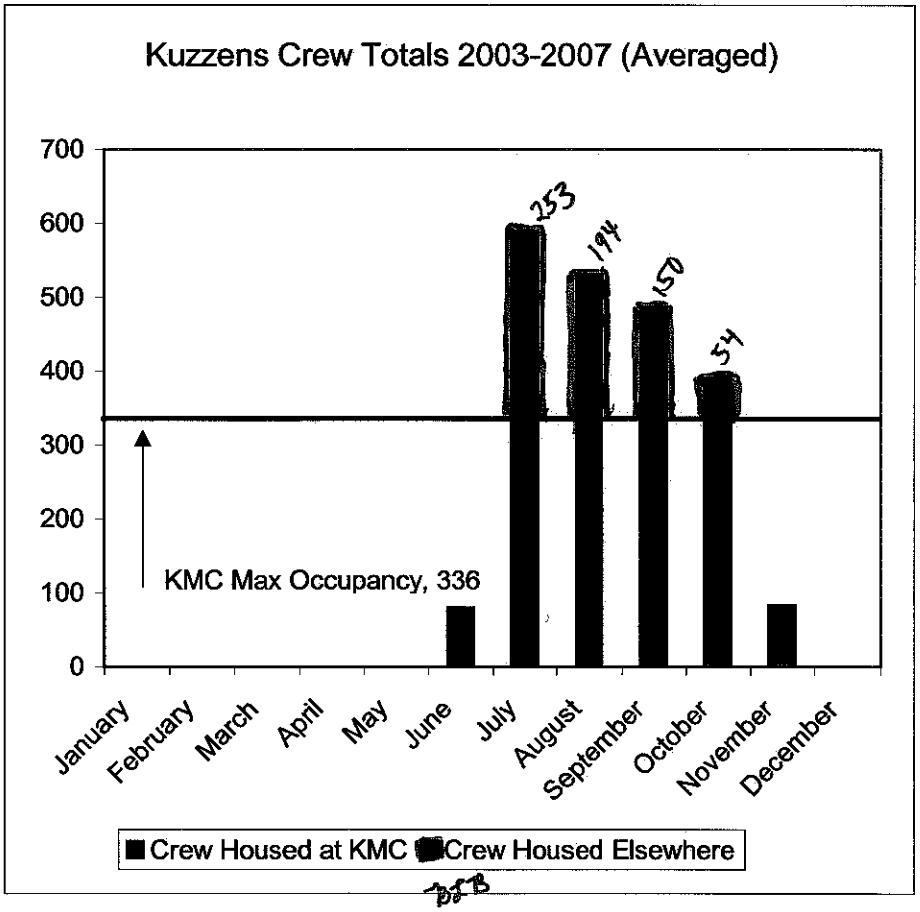


TABLE 1b. SITE OCCUPANCY

VADEQ GROUNDWATER WITHDRAWAL

Kuzzens KMC Migrant Labor Camp

Cheriton, Virginia

MSA, P.C.

ENVIRONMENTAL SCIENCES, PLANNING, SURVEYING
ENGINEERING & LANDSCAPE ARCHITECTURE

5033 ROUSE DRIVE
VIRGINIA BEACH, VIRGINIA 23462
(757) 490 - 9264 FAX (757) 490 - 0634
www.msaonline.com

DATE:	SCALE:	MSA JOB #:
5/11/2007	**Relative**	**02833C**

GROUNDWATER CONSERVATION AND MANAGEMENT PLAN

KUZZENS KMC CAMP
20508 PAT TOWN ROAD
CHERITON, NORTHAMPTON COUNTY VIRGINIA

NORTHAMPTON, VIRGINIA

JUNE, 2007

Table of Contents

1.0 GENERAL INFORMATION

The Kuzzen's KMC Migrant Labor Camp (MLC), herein referred to as the "facility", is a seasonal labor camp that provides a temporary residence during the agricultural season. This camp is located within the town of Cheriton, Northampton County, Virginia. The facility provides a potable water supply (transient, non-community) to its transients.

Typical consumption at the facility requires consumption of a virtually fixed amount of groundwater from its two-well system located centrally on the MLC property. Because this property is located within the Eastern Virginia Groundwater Management Area – as defined by the Virginia Department of Environmental Quality [VDEQ] – a Water Conservation and Management Plan has been prepared in accordance with the Ground Water Management Act of 1992, Chapter 25 (§62.1-254 et seq.) of Title 62.1 of the Code of Virginia. The purpose of this document is to analyze water supply and demand issues facing the facility and develop a reasoned and justifiable response for water conservation and management. This document is intended to help guide the management of the KMC MLC (Kuzzen's Inc.), who are responsible for the operation and policy management decisions of the facility. Lastly, this document will meet the permit requirement by VDEQ for a water conservation and management plan.

Water conservation measures are those physical facilities, equipment, or devices utilized with certain methods, techniques, policies, practices, and procedures, which reduce water consumption, improve water use efficiency, reduce water loss or waste, increase water recycling or reuse and ultimately result in a reduction of water demand. Water management consists of a plan to implement water conservation measures. This Water Conservation and Management Plan, referred to herein as the "Plan" includes identification of water demand and water source and then provide guidance to implement water management and conservation measures.

2.0 WATER DEMAND

Water at this facility is utilized for a variety of purposes. This use includes, but is not limited to, water used for cooking, bathing, laundry, cleaning, and other assorted domestic purposes. Nearly all water that is withdrawn at the facility is for potable use. The facility maintains a full-time water distribution system to supply each individual camper with water for all domestic needs. Sanitary waste and domestic usage waste generated on-site is handled by a single mass drain field located on the property.

The facility does not engage in any routine irrigation practices. Water withdrawal data, as of this writing, was unavailable. This is an existing withdrawal. It is a fact that the facility operates seasonally and is closed most of the year. Site occupancy occurs between mid June through mid October.

3.0 WATER SUPPLY

The following section presents a general overview of water resources available to the facility. As there are no municipal supply pipelines located within the town of Cheriton or Northampton County, drinking water, as well as general-use water, is directly withdrawn and distributed at the camp. Due to the nature of water usage, almost all water is used for potable purposes. There are two wells located within the complex that supply adequate quality and quantity of groundwater.

Water occurs in several forms or media (i.e., liquid and solid meteoric precipitation, surface water, and groundwater) in the relative geographic proximity of the facility. Although this region receives approximately 42 inches of precipitation per year, the facility is not large enough to be able to support a precipitation collection system and cistern storage system that could supply the required volume and rate of fresh water during normal operations. During periods of peak demand, surface water resources are not reliable as a result of high rates of evapotranspiration and low inputs from precipitation.

Groundwater has been used for at this location since the late 1940's without issues regarding quality or quantity. Due to the dynamic nature of the confined aquifer system, groundwater is naturally buffered during recharge to the aquifer. Thus, the regional, confined aquifer's groundwater is the most reliable source of quality water as opposed to any other options (surface water, sea water, etc.).

4.0 WATER CONSERVATION MEASURES

The following conservatory measures will be implemented with regard to the water supply including groundwater from the facilities' wells.

- No unnecessary groundwater withdrawal will be permitted. A bi-lingual notice will be dispatched to each tenant notifying them that the facility is located within the Eastern Shore Ground Water Management Area. This notice will explain the obligation that Kuzzen's Inc has to obtain and preserve a ground water withdrawal permit with the Virginia Department of Environmental Quality. This notice will also include highlights on how each individual can assist in water conservation efforts.

- Facility management will regularly review water use and will implement changes when identified:
  - During camp occupancy, well readings will be collected once per week to allow for the immediate identification of unusual use and/or leaks.
  - The Management will adopt and maintain an electronic database to record and monitor the well readings collected above.

- Water saving plumbing fixtures are used at this site. In the event of a need for replacement, new water saving fixtures will be used as direct replacements as provided in the Uniform Statewide Building Code. Laundry washing machines located on-site may have the opportunity to be updated. When these machines require replacement, newer efficient models should be evaluated.

- Water for irrigation is not used at this facility.

- Encourage transients to conserve water through the use of regularly posted bulletins and other conversational reminders, posters and/or notices posted in public areas. These bulletins will be issued each year or as new conservation efforts are identified and implemented. These bi-lingual bulletins will be posted in public areas such as the entrance to the facility, at the bath houses, and laundry facilities.

- *Water Reuse Evaluation*: All water used at this facility can not be reused or recycled.

5.0 WATER MANAGEMENT MEASURES

The following management measures will be implemented with regard to the water supply including groundwater from the facilities' wells.

- Water Loss Reduction:
  - (a) The facility will conduct weekly readings during camp occupancy in order to identify excessive flow that may indicate a leak in the system or significant change in consumption.
  - (b) The facility will conduct routine inspection of all above ground water piping systems and storage tanks for any indication of leaks on a weekly basis.
  - (c) The facility will conduct routine observations along underground potable water piping systems for indications of leaks. In conjunction with regular collection of monthly meter readings, routine observations along pipelines will also be conducted.
  - (d) Any leak discovered in the potable water storage/supply system will be repaired as soon as is practical or will be bypassed so as to minimize loss of water.

- Mandatory water use restrictions will be implemented during water shortage emergencies declared the local governing body, the Director of DEQ, or the Governor. Non-essential uses of water, such as irrigation will be restricted. In addition, facility personnel will be prohibited from general washing of buildings, paved surfaces, or equipment. The facility will comply with penalties for demonstrated failure to comply with mandatory water use restrictions.

- Water Conservation: Water conservation efforts as described in section 4.0 of this document shall be followed in order to preserve the resource and right to withdrawal water from the resource.

VDCR Kiptopeke State Park

3100-001 / NEW

Section 5
Kiptopeke State Park
GW # ~~0031600~~ 0054000

Description of Services/Product:

Kiptopeke State Park provides year-round recreational opportunities including hiking/biking, camping, fishing, boating, wildlife watching and swimming. This includes 47 tent sites, 86 electric/water/sewer sites, 8 rental RVs, 1 camping lodge (bunkhouse sleeps 14), 5 group tent sites, 1 yurt (sleeps 6), 5-six bedroom cabin (sleep 16), linen facility, 4 bathhouses/bathroom facilities (3 of 4 have showers), fishing pier (with fish cleaning station), boat ramp, RV dump station, camp store, contact station, office, shop/maintenance area, picnic area with 2 shelters, 4.2 miles of biking/hiking trails and 5 residences (4 active and one seasonal-interpretive trailer).
The Family Campground magazine rated Kiptopeke State Park as a Top 100 family campground, Top 10 fishing location and Top 5 birding location in 2005.

Section 5
Kiptopeke State Park
GW # ~~0031600~~ 0054000

Future Population:

Kiptopeke State Park continually serves 300,000-500,000 people per year. These numbers have fluctuated since 2001 due to World Trade Center destruction, rising and falling gas prices, terrorism threats and rising costs of living/travel. We hit a record attendance year in 2003 of 500,000, but have seen attendance drop to 300,000 over the last two years because of gasoline costs. We feel the park will continue to serve the 300,000-500,000 population range over the next ten years.

Expansion Plans:

Kiptopeke State Park recently added 5-six bedroom cabins to its overnight facilities through the 2002 GOB (Government Obligation Bonds). We don't have any additional 2002 GOB projects funded or scheduled for Kiptopeke.
The park's master plan presently calls for visitor and environmental education centers with the EEC having dormitories built to sleep 48. We plan in 2007 to change our master plan, adding these additional facilities: 4-2 bedroom cabins, 2-3 bedroom cabins and 6 yurts (replacing the 5 group tent sites with yurts). These six new cabins and the visitor center would be top building priorities.

Kiptopeke State Park
Section 5
GW#0054000 (new permit #)

Section 5-Question 1: Per my conversations with Brenda Brown, I've recalculated the figures used for 2004-2007 and projections for 2008-2017, bringing the projected numbers in alignment with annual use figures. Please review this completed request for new figures and explanations to previously submitted permit.

We used 1997's water permit paperwork and the standard for new campgrounds in VA State Park's that each site averages 4 people/day and 25 gallons each person a day. Therefore, I used the 25 gallons per day in my figures here per person. See attached paperwork on DCR sites Visitor Centers. I used planned scope of work for the Environmental Education Center to calculate its usage numbers and placed it under the projected 2008-2017 annual usage numbers.

Smith Mountain Lake State Park
Visitor Center Water Usage 2005-49,370 gal
2004-36,860 gal
(2-year avg. 43,115 gal/yr.)

Grayson Highlands State Park
Visitor Center Water Usage 2007-***60,850 gal***

Hungry Mother State Park
Visitor Center Water Usage 2006-82,600 gal
2007-47,500 gal
(2-year avg. 65,050 gal/yr)

Therefore Kiptopeke averaged these for a sum ***56,436 gal/yr***.

Environmental Education Centers (EEC)-Natural Tunnel is the only park with similar facilities to the one proposed at Kiptopeke. Their EEC's water supply is on a share water system and therefore they don't have numbers for the EEC's use only. I've based the figures listed below on the occupancy rates of our present overnight facilities Yurt-48% and RV trailers 46% yearly.

EEC-48 rooms X 193 nights/year X 50 gpd/room=***463,200*** gpy

(193 nights is 50% occupancy rate over the year and used standard park numbers per campsite of 100 gpd for 4 people and used the 25 gallons per day average per person and multiplied by 2 people per room for total water consumption).

From: Amanda Brown
To: Sweeney, Sam
Date: 2/28/2008 8:26:59 AM
Subject: Re: Water Usage SMLSP

Here you are

2006- 36,860

2005- 49,370

~Amanda

Amanda Brown
Smith Mountain Lake State Park

>>> Sam Sweeney 02/28/08 5:01 AM >>>
Amanda, can you tell me how much of that total was strictly VC operations? Thanks Sam

From: Ann Pickle
To: Sweeney, Sam
Date: 3/10/2008 2:11:25 PM
Subject: Re: Visitor Center Water Usage

Here you go. 47,500 gallons per year = $328.46 per year. I hope this helps. If you need anything else, please let me know.

Ann Pickle
Office Manager
Hungry Mother State Park
2854 Park Boulevard
Marion, VA 24354
(276) 781-7400
Fax: (276) 781-7402
ann.pickle@dcr.virginia.gov

>>> Sam Sweeney 03/07/08 4:30 PM >>>
Ann, can you send me the water usage for your visitor center? I need several state park's water usage totals for their VCs for a water application with DEQ. Thanks Sam

From: Ann Pickle
To: Sweeney, Sam
Date: 3/14/2008 8:47:51 AM
Subject: Re: Visitor Center Water Usage

Here you go. 82,600 gallons or $593.34 for 2006. If you need anything else, please let me know and I will get it to you as soon as I can. Thanks

Ann Pickle
Office Manager
Hungry Mother State Park
2854 Park Boulevard
Marion, VA 24354
(276) 781-7400
Fax: (276) 781-7402
ann.pickle@dcr.virginia.gov

>>> Sam Sweeney 03/13/08 8:39 AM >>>
Ann, the last two years would be helpful, but if you can only do one year I understand. I have to create a baseline total averaging several state parks with similar attendance figures and use them to complete a usage sheet for future facilities. Hope all is going well. Sam

FAX TRANSMISSION

Grayson Highlands State Park
829 Grayson Highland Lane
Mouth of Wilson, VA 24363
Phone: (276)579-7092
FAX: (276)579-2374

TO: Sam Sweeney

DATE: 2/21/2007

FAX#: 1-757-331-4649

Pages: 8 ; including this one

FROM: Harvey Thompson

SUBJECT:

COMMENTS: Visitor Center Well Usage
April → October 2007 60,850 gallons

You can determine amts. For each well water systems for GH from the monthly well monitoring reports that follow

Virginia Department of Health
Monthly Operating Report
Groundwater-Well or Spring
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077259, 1077260, 1077261, 1077262, 1077263

County: Grayson

Year: 2007 Month: April

Well	Monthly Usage - in gallons for each source	Attendance
# 2 Picnic Area	10,090	
# 3 Campground	1,610	
# 8 Visitor Center	6,120	
# 11 Campground	25,800	
# 12 Office	500	4,249
# 13 Stable Area	6,920	505
# 14 Campground	2,800	
Total Usage	**53,440**	**Total** 4,754

Number of Connections: 7

Number of People Served: 4,754

Certified Operator: Harvey N. Thompson

Certificate Number: 1904 000400

Signed: Harvey N. Thompson, Park Manager

Title: Park Manager Senior

Comments: All water systems were online by May 1, 2007.
Visitor Center not opened to public until May 19, 2007.
Campgrounds opened full service May 1, 2007.

Submit to: Virginia Department of Health
Office of Water Programs
454 East Main Street
Abingdon, VA 24210

Virginia Department of Health
Monthly Operating Report
Groundwater-Well or Spring
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077259, 1077260, 1077261, 1077262, 1077263

County: Grayson

Year: 2007 Month: May

Well	Monthly Usage - in gallons for each source	Attendance
# 2 Picnic Area	5,580	3,865
# 3 Campground	14,430	1,450
# 8 Visitor Center	8,890	3,000
# 11 Campground	27,350	1,070
# 12 Office	800	665
# 13 Stable Area	12,460	543
# 14 Campground	36,510	1,850
Total Usage	106,020	Total 12,243

Number of Connections: 7

Number of People Served: 12,243

Certified Operator: Harvey N. Thompson

Certificate Number: 1904 000400

Signed: Harvey N. Thompson, Park Manager

Title: Park Manager Senior

Comments: All water systems were online by May 1, 2007.
Visitor Center not opened to public until May 19, 2007.
Campgrounds opened full service May 1, 2007.

Submit to: Virginia Department of Health
Office of Water Programs
454 East Main Street
Abingdon, VA 24210

Virginia Department of Health
Monthly Operating Report
Groundwater-Well or Spring
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077259, 1077260, 1077261, 1077262, 1077263

County: Grayson

Year: 2007 Month: June

Well	Monthly Usage - in gallons for each source	Attendance
# 2 Picnic Area	10,710	7,540
# 3 Campground	21,430	2,000
# 8 Visitor Center	9,820	5,001
# 11 Campground	38,350	2,000
# 12 Office	700	886
# 13 Stable Area	35,220	997
# 14 Campground	49,970	2,000
Total Usage	166,200	Total 20,424

Number of Connections: 7

Number of People Served: 20,424

Certified Operator: Harvey N. Thompson

Certificate Number: 1904 000400

Signed: Harvey N. Thompson

Title: Park Manager Senior

Comments:

Submit to: Virginia Department of Health
Office of Water Programs
454 East Main Street
Abingdon, VA 24210

Virginia Department of Health
Monthly Operating Report
Groundwater-Well or Spring
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077259, 1077260, 1077261, 1077262, 1077263

County: Grayson

Year: 2007 Month: July

Well	Monthly Usage - in gallons for each source	Attendance
# 2 Picnic Area	10,570	2,550
# 3 Campground	23,740	2,500
# 8 Visitor Center	12,390	3,500
# 11 Campground	25,380	3,000
# 12 Office	2,800	888
# 13 Stable Area	30,350	1,500
# 14 Campground	69,080	4,979
Total Usage	174,310	Total 18,915

Number of Connections: 7

Number of People Served: 18,915

Certified Operator: Harvey N. Thompson

Certificate Number: 1904 000400

Signed: Harvey N. Thompson, Park Manager

Title: Park Manager Senior

Comments: Installed new water meter at the office well.
Due to the drought and lack of winter snow fall, we are averaging 4,000 gallons of water per day from 3 wells that supply the campground.

Submit to: Virginia Department of Health
Office of Water Programs
454 East Main Street
Abingdon, VA 24210

Virginia Department of Health
Monthly Operating Report
Groundwater-Well or Spring
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077259, 1077260, 1077261, 1077262, 1077263

County: Grayson

Year: 2007 Month: August

Well	Monthly Usage – in gallons for each source	Attendance
# 2 Picnic Area	14,500	2,500
# 3 Campground	29,550	3,203
# 5 Visitor Center	12,340	3,600
# 11 Campground	24,100	2,500
# 12 Office	217,320	900
# 13 Stable Area	38,010	2,000
# 14 Campground	51,350	4,500
Total Usage	387,170	Total 19,203

Number of Connections: 7

Number of People Served: 19,203

Certified Operator: Harvey N. Thompson

Certificate Number: 1904 000400

Signed: Harvey N. Thompson Park Manager

Title: Park Manager Senior

Comments: Installed new water meter at the office well.
iscovered serious leak in supply line to Office, digging to find problem for after replacing water meter. No evidence of leakage at ground level.

Submit to: Virginia Department of Health
Office of Water Programs
454 East Main Street
Abingdon, VA 24210

Virginia Department of Health
Monthly Operating Report
Groundwater-Well or Spring
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077259, 1077260, 1077261, 1077262, 1077263

County: Grayson

Year: 2007 Month: September

Well	Monthly Usage - in gallons for each source		Attendance
# 2 Picnic Area	18,580		3,000
# 3 Campground	22,128		4,500
# 8 Visitor Center	6,170		2,500
# 11 Campground	13,040		4,500
# 12 Office	156,256		1,500
# 13 Stable Area	26,150		3,500
# 14 Campground	36,340		4,415
Total Usage	277,662	Total	23,915

Number of Connections: 7

Number of People Served: 23,915

Certified Operator: Harvey N. Thompson

Certificate Number: 1904 000400

Signed: Harvey N. Thompson | PMS

Title: Park Manager Senior

Comments: Leak at office well system has been repaired. Will begin winterization process at the end of October.

Submit to: Virginia Department of Health
Office of Water Programs
454 East Main Street
Abingdon, VA 24210

Virginia Department of Health
Monthly Operating Report
Groundwater-Well or Spring
Waterworks With No Treatment

Name of Water Supply: Grayson Highlands State Park

Waterworks Operation Permit Numbers: 1077259, 1077260, 1077261, 1077262, 1077263

County: Grayson

Year: 2007 Month: October

Well	Monthly Usage - in gallons for each source	Attendance
# 2 Picnic Area	12,620	1,500
# 3 Campground	17,650	3,500
# 8 Visitor Center	6,120	1,500
# 11 Campground	14,470	3,500
# 12 Office	9,580	1,701
# 13 Stable Area	14,860	1,600
# 14 Campground	24,850	3,500
Total Usage	**100,150**	**16,801**

Number of Connections: 7

Number of People Served: 16,801

Certified Operator: Harvey N. Thompson

Certificate Number: 1904 000400

Signed: Harvey N. Thompson / nd

Title: Park Manager Senior

Comments: Will be winterizing all well water systems with the exception of the offic during the month of November.

Submit to: Virginia Department of Health
Office of Water Programs
454 East Main Street
Abingdon, VA 24210

Section 5-Question 2:

Seasonal water usage was based on projections for 2008-2017 and not from 2004-2006 figures. Figures for overnight stays dropped after 911 and with new cabins and camping lodge/bunkhouse added since 2005 increased usage numbers should be assumed. Usually takes 3-4 years to see what the actual occupancy rates per unit for annual basis will be.

Annual Projected Water Usage 2008-2017

Seasonal Water Usage-May 1-Labor Day Weekend

May:
Weekends/Holiday 15 days X 31,000 gpd= 465,000 gal
Week Days 16 days X 16,900 gpd= 270,400 gal
Total 735,400 gal

June:
Weekends 12 days X 31,000 gpd= 372,000 gal
Weekdays 18 days X 16,900 gpd= 304,200 gal
Total 676,200 gal

July:
Weekends/holiday 9 days X 31,000 gpd= 279,000 gal
Weekdays 22 days X 16,900 gpd= 371,800 gal
Total 650,800 gal

August:
Weekends 10 days X 31,000 gpd= 310,000 gal
Weekdays 21 days X 16,900 gpd= 354,900 gal
Section 5-2 continued:

Total 664,900 gal

September:
Weekends 9 days X 31,000 gpd= 279,000 gal
Weekdays 21 days x 5,500 gpd= 115,500 gal
Total 394,500 gal

October/November/December 1, 2008
62 days X 5,500 gpd= 341,000 gal

December/January/February
90 days X 4,300 gpd= 387,000 gal

March-April
61 days X 5,500 gpd= 335,500 gal

Projected Annual 2008-2017 Grand Total Year Water Usage
4,185,300 gpy

Section 5-Question 3:

We used 100-gpd/per site standard per DCR estimates for all sites. This assumes 25 gpd per person with occupancy rate per site of 4 people.

Linens: 14 beds/per lodge cabin X 23 gal/wash= 320 gallons. (Rounded down from 322 to 320 to have even/round numbers to work with).

Section 5-Question 4:

Park Manager's Residence-single family home, 3 BD, 2 BA, 4 residents, summer garden irrigation

Assistant Park Manager's Residence-single family home, 3 BD, 2 BA, 2 residents, no irrigation

Chief Ranger's Residence-single family home, 3 BD, 2 BA, 1 resident, summer garden irrigation

Interpretive Trailer-office/home, 1 BD, 11/2 BA, 1 resident Spring/Summer/Fall, no lawn irrigation (***Seasonally used facility***)

Dutton Residence-single family home, 3 BD, 2 BA, 1 resident, summer lawn irrigation system

Section 5-Question 5:

Summer interpretive programmers and occasional volunteers use the interpretive trailer. It isn't always used yearly, but since 2004, its been used throughout the winters in 2004 and 2005, fall in 2006 and 2007 with volunteers staying from 4-16 weeks. However, the Dutton residence is located in the campground and is home to Mrs. Dutton year-round. Since, the interpretive trailer is not allowed in our totals, we would like to substitute Mrs. Dutton's residence for the interpretive trailer. Both are serviced off the new park well DEQ #165-378.

Section 5-Question 6: The water in question is used at the waterfront bathroom and fishing pier.

Line 3: 200 people X 5 gpd=1000 gpd (Swim beach bathroom and fishing pier)

Section 5-6
Kiptopeke State Park
Calculations

Weekend Summer Water Demand-Weekend Season Use (May 1-Labor Day)

Campground (135 sites X 100 gpd/site)=	13,500
Beach (800 people @ 5 gpd/person)=	4,000
4 Staff Residences @ 400 gpd=	1,600
Maintenance Shop (6 people @ 5 gpd/person)	30
Picnic Area (200 people X 2 turnovers X 5 gpd/person)=	2,000
Six bedroom cabins (5 cabins X 400 gpd)=	2,000
Linen Services-Cabins (320 gal/rental X 5)=	1,600

Summer Season Use Ave. 30 % higher

Peak Daily (Weekend Season)=24,730

Peak Daily (Weekend Season) 24,730 X 1.25=30,912 GPD

Therefore say **31,000 GPD**

see next
revised
sheet [illegible]

Section 5-2

The extra 25% was utilized in the 1997 permit process, I repeated this allowance for variances; however, based on discussions with DEQ's Brenda Brown, this is not allowed. Therefore the Water Demand should read 24,730 GPD.

Section 5-2
Kiptopeke State Park
Calculations

Weekend Summer Water Demand-Weekend Season Use (May 1-Labor Day)

Campground (135 sites X 100 gpd/site)=	13,500
Beach (800 people @ 5 gpd/person)=	4,000
4 Staff Residences @ 400 gpd=	1,600
Maintenance Shop (6 people @ 5 gpd/person)	30
Picnic Area (200 people X 2 turnovers X 5 gpd/person)=	2,000
Six bedroom cabins (5 cabins X 400 gpd)=	2,000
Linen Services-Cabins (320 gal/rental X 5)=	1,600

Summer Season Use Ave. 30 % higher

Peak Daily (Weekend Season)=24,730

Peak Daily (Weekend Season) 24,730 GPD

Section 5-3

The extra 25% was utilized in the 1997 permit process, I repeated this allowance for variances; however, based on discussions with DEQ's Brenda Brown, this is not allowed. Therefore the Water Demand should read 13,530 GPD.
Corrected information posted below.

Section 5-3

Weekday Summer Seasonal Water Withdrawal (May 1-Labor Day)

80 campsites X 100 gpd=	8,000
50 people X 5 gpd X 2 turnovers (picnic)=	500
200 people X 5 gpd=	1,000
5 Residences X 400 gpd=	2,000
5 Cabins X 400 gpd=	2,000
Maint. Shop (6 X 5 gpd)=	30
Daily Summer Demand	***13,530 GPD***

Section 5
Kiptopeke State Park
Calculations
Section 5

Off Season Water Demand-Weekdays (Labor Day-1st Monday Dec. & March 1-April 30)

10 campsites X 100 gpd/site=	1,000
Picnic Area 50 people X 5 gpd=	250
4 Residences @ 400 gpd=	1,600
Office/Shop Areas 9 people X 10 gpd=	90
Cabins 2 nights rental X 400 gpd=	800
Linen Services (2 X 320 gal/rental)=	640

Daily Off Season Water Demands 4,380 GPD

Kiptopeke State Park
Off Season Water Demand Weekends (Labor Day-Dec. 1st Monday & March 1-April 30)

20 Campsites X 100 gpd/site=	2,000
Picnic Area 50 people @ 5 gpd=	250
4 residences @ 400 gpd=	1,600
Office/Shop 9 people @ 10 gpd=	90
Cabins 5 rentals @ 400 gpd=	2,000
Cabin Linens 5X 320=	1,560
Weekend Daily Demands	8,500 GPD

Kiptopeke State Park
Winter Water Demands (1st Monday Dec.-March 1)

4 residences @ 400 gpd=	1,600
Shop/Office (9 people @ 10 gpd)=	90
Cabins 2 rental @ 400 gpd=	800
Day Use general	250
Linen Services Cabins (2 X 320)=	640

Total Winter Daily/Weekend Use 3,380 GPD

Per my conversation with Brenda Brown, DEQ Water Permit Writer, I've adjusted each year's totals to accurately show the water used and estimated amount come within 10% of projected totals.

Section 5: DEQ Question 5-7 Revised Totals

Kiptopeke State Park

Water Calculations

2004 Usage Numbers
Yearly Attendance: 509,599

Overnight Usage

RV Rental	761 nights X 100 gpd= 76,100 gpy
EWS campsites	2370 nights X 100 gpd= 237,000 gpy
EW campsites	2733 nights X 100 gpd= 273,300 gpy
Tent campsites	2259 nights X 100 gpd= 225,900 gpy
Park-sold campsites	3318 nights X 100 gpd= 331,800 gpy
Group Campsites	240 nights X 100 gpd= 24,000 gpy
Picnic Shelter	33 days X 500 gpd= 16,500 gpy
Yurt Rentals	94 nights X 100 gpd= 9,400 gpy
Residences (5)	(365X400 gpdX5) gpd=730,000 gpy
Camping Lodge	new-24 nights X 300 gpd= 7,200 gpy

Overnight Usage Total 1,931,200 gpy

Day Use

Parking Paid (4 per car-beach)	20,458 passes X 4 people X 5 gpd=414,160 gpy	
Fish Cleaning Station	estimate	4,000 gpy
Linen-Vending Usages	1,085 rentals X 40 per use= 43,400 gpy	
Park Shop Usages	estimate	10,000 gpy
Custodial Needs (Cleaning Facilities/Laundry)		100,800 gpy
Office	estimate	4,000 gpy
Dump Station		11,000 gpy

Day-Use Totals 587,360 gpy

Total Estimated Use ***2,518,560*** gpy **(Corrected Estimated Total-rounding removed from figure) 2/25/08**

Actual 2004 Water Use 2,361,053 gpy

Based on my conversation with Brenda Brown regarding the overages estimated for water usage in these years, I revised them to better reflect what truly happened.

See attached revised sheets for 2004-2006's water usage totals.

Kiptopeke State Park

Water Calculations

2004 Usage Numbers

Yearly Attendance: 509,599

Overnight Usage

RV Rental	761 nights X 100 gpd= 76,100 gpy
EWS campsites	2370 nights X 100 gpd= 237,000 gpy
EW campsites	2733 nights X 100 gpd= 273,300 gpy
Tent campsites	2259 nights X 100 gpd= 225,900 gpy
Park-sold campsites	3318 nights X 100 gpd= 331,800 gpy
Group Campsites	240 nights X 100 gpd= 24,000 gpy
Picnic Shelter	33 days X 500 gpd= 16,500 gpy
Yurt Rentals	94 nights X 100 gpd= 9,400 gpy
Residences (5)	(365X200 gpdX5) gpd=365,000 gpy
Camping Lodge	new-24 nights X 300 gpd= 7,200 gpy

Overnight Usage Total 1,566,200 gpy

Day Use

Parking Paid (4 per car-beach) 20,458 passes X 4 people X 5 gpd=414,160 gpy

Fish Cleaning Station	estimate	4,000 gpy
Linen-Vending Usages	1,085 rentals X 40 per use=	43,400 gpy
Park Shop Usages	estimate	10,000 gpy
Custodial Needs (Cleaning Facilities/Laundry)		100,800 gpy
Office	estimate	4,000 gpy
Dump Station		11,000 gpy
	Day-Use Totals	587,360 gpy
	Total Estimated Use	2,518,560 gpy
	Actual 2004 Water Use	2,361,053 gpy

Water Calculations

2005 Usage Numbers
Yearly Attendance: 399,838

Overnight Usage

RV Rental	846 nights X 100 gpd= 84,600 gpy
EWS campsites	2663 nights X 100 gpd=266,300 gpy
EW campsites	2895 nights X 100 gpd=289,500 gpy
Tent campsites	2340 nights X 100 gpd=234,000 gpy
Park-sold campsites	3827 nights X 100 gpd=382,700 gpy
Group Campsites	122 nights X 100 gpd= 12,200 gpy
Picnic Shelter	46 days X 500 gpd= 23,000 gpy
Yurt Rentals	119 nights X 100 gpd= 11,900 gpy
Camping Lodge	40 nights X 300 gpd= 12,000 gpy
Residences (5)	(365 daysX5X200 gpd)=365,000 gpy

Total Overnight Usage 1,681,200 gpy

Day Use

Parking Paid (4 per car-beach)	19,833 passes X 4 X 10 gpd=	793,320 gpy
Fish Cleaning Station	estimate	4,000 gpy
Linen-Vending Usages	1,686 rentals X 40 gpd=	67,440 gpy
Park Shop Usages	estimate	10,000 gpy
Custodial needs (Cleaning Facilities/Laundry)	estimate	90,800 gpy
Office	estimate	4,000 gpy
Dump Station		11,000 gpy

Total Day-Use Usage 980,560 gpy

Water Usage Estimate 2005 2,661,760 gal/yr.
Actual Usage 2005 2,614,898 gal/yr.

Water Calculations

2006 Usage Numbers
Yearly Attendance: 275,079

Overnight Usage

RV Rental	781 nights X 100 gpd= 78,100 gpy
EWS campsites	3049 nights X 100 gpd=304,900 gpy
EW campsites	2617 nights X 100 gpd=261,700 gpy
Tent campsites	4102 nights X 100 gpd=410,200 gpy
Park-sold campsites	3827 nights X 100 gpd=382,700 gpy
Group Campsites	143 nights X 100 gpd= 14,300 gpy
Picnic Shelter	67 days X 500 gpd= 33,500 gpy
Yurt Rentals	110 nights X 100 gpd= 11,000 gpy
Camping Lodge	54 nights X 300 gpd= 16,200 gpy
Residences (5)	(365 daysX5X200 gpd)=365,000 gpy

Total Overnight Usage 1,877,600 gpy

Day Use

Parking Paid (4 per car-beach)	12,352 passes X 4 X 5 gpd=396,660 gpy	
Fish Cleaning Station	estimate	4,000 gpy
Linen-Vending Usages	1,513 rentals X 40 gpd=	60,520 gpy
Park Shop Usages	estimate	10,000 gpy
Custodial needs (Cleaning Facilities/Laundry)	estimate	90,800 gpy
Office	estimate	4,000 gpy
Dump Station		11,000 gpy

Total Day-Use Usage 576,980 gpy

Water Usage Estimate 2006 2,454,580 gal/yr.
Actual Usage 2006 2,234,022 gal/yr.

Section 5-Question 10:

Kiptopeke State Park
Water Calculations

2007 Actual Usage Numbers
Yearly Attendance: 376,456

*Reserve America total nights = # of sites reserved in the year

Overnight Usage

RV Rental	855 nights* X 100 gpd= 85,500 gpy
EWS campsites	3,986 nights* X 100 gpd= 398,600gpy

(Divided standard electric site totals in half since new reservation system doesn't distinguish between EWS/ES sites in totals)

EW campsites	3986 nights* X 100 gpd= 398,600 gpy
Tent campsites	3525 nights* X 100 gpd= 352,500 gpy
Park-sold campsites	545 nights* X 100 gpd= 54,500 gpy
Group Campsites	239 nights* X 100 gpd= 23,900 gpy
Picnic Shelter	78 days X 500 gpd=39,000 gpy
Yurt Rentals	121 nights* X 100 gpd= 12,100 gpy
Residences (5)	365 X 200 gpd X 5 gpd=365,000 gpy
Camping Lodge	71 nights* X 300 gpd= 21,300 gpy
Lodges	52 nights* X 400gpd= 20,800gpy

Overnight Usage Total 1,771,800 gpy

Day Use

Parking Paid (4 per car-beach)	15,766 passesX4peopleX5gpd=315,320 gpy
Fish Cleaning Station	estimate 4,000 gpy
Linen-Vending Usages	999 rentals X 30 per use= 29,970 gpy
Park Shop Usages	estimate 10,000 gpy
Custodial Needs (Cleaning Facilities/Laundry)	100,800 gpy
Office	estimate 4,000 gpy
Dump Station	11,000 gpy
Day-Use Totals	475,090 gpy
Total Estimated Use	***2,246,890*** gpy
Actual 2007 Water Use	2,361,053 gpy

Kiptopeke State Park
GW Permit #0054000

Section 5-1

Its complex includes an environmental education center and 2 dormitories sleeping 60 people overnight. Kiptopeke plans the same style EEC with a 48 person capacity dormitory. See figures below for EEC's water consumption revisions.

Natural Tunnel State Park's well supplied all operations within the park with water until last month. Last month they started using county water. Their park operations include an Olympic and children's size pools, 5 picnic shelters, 3 bathroom facilities, amphitheater, campground, chairlift, visitor center and the EEC. It is difficult to speculate the total amount of water needed for the dormitory and EEC with all these units on a combine water system.

Kiptopeke State Park
Water Calculations

2008-2017 Projected Usage Numbers
Yearly Attendance: 309,838 2005 attendance
Projected Yearly Attendance: 340,822 (2005's Plus 10%)

Overnight Usage

RV Rental	811 nights X 100 gpd= 81,100 gpy
EWS campsites	3,017 nights X 100 gpd= 301,700gpy

(Divided standard electric site totals in half since new reservation system doesn't distinguish between EWS/ES sites in totals)

EW campsites	3058 nights X 100 gpd= 305,800 gpy
Tent campsites	3056 nights X 100 gpd= 305,600 gpy
Park-sold campsites	2,879 nights X 100 gpd= 287,900 gpy
Group Campsites	186 nights X 100 gpd= 18,600 gpy
Picnic Shelter	56 days X 500 gpd=28,000 gpy
Yurt Rentals	111 nights X 100 gpd= 11,100 gpy
Residences (5)	365 X 200 gpd X 5) gpd=365,000 gpy
**Camping Lodge	138 nights X 300 gpd= 41,400 gpy
**Lodges	913 nights X 400gpd=365,200 gpy

(5 lodges X 50% occupancy over 365 days)

**Note lodge opened 2007 and 2008 will be first full year of rentals-takes 2-3 (i.e. 2009-2010) years to reach average yearly rentals. Presently, RV rentals 46% occupancy rate, camping lodge 39% (after 1 ½ seasons open to public use), yurt 48% rate, therefore we are using a 50% occupancy rate.

**Note-Camping lodge opened to public use in fall of 2005 and HVAC added in 2007. Except the same occupancy rate 50% as lodges based on RV trailers and Yurt occupancy rates.

Special Notes:
Overnight usage is prefaced on 275 nights/year March 1 through November 30 when campground is open. (All campsites (tent, group, E/W and EWS), RVs, yurt, camping lodge and picnic shelters fit under this time).
Cabins/Lodges are open year round-365 days; therefore the numbers are for 365 days.
Park is open for day use activities year round but only day use and cabin facilities from December 1-February 28/29 each year.

Overnight Usage Total 2,111,400 gpy

Day Use Water Consumption

Parking Paid (4 per car-beach)	17,102 passesX4peopleX5gpd=342,040 gpy
Fish Cleaning Station	estimate 4,400 gpy
Linen-Vending Usages	1,321 rentals X 30 per use= 39,630 gpy
Park Shop Usages	estimate 11,000 gpy
Custodial Needs (Cleaning Facilities/Laundry) [913/2 night stay min.=456 rentals/year X 26 gal/wash X 14 per cabin]	165,984 gpy
Office	estimate 4,400 gpy
Dump Station	12,100 gpy
Day-Use Totals	579,554 gpy

Figures for parking and linen-vending usages based on 2004-2007 figures for each line item averaged over the four year period.

Total Estimated Use ***2,690,954*** gpy

Future Proposed Facilities to be added between 2008-2017:

Note: Kiptopeke State Park's master plan is being revised in spring 2008, with the additional proposed facilities being added to park infrastructure. 2002 state parks received Government Obligated Bonds for new facilities. These projects are due for completion in 2010. State parks are looking for another bond proposal in 2012 funding new facilities.

Kiptopeke's New Facilities Water Usage
Visitor Center-located at waterfront area of park-
Well source is park campground well 165-378.

Kiptopeke State Park
Section 5-Question 11 continued

Environmental Education Center with 48 person capacity 24-room dormitory-south of cabin area-new EEC well DEQ#165-560 proposed for these site-0.3 miles south of lodges now well 165-463.

Cabins: 4-2 bedroom cabins-well 165-463-located in cabin loop
2-3-bedroom cabins-well 165-463-located in cabin loop

Park housing-4 additional houses-single family dwellings (3 bedrooms/2 baths/no irrigation systems for lawns) well 165-463/165-378 or new well for their water source, depends on final location of homes. Present plans have them on new park well DEQ # 165-378.

Proposed facility Usage Figures:

Visitor Center estimates based on other DCR facilities-56,436 gal/yr.
Environmental Education Center with 48-room dormitory-
24 room (2 people per room) X 193 (yr-round operation with 50% occupancy rate) X 50 gpd/room (25 gal/day X 2 people per room)=231,600 gal/yr.
Cabins: 4-2 bedroom cabins-183 nights/yr X 4 cabins X 200 gal/day=146,400 gal/yr
2-3-bedroom cabins-183 nights/yr X 2 cabins X 250 gal/day=91,500 gal/yr
Park Housing 4 homes-365 X 4 homes X 200 gpd= 292,000 gpy
Facility/Laundry Facilities
2 bedrooms cabins laundry washing:
5 beds/linens X 26 gal/wash X 92 rentals/yr X 4 cabins= 47,840 gal/yr.
7 beds/linens X 26 gal/wash X 92 rentals/yr X 2 cabins= 33,488 gal/yr.

Note: Cabin rates based on 50% occupancy rate on 365 days/year and a 2-night min. stay requirement by state parks.

Projected New Facilities Water Usage 2008-2017 899,264 gal/yr.

Grand Total Projected Water Use 2008-2017 3,590,218 gal/yr.

Section 5-Question 12:

The difference between these figures is Kiptopeke is washing all cabin laundry/linens for cabin stays at the park and that is the 288,000 gpy.

The other line item is the Linen-vending rental laundry washers located in the campground. Those usage numbers are based on recorded uses each year from cash registers sells.

Section 5
Kiptopeke State Park
GW # ~~0031600~~ 0054000

Well Schedules

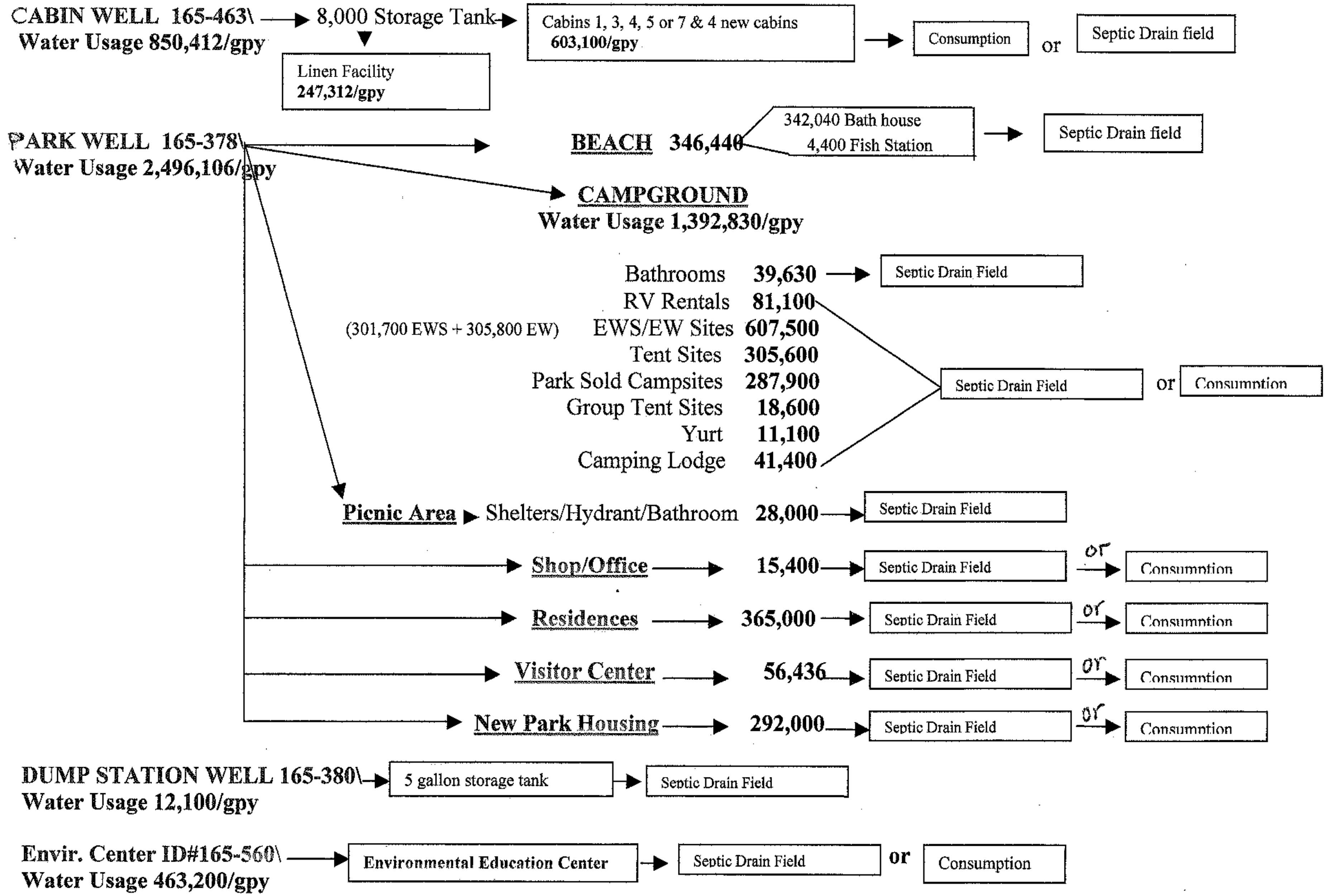
Well ID	FREQENCY Days per week Average	Months per Year Average
Park Well-Winter	2	3
Park Well-Off Season-weekday	3	5
Park Well-Off Season-weekends	2	5
Park Well-Summer Weekdays	4	4
Park Well-Summer weekends	2	4
Cabin Well-Winter	1	3
Cabin Well-Off season weekday	1	5
Cabin Well-Off season weekends	1	5
Cabin Well-Summer Days	2	4
Cabin Well-Summer Weekends	1	4

Kiptopeke State Park

Well Water Flows

Well ID	Max. Daily Flow Rate (in MGD)	Max. Total Volume	Duration (in Days)
Park Well-Winter	.0027	.235	87
Park Well-Off Season-Daily	.00406	.4304	106
Park Well-Off Season-Weekend	.00714	.314	44
Park Well-Summer Daily	.0149	1.326	89
Park Well-Summer Weekend	.0274	.9864	36
Cabin Well-Winter	.00144	.1253	87
Cabin Well-Off Season Daily	.00144	.153	106
Cabin Well-Off Season Weekend	.0036	.158	44
Cabin Well-Summer Daily	.002	.178	89
Cabin Well Summer Weekend	.002	.072	36

SECT N 5
KIPTOPEKE STATE PARK
TITLE: WATER FLOW DISTRIBUTION
BASED ON 2008 – 2017 PROJECTIONS



\ = Metered Well Symbol

1. Use of Water Saving Devices/Plumbing:
The Division of State Parks at Kiptopeke and all other State Parks is specifying the use of water saving fixtures in all new and renovated structures as provided in the Uniform Statewide Building Code.
2. Water Loss Reduction Program:
The water system will be visually inspected for leaks by full-time staff on a weekly basis. Monthly water readings will be reviewed to ensure all excessive withdrawals, which may be indicative of a leak are accounted for. If a leak is detected, that part of the water system will be shut down immediately and repaired. The staff will be instructed to notice areas where changes would help conserve water or reduce losses.
3. Water Use Education Program
Employees will receive instruction as to the important of efficient water use and conservation methods during orientation. Campers will also receive instruction concerning efficient water use and conservation at the campground. Placards

promoting water conservation methods will be posted in bathrooms, kiosks and through Interpretive/environmental educational programming.

4. Evaluation of Potential Water Reuse Options:

There are no practical options for water reuse. Kiptopeke State Park is served by a number of drain fields and does not have any treated wastewater for use as a water reuse option, for non-potable purposes such as agricultural/park irrigation or toilet flushing. The Division of State Parks has no plans at this time for any wastewater treatment facility at this park.

5. Requirements for Mandatory Water Use Reductions

The park will comply with any mandatory water use reduction during water shortage emergencies declared by the local governing body or the Director of DEQ and with any penalties for failure to comply. This will include provisions of requirements for mandatory water use restrictions to seasonable and year-round employees, prohibiting all non-essential uses such as lawn and ornamental irrigation or vehicle washing at the park.

YMCA Family Campground

3100-001 / NEW

ATTACHMENT 5
WATER NEED JUSTIFICATION

General Description

The YMCA of South Hampton Roads is in the process of developing approximately 150 acres in the Silver Beach area for use as a family campground. The campground will contain an office, rental cabins, a dining hall, various activity centers, and staff housing. The YMCA plans to develop the campground in phases, with Phase I having facilities to accommodate 300 campers and staff, and Phase II accommodating an additional 150 campers for a total of up to 450 persons.

The campground will be supplied with potable water using two (2) onsite wells which are completed to a depth of 220 feet. A 4-inch diameter residential well constructed to a depth similar to the other wells on the site is proposed to serve the Camp Director's house. A schematic diagram outlining the campground water supply system is included as Figure 1 of this attachment, followed by a figure prepared by Kimley-Horn and Associates, Inc. presenting water plant details.

Sanitary wastewater from the campground will be disposed of using a mass drainfield, with a smaller septic system drainfield receiving wastewater from staff facilities. An independent onsite septic system with drainfield is proposed to receive wastewater from the Camp Director's house. A discussion of the proposed wastewater treatment and disposal system is included in Attachment 6.

Estimated Water Use

The campground is expected to operate at full capacity during the summer months of June, July and August. Due to the seasonal nature of camping, it is anticipated that during the months of April, May, September, and October the campground will be operating at one-half (1/2) capacity. During the months of March and November it is estimated that 100 people will be using the campground on weekends, with 50 people expected at the campground on weekends during the months of December, January and February. A total of 10 people, comprised of YMCA staff and their families, are anticipated to be resident year round and are included in the estimates noted above.

The Virginia Department of Health has required that 75 gallons per person per day be used as a water supply/system design criteria for the campground. According to representatives from Kimley-Horn and Associates, Inc., this criteria is sufficient in a campground setting to accomodate incidental uses of water such as the operation of a swimming pool, general cleaning tasks, and landscape maintenance.

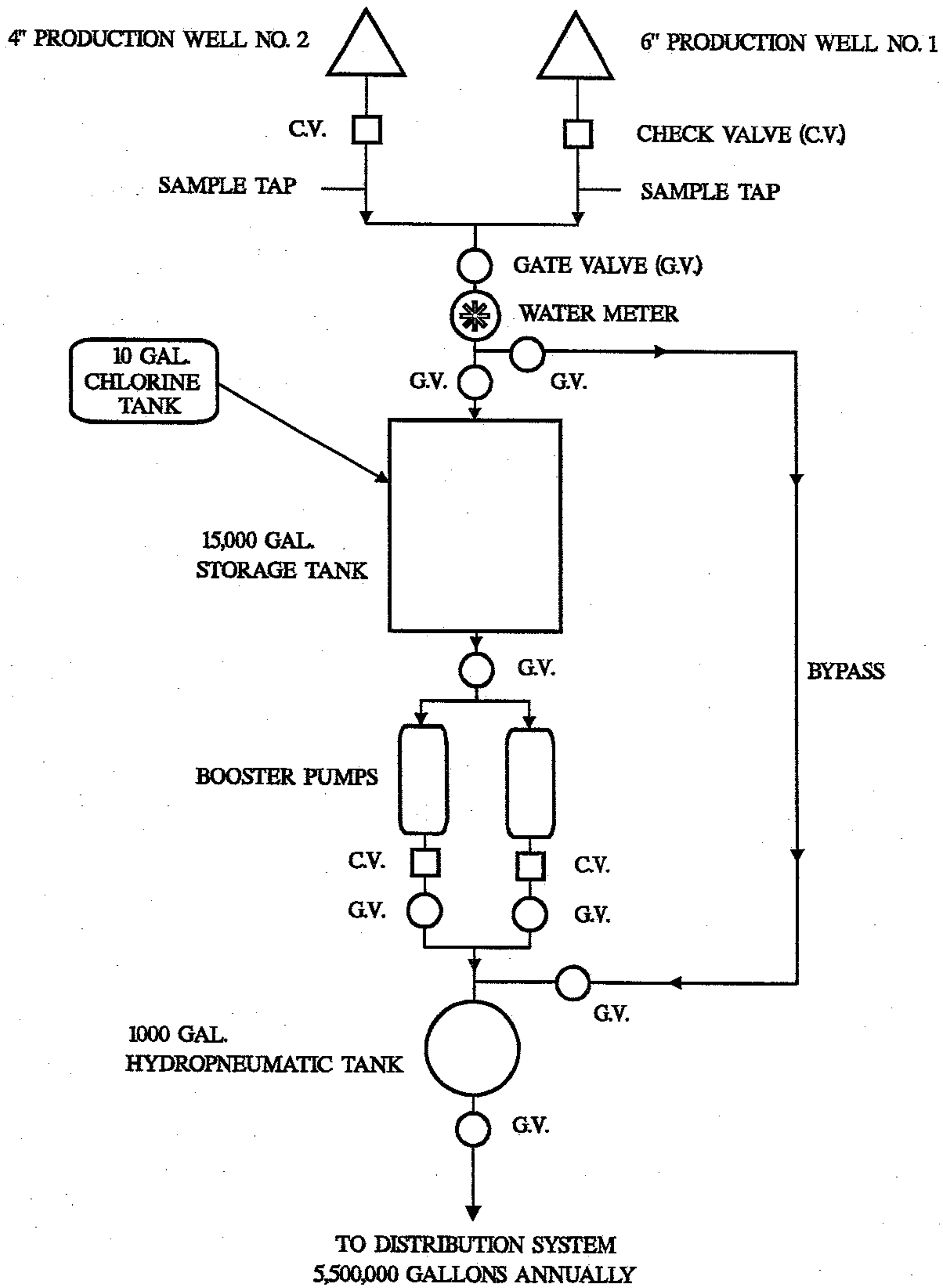
Table 1 summarizes the anticipated monthly and annual water use. At full capacity, the campground will require approximately 34,000 gallons of water per day.

Annual water use for public supply is estimated to be approximately 5,463,000 gallons. Therefore, the YMCA of South Hampton Roads requests a permit to withdraw 5,500,000 gallons annually, with a monthly maximum of 1,100,000 gallons. ÷ 31 = 35.48 mgd

TABLE 1
ESTIMATED WATER USE SUMMARY

Month	No. of Persons	Max.Daily Flow Rate (gallons)	Tot. Est. Water Use (gallons per month)
January	50	3,750 Days 23 8	People 10 50 47,250
February	50	3,750	45,000
March	100	7,500	77,250
April	225	16,875	506,250
May	225	16,875	523,125
June	450	33,750	1,012,500
July	450	33,750	1,046,250
August	450	33,750	1,046,250
September	225	16,875	506,250
October	225	16,875	523,125
November	100	7,500	76,500
December	50	3,750	53,250
	Total Estimated Annual Water Use	=	5,463,000

Basis: 75 GPD per person
Campground open only weekends November through March
A maximum of ten (10) persons onsite year round



RKA	WATER SYSTEM SCHEMATIC YMCA FAMILY CAMPGROUND SILVER BEACH, VIRGINIA	FIGURE NO. 1

ATTACHMENT 13
WATER CONSERVATION AND MANAGEMENT PLAN

1. Water Saving Plumbing and Processes

   All domestic plumbing fixtures at the YMCA Family Campground will meet the 1993 BOCA plumbing code for ultra low water consumption.

2. Water Loss Reduction Program

   The plumbing systems will be inspected and maintained on a regular basis. YMCA staff will be instructed to note areas where changes will help to conserve water, or reduce losses. Campers will be requested to notify staff of any problems with the water system such as plumbing leaks or dripping fixtures.

3. Water Use Education Program

   Employees will receive instruction as to the importance of efficient water use and conservation methods during their orientation. Placards promoting water conservation methods will be posted in appropriate areas.

4. Evaluation of Potential Water Reuse Options

   Wastewater from the campground will be returned to the ground using a mass drainfield and smaller onsite drainfield.

5. Requirements for Mandatory Water Use Reductions

   The campground will comply with any mandatory water use reductions during water shortage emergencies declared by the local governing body or the Director of DEQ. This will include provision of requirements for mandatory water use restrictions to seasonal and year-round employees, prohibiting all non-essential uses such as lawn and ornamental irrigation or car washing at the campground.

LARGE AGRICULTURAL SELF-SUPPLIED WATER USERS

3100-001 / NEW

David's Nursery

3100-001 / NEW

#5 (David's Nursery):

JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED

Projecting what plants to grow and in what quantities for future sales has always been and will continue to be the most difficult aspect of horticulture. David's Nursery is spread out on over 500 acres and grows a wide variety of plants, mostly woody ornamentals but also including some perennials. This year we will sell approximately 250,000 plants, some of which took eight years to mature. My two sons are active partners in this business; they are young and aggressive, and I can easily foresee them doubling the size of our nursery in the next ten years. Of course, doubling our size will necessitate doubling our water demand. At the present time we have approximately 40 employees whose annual income range is from $14,000 to $50,000. Considering our estimated future sales growth, our number of employees and their incomes will also increase and impact the economy of the Eastern Shore. We are in the top ten of wholesale nurseries in the state of Virginia. A graph is attached which details our sales from recent years and projects our future doubling in size.

Nursery crops are rotated with winter wheat to add humus to the soil. Woodsland covers several areas which along with grass filter strips and the winter wheat prevent wind and water erosion. Ponds serve a dual purpose, not only for irrigation, but to detain sediment from entering the creek.

Irrigation is provided by the following methods: traveling gun, trickle, overhead, and individual spray nozzles. The traveling gun waters approximately 125 acres of field grown plants. The water for this gun comes from a pond. The trickle system, which is supplied by another pond, furnishes water to 30 acres of field grown hollies. Another 37 acres of plants grown in containers are watered by overhead irrigation provided by three wells (container well, well #1, & well #2). Our P & P (Pot in Pot) consists of 44 acres which are watered by 3 additional wells. Each plant in this area has an individual watering nozzle secured in the container so that none of the water is wasted. We are currently expanding our P & P type of growing and we intend to use this type of plant production at our new well. We would like to have everything on trickle or individual nozzles as in P&P, but not all plants grow satisfactorily using these methods and we have to use our best business judgment as to what plants we can sell in the future. We ~~alternate~~ pump~~ing~~ from our different wells which are spread throughout our many fields, however these wells are cross connected so if one breaks down we are still able to supply water to our plants.

Included is a mathematical estimate of our present water usage. This is a seasonal estimate for eight months not taking into account rainy days during those months. The days which we pump in November, December, January and February should be offset by the rainy days in the other eight months. We will install water meters on most wells so that next year we will know how much water to apply for.

David's Nursery Year 2000

P + P 1 15 A. 18 Zone Trickle 2 zones Overhead
150 GPM Pump 10 min/zone Trickle 45 min Overhead
Trickle 10 min x 150 GPM x 18 Zones x 30 days = 810,000 gal/mo
45 x 150 x 2 x 30 days = 351,000 gal/mo
1,161,000 gal x 8 Mo. = 9,288,000 gal/year

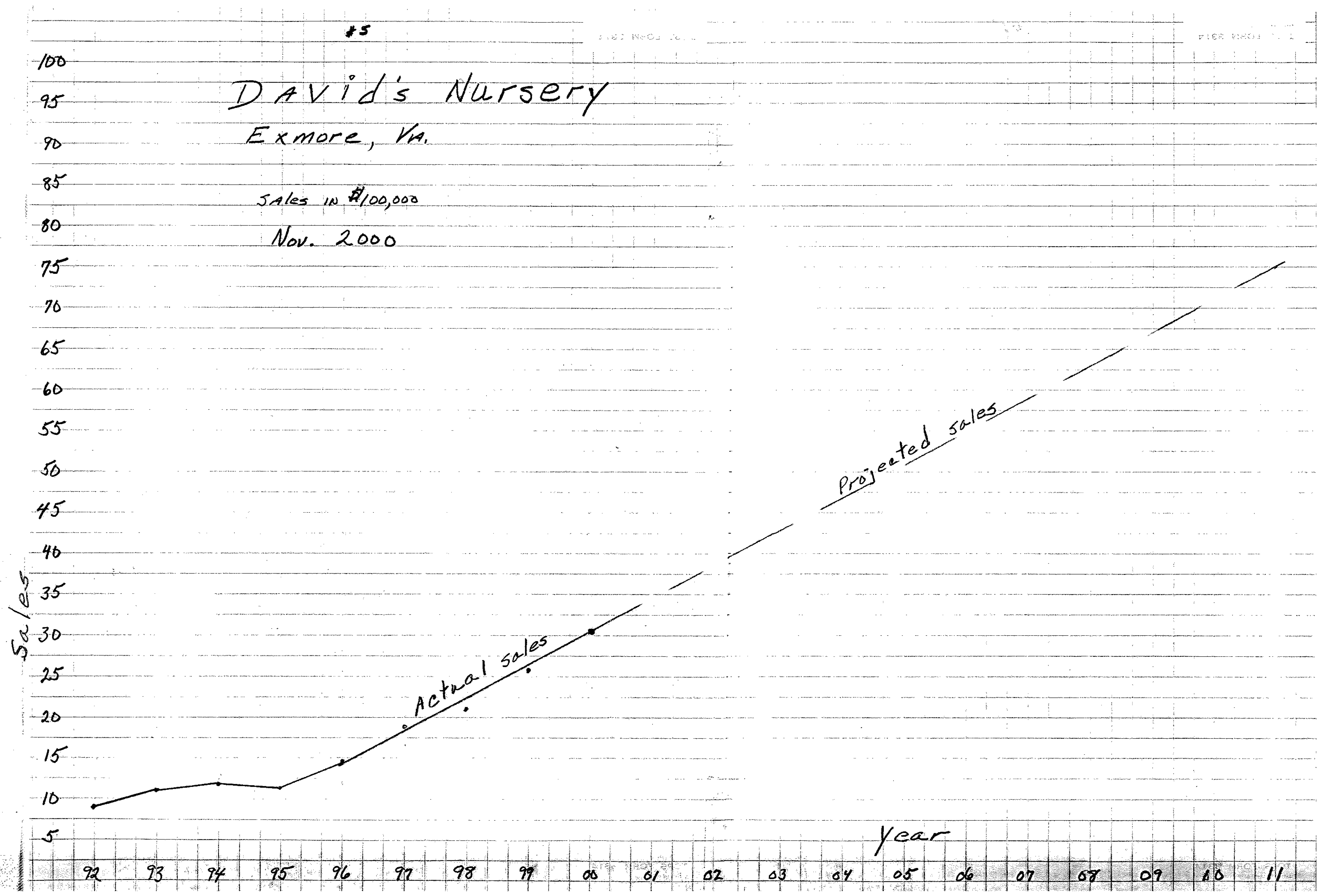
P + P 2 16 A. 150 GPM - 24 Zones Trickle @ 10 min
150 GPM x 10 min x 24 Zones x 30 days = 1,080,000 gal
1080 000 gal x 8 mo. = 8,640,000 gal/year

P + P 3 16 A. 150 GPM - 25 zones Trickle @ 10 min
150 GPM x 10 min x 25 zones x 30 days = 1,125,000 gal/mo
1 125 000 gal x 8 mo = 9,000,000 gal/year

Container Well 8 A (Overhead) 220 GPM 7 zones @ 10 min
220 GPM x 60 min x 7 Zone x 30 days = 2,772,000 gal/mo
2 772 000 x 8 mo. = 22,176,000 gal/yr.

#1 25 A 311 GPM (Overhead) 14 zones @ 60 min.
311 GPM x 60 min x 14 zones x 30 days = 7 837 200 gal/mo.
7 837 200 x 8 = 62,697,600 gal/yr.
7 837 200 ÷ 25 ÷ 27 000 = 11.6 inches/mo

#2 4 A 220 GPM 4 zones @ 180 min
180 min x 220 GPM x 10 days 396 000 gal/mo
396 000 x 8 Mo = 3168000 gal/yr


#5
David's Nursery
Exmore, VA.
Sales in $100,000
Nov. 2000
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
Sales
Actual sales
Projected sales
Year
92
93
94
95
96
97
98
99
00
01
02
03
04
05
06
07
08
09
10
11

#13 (David's Nursery):

WATER CONSERVATION AND MANAGEMENT PLAN

At David's Nursery we are constantly asking ourselves how we can save water. To increase our efficiency we often water at night when there is no wind or evaporation. We use time clocks to change zones so we do not run the water excessively. P&P and trickle irrigation are ways we save water by putting water where it is most needed.

We check continually for leaks in all of our irrigation. If we discover a break in our overhead irrigation, we have at least five people who are immediately available to repair the system. In our P&P field (approximately 37 acres but expanding) a team of five men regularly walk each row checking for leaks.

We have four people trained in the use of our time clocks. We turn them off in wet weather and curtail their use during cool weather when the plants' growth slows and the days are shorter. Our employees report leaks immediately and we continue to train new employees on how to fix them.

We reuse water in ponds from which we supplement our irrigation as described in #12.

Herbert Nottingham Farm

3100-001 / NEW

Attachment A

This well is necessary for the production of a vegetable crop , tomatoes , utilizing drip irrigation under a plastic mulch . I chose drip irrigation because of its high-water use efficiency and the limited source of available water (no location for a productive dug pond) on this farm .

Drip irrigation allows me to implement one of the primary objectives of good water management - simply the ability to apply the right amount of water at the right time while maintaining higher yields attributable to irrigation .This irrigation practice also allows me to control nutrient application which in turn can control nutrient leaching . These are two major considerations with groundwater pollution and my proximity to the Chesapeake Bay . Through the use of technology both old and new many things related to drip irrigation can be monitored water usage being one of these . In the last four years to better utilize my available water I have used a combination of several things , a crop consultant and tensiomters . I found I needed more water to meet the yield goal set for a profitable return for the tomato crop .

To predict what water needs will be needed at a given time or what yields can be assumed with x amount of water is very difficult for several reasons .

1. Vegetable crops moisture needs vary according to growth stages . The easiest example to explain would be corn which cannot stand moisture stress during the tasseling and silking , with tomatoes blossom aborting can be associated with moisture stress . Transpoevaporation is another factor very important in later growth stages especially in tomatoes , which relates to the next factor .

2. Weather Conditions . Without adequate rainfall subsoil moisture can require substantial amounts above that of normal irrigation just to maintain optimum moisture levels for plant growth . Getting back to transpoevaportion , hot sunny days in the final growth stages of a tomato plant require additional amounts of water to keep the plant healthy and productive .

3. Market Conditions . Market conditions basically determine the length of my growing season , a good market could extend the season as much as 3-4 weeks , with a mature crop during the month of August my water usage could increase by 25% . The opposite holds true for a bad market .

Understanding these things makes it easier to see where agricultural needs differ from commercial processing or industrial needs . It's difficult say it takes x gallons to produce y products . I use a conservative estimate of 300,000 gallons per acre to produce a 1500 box crop of tomatoes . This figure was an average of the figures used by the Maryland Department of Agricultural and Pacific Tomato Growers . Once again I used the conservative side of their figures . With this figure my projected water needs would be 10.65 million gallons .

My normal growing season begins in March when the land is tilled and dry fertilizer applied , fumigation , then the installation of drip irrigation ,followed by plastic mulch row covering and the farm is ready for planting . The tomato crop is planted generally in early April , at this time our irrigation begins . Below are monthly water projections .

April - 1 million
May - 2.25 million
June - 2.75 million
July - 3.15 million

Attachment A

August - 1.5 million

Considering these things plus my historical data I feel that 10.65 million gallons annually would satisfy my needs as projected for the next 10 years .

I have enclosed several reports compiled by Virginias' Marketing Service that should help substantiate the factors I used above in their relation to my irrigation needs as they relate to vegetable production .

Attachment A

For the last 8 years this well has supplied water for the production of vegetables on this 35 acres . It is reasonably to assume my water needs will not exceed the 10.65 million gallons applied for in this application .

Population should remain basically the same considering current zoning ordinances require 5 acre minimums in agricultural areas . Currently there are 4 residences within 200 yards of this well location with no known complaints concerning residential water .

Considering current zoning ordinances population expansion should remain basically at the same level for the next 10 years .

A[...]ication # ___________

COMMONWEALTH of VIRGINIA U5221 P.AGTR025
DEPARTMENT OF ENVIRONMENTAL QUALITY

AGRICULTURAL GROUND WATER WITHDRAWAL APPLICATION
FOR EXISTING USERS TO OBTAIN A GROUND WATER WITHDRAWAL PERMIT
PURSUANT TO THE GROUND WATER MANAGEMENT ACT OF 1992

Section 62.1-259 and Section 62.1-260.E of the Ground Water Management Act of 1992 require that all persons withdrawing ground water on or before July 1, 1992 for agricultural or livestock watering purposes in excess of 300,000 gallons per month from a well, well system or a pond recharged by ground water with mechanical assistance in the Eastern Shore or Eastern Virginia Ground Water Management Areas, apply for a ground water withdrawal permit by December 31, 1993. Section 62.1-260 E requires the Virginia Department of Environmental Quality to issue ground water withdrawal permits for the total amount of ground water withdrawn in any consecutive twelve month period between July 1, 1983 and June 30, 1993 together with such savings as can be demonstrated to have been achieved through water conservation. A separate application must be filed for each well or system of wells. An agricultural well system is defined as follows: (1) two or more unconnected withdrawal points located on the same or contiguous properties under common ownership for which the withdrawal is put to the same beneficial use, (2) two or more interconnected withdrawal points under common ownership which may or may not be located on a contiguous property. Completed applications must be received at the Virginia Department of Environmental Quality, Office of Spill Response and Remediation, P.O. Box 11143, Richmond, VA. 23230, by December 31, 1993.

1. Landowner: W. T. NOTTINGHAM JR. Phone: 804-331-3119

Landowner Address: 2497 PICKETTS HB. RD. (HARBOR DRIVE) CAPE CHARLES, VA 23310
(Street, RR and Box #, City, State, Zip Code)

Agent/Renter Name: NOTTINGHAM ENTERPRISES INC Phone: 804-331-3119

Location of Withdrawal Well or Well System: NORTHAMPTON, CHEAPSIDE
(County/City)

Farm Name: CHEAPSIDE FARM

2. Total amount of ground water withdrawal during any consecutive twelve month period between July 1, 1983 and June 30, 1993 5,723,400 Gallons.

Consecutive twelve month begins JULY 1, 1992 and ends JUNE 30, 1993.
(Period must begin on the first day of the beginning month and end on the last day of the ending month.)

3. Documentation of ground water withdrawal claim must be provided. *The preferred documentation of withdrawal amounts are voluntary ground water withdrawal reports submitted pursuant to the Water Withdrawal Reporting regulations (VR 680-15-01) or flow meter readings. Attach a copy of the Annual Report of Water Withdrawals or flow meter readings if available for the period chosen in 2. above. If ground water withdrawal reports or meter readings are not available, provide estimates of withdrawals based on one of the following methods:*

For Irrigation:

Method #1: Total acres irrigated, depth of irrigation, number of irrigations per year. (Example; 100 acres of potatoes, 1 inch of irrigation, irrigated 3 times per year. Solution: There are 27,152 gallons in 1 acre inch of water. 100 acres x 3 times x 27,152 gallons/acre = 8,145,600 gallons of ground water withdrawn in one year).

Type of crops/fruits/vegetables irrigated during 12 month period: ___________

Number of acres irrigated for each crop during 12 month period: ___________

Number of inches of irrigation during 12 month period: ___________

Number of irrigations: ___________

Calculate your annual usage: ___________

DEC 2001
RECEIVED DEQ
Tidewater
Regional Office

Method #2: Pumping capacity of well pump(s) and total pumping time. (Example: Well #1 pumps 150 gallons per minute and well #2 pumps 100 gallons per minute. Both wells are pumped for 200 hours during a 12 month period. Solution: 150 gallons/minute x 60 min/hr x 200 hours = 1,800,000 gallons pumped from well #1. 100 gallons/minute x 60 min/hr x 200 hours = 1,200,000 gallons pumped from well #2. Total = 1,800,000 + 1,200,000 = 3,000,000 gallons of ground water used in one year).

Type of crops/fruits/vegetables irrigated during 12 month period:

____

Number of acres irrigated for each crop during 12 month period:______________

Pump capacity:______________ Hours pumped:______________

Pump capacity:______________ Hours pumped:______________

Pump capacity:______________ Hours pumped:______________

Pump capacity:______________ Hours pumped:______________

Pump capacity:______________ Hours pumped:______________

Pump capacity:______________ Hours pumped:______________

Pump capacity:______________ Hours pumped:______________

Pump capacity:______________ Hours pumped:______________

Attach additional sheets if necessary

Calculate your annual usage:______________

____

____

____

____

____

____

Method #3: Gallons of fuel, electricity, etc. for pump, pumping rate. (Example: Pump uses .6 gallons of fuel/hr., pumping rate is 400 gallons per minute, 150 gallons of fuel used. Solution: 400 gal/min x 60 min/hr = 24,000 gal/hr divided by .6 gal of fuel/hr = 40,000 gal of water/gallon of fuel x 150 gal of fuel = 6,000,000 gal of water used in one year).

Type of crops/fruits/vegetables irrigated during 12 month period:

____

Number of acres irrigated during 12 month period:______________

Fuel usage rate:______________

Total fuel used during 12 month period:______________

Calculate your annual usage:______________

____

____

____

____

Method #4: Other methods for recording irrigation usage

Type of crops/fruits/vegetables irrigated during 12 month period:

____

Number of acres irrigated during 12 month period: ______________

Explain your irrigation system and approach to develop your estimated withdrawal:

____

____

____

____

For Livestock Watering:

Type of livestock/poultry watered during 12 month period: ______________

Animal subtype	Number of animals	Amount of water per animal per day

Provide the name of the reference document used to determine water consumption rates.

____

Do You use water for livestock cooling? Yes No *(circle one)*

Number of livestock/poultry cooled: ______________

Annual amount of water used for cooling: ______________

Do you use water for dairy operation washing? Yes No *(circle one)*

Annual amount of water used for dairy operation washing: ______________

Figure your annual usage: ______________

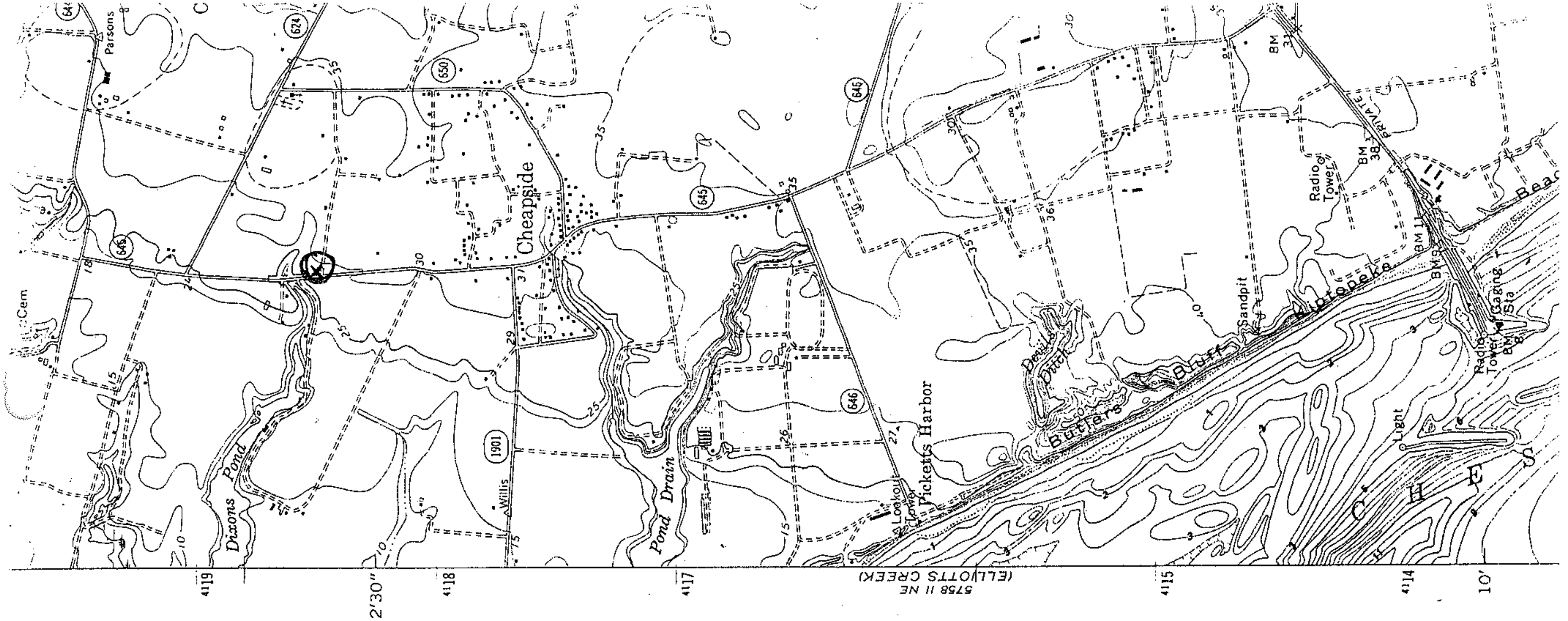
____

____

____

____

4. *Well Location(s): Locate all wells associated with the application on a United States Geological Survey 7 1/2 minute topographic map or copies of such maps. Assistance may be obtained from Department of Environmental Quality staff at 804-527-5187.*



INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1991
421 422000m.E. 37°07'30" 75°52'30"

ROAD CLASSIFICATION

Primary highway, all weather, hard surface
Light-duty road, all weather, improved surface
Secondary highway, all weather, hard surface
Unimproved road, fair or dry weather
U. S. Route
State Route

GINIA
OCATION

Map photoinspected 1989
No major culture or drainage changes observed

N

0°34'
0 MILS

MAGNETIC NORTH
ENTER OF SHEET

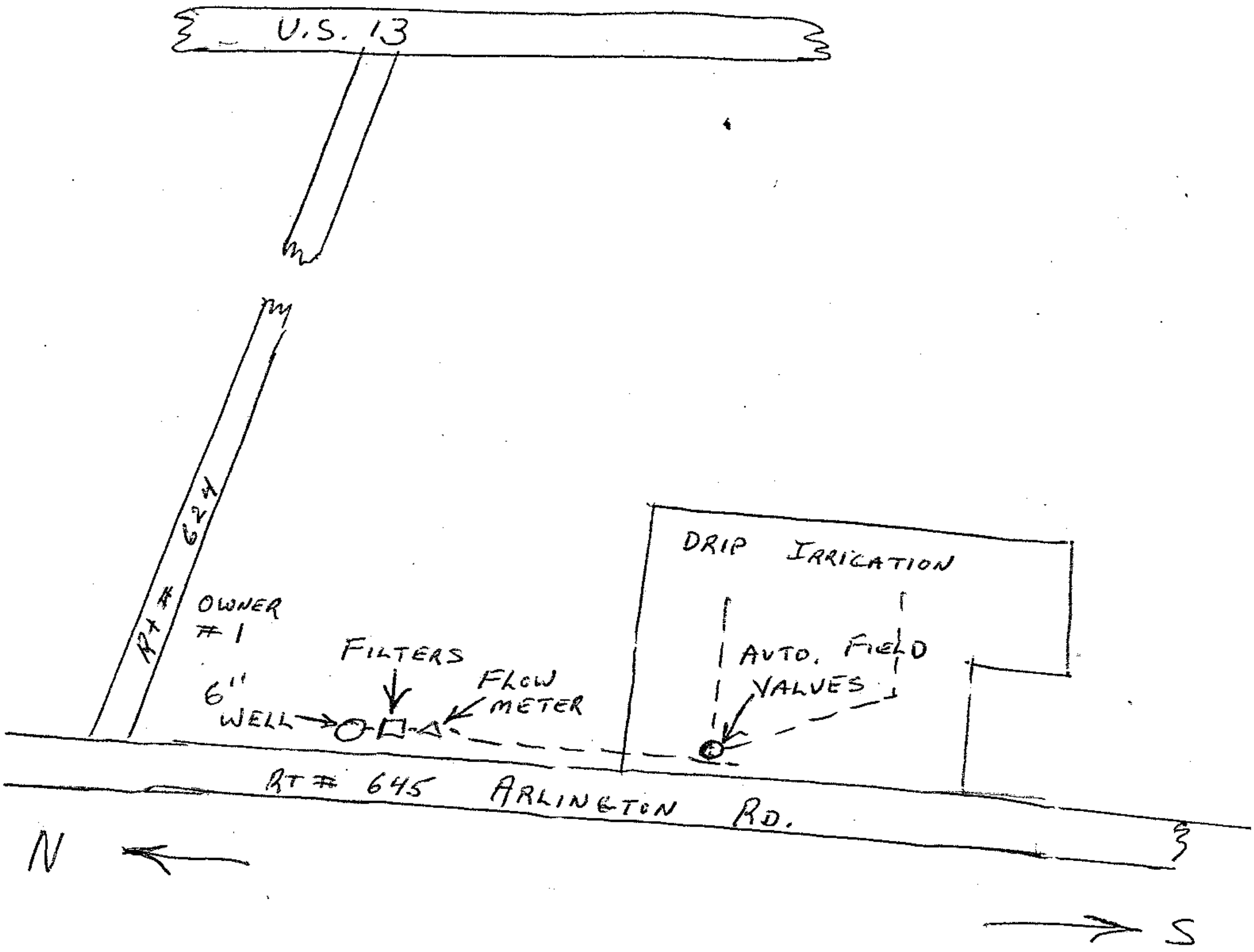
le compiled from latest
controlling ...

TOWNSEND, VA.
37075-B8-TB-024
PHOTOINSPECTED 1989
1968
PHOTOREVISED 1980

BATHYMETRY ADDED 1986

DMA 5858 III NW–SERIES V834

5. Irrigation system sketch: *Provide a sketch of the irrigation system in the space provided below. Show the location of all wells, ponds, meter locations and buried water lines in the irrigation system. See attached example.*



6. EXISTING WELL INFORMATION

Complete the well information worksheet for all existing wells associated with this application. <u>ATTACH</u> copies of original water well completion reports for each well listed below. DEQ well identification plates must be attached to each existing well. Well identification plates can be obtained at the appropriate DEQ Regional Office.

Provide the four digit user ID# listed on your Annual Report of Water Withdrawals if you are currently reporting under the Water Withdrawal Reporting Regulations. 5221 1/6/94 mP

Well Name	Owner well #	Depth (ft.)	Pump Capac. (gpm)	Pump Set (ft)	Pump Size (hp)	Well** Status	Screen Interval(s) (ft.)	Office Use Only			
								DEQ Well #	Latitude	Longitude	El
CHEAPSIDE FARM	1	138'	525	105'	30	ACT	Bottom 40'				

Attach additional sheets if necessary

** Well Status: (Act) Active, (Abnd) Abandoned, (Alt) Altered From the Original Construction, (OS) Out of Service

7. Section 62.1-260.E. of the Ground Water Management Act of 1992 allows the applicant to apply for ground water withdrawal rights, in addition to those based on withdrawals between July 1, 1983 and June 30, 1993, for savings achieved through water conservation. In order to qualify for savings achieved through water conservation, water conservation measures must have been implemented which resulted in a lower withdrawal amount during the 10 year period. For example, a farmer irrigated 100 acres of crops with a sprinkler irrigation system which used 8.1 million gallons in 1981. In 1982, the farmer installed a drip system to irrigate the 100 acres which used 6.1 million gallons of water for the year. Therefore, when the 10 year period started on July 1, 1983, the farmer would only be able to document 6.1 million gallons if he continued to irrigate the same crop and acreage through June 30, 1993. In this case, the farmer would be entitled to apply for 6.1 million gallons plus the 2 million gallons he saved prior to July 1, 1983.

   Does the applicant intend to apply for ground water withdrawal rights based on savings achieved through water conservation? _______ Yes ___✓___ No

8. Section 62.1-260.G. of the Ground Water Management Act of 1992 allows the applicant to apply for more water in addition to those based on withdrawals between July 1, 1983 and June 30, 1993 and savings achieved through water conservation.

   Does the applicant intend to apply for ground water withdrawal rights in excess of those established by historical use and savings achieved through water conservation at this time? _______ Yes ___✓___ No

9. Signatory Requirements: *The application must be signed by the landowner, responsible corporate official, general partner or proprietor.*

   I certify under penalty of law that this document and all information submitted were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is to the best of my knowledge, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations. I further certify that I am an authorized signatory as specified in the Ground Water Withdrawal Permit Regulation (VR 680-13-07).

Signature: W. T. Nottingham Jr. Date 12-5-93

Printed Name: W.T. NOTTINGHAM JR.

Title: President, Nottingham Enterprises Inc.

Phone: (804) 331-3119

Owner Name: W.T. Nottingham Jr.

System Name: Nottingham Enterprises Inc.

User ID#: 5221

Data from Annual Water Use Reports on file.

1999 *Tomato Crop*				***1998*** *Tomato Crop*			
Withdrawal Location	**MG Used**	**Acres Irr.**	***Inches/Acre***	**Withdrawal Location**	**MG Used**	**Acres Irr.**	***Inches/Acre***
Pond Drain (North Side)	8.06	46.60	6.37	Pond Drain (North Side)	10.60	46.60	8.38
Pond Drain (South Side)	24.43	115.00	7.82	Pond Drain (South Side)	24.40	115.00	7.81
Well #1	9.78	35.50	10.15	Well #1	8.08	35.50	8.38
	42.27				***43.08***		
1997 *Tomato Crop*				***1996*** *Tomato Crop*			
Withdrawal Location	**MG Used**	**Acres Irr.**	***Inches/Acre***	**Withdrawal Location**	**MG Used**	**Acres Irr.**	***Inches/Acre***
Pond Drain (North Side)	5.80	46.60	4.58	Pond Drain (North Side)	5.20	46.60	4.11
Pond Drain (South Side)	9.80	115.00	3.14	Pond Drain (South Side)	8.64	115.00	2.77
Well #1	5.00	35.50	5.19	Well #1	4.40	35.50	4.56
	20.60				***18.24***		
1995 *Tomato Crop*				***1994*** *Tomato Crop*			
Withdrawal Location	**MG Used**	**Acres Irr.**	***Inches/Acre***	**Withdrawal Location**	**MG Used**	**Acres Irr.**	***Inches/Acre***
Pond Drain (North Side)	4.92	46.60	3.89	Pond Drain (North Side)	6.21	46.60	4.91
Pond Drain (South Side)	10.58	115.00	3.39	Pond Drain (South Side)	15.22	115.00	4.87
Well #1	3.58	35.50	3.71	Well #1	5.87	35.50	6.09
	19.08				***27.30***		
1993 *Tomato Crop*				***1992*** *No Report On File*			
Withdrawal Location	**MG Used**	**Acres Irr.**	***Inches/Acre***				
P1	13.80	110.00	4.62				
P2	6.48	50.80	4.70				
P3	0.73						
	21.01						
1991 *Potato Crop*				***1990*** *Potato Crop*			
Withdrawal Location	**MG Used**	**Acres Irr.**	***Inches/Acre***	**Withdrawal Location**	**MG Used**	**Acres Irr.**	***Inches/Acre***
Lake Allure	16.335	110	5.47	Pond	5.32	98	2.00
	16.335				***5.32***		

Nottingham Enterprise Inc.

2497 Pickett's Harbor Drive
Cape Charles, Va. 23310

Phone 757-621-9039
Fax 757-331-4552

January 18, 2002

Water Conservation and Management Plan

1. Requirements for the use of water saving plumbing and processes.

The Water Conservation and Management Plan for this farm utilizes all the technology available that I could afford , from the use of a computer controlled irrigation system , to buried PVC pipe , to the trickle tape that applies the irrigation water . My emphasize has been the most efficient use of the water available .

We begin all farm irrigation systems by making both a visual and physical survey of the farm . Through these surveys we try to determine two things , usable acreage and topographic characteristics . The usable acreage is then divided into zones to accommodate the available water . This is very important with trickle irrigation systems , available water must be divided so the capacity (gallons/min) of your water source is not exceeded and your water pressure to the trickle tape allows the trickle tape to operate at peak efficiency . The topographic survey helps to determine row direction , row length , drainage problems and to a small degree the PVC pipe size for my buried water supply line . The topo survey on this farm indicated a need to perform some land contouring , to improve the drainage and increase the efficiency of our trickle tape .

Next a blueprint is formed to indicate how I intend to supply the water to the zones that have been divided in the field . PVC pipe buried to a depth of 48 inches will be used to supply water from the well pump to the valves in each field zone . The entire system is controlled by a small computer . The computer allows me to program the amount of water applied to each zone ; the time irrigation starts and stops , the # of irrigation cycles in a day , the amount of fertilizer applied , the time of the fertilizer application and more . The information from the physical survey helps determine the gallons per minute each zone requires , it is important figure used in the programming of each irrigation zone . I program each zone with the flow rate that will normally be required using the information already obtained .

The computer system offers many other features , one of the most important when dealing with water conservation and management is the Evapotranspiration Watering Factor (ET Watering Factor) . This allows me to add a percentage increase in the amount of water needed to sustain a plant on a hot day . A weather monitor can also be interfaced to automatically do this , in my case this proved cost prohibitive , I simply watch the weather and adjust the amount of water accordingly . I determine irrigation needs mainly by two means ,through the use of tensiometers and experience. Tensiometers measure soil saturation , I generally placed 2 in each zone at different soil depths from their readings I determine the daily irrigation requirements.

2. Water loss reduction program.

The PVC pipe in this system has compression fittings at one end of each pipe that are pressed together (identical to pipe used in municipal water systems) making them virtually leak free , at any directional change or line end concrete is poured to assure no separation or leaks .The plumbing from the well casing to the point at which it attaches to the buried PVC pipe is located on a 8'x10'concrete pad making it compact , simplistic in design , visually and physically accessible , making any leaks easily discernible and readily serviceable .

A water flow meter interfaced with my computer controller monitors flow rates for each zone , if the flow rate I programmed for a certain zone is exceeded the computer shuts down the irrigation cycle in that zone and starts the next zones' cycle . I can set the amount of excess water the computer will tolerate before it switches zones . Trickle irrigation systems have irrigation tape fittings that are disconnected from sudden pressure changes , field labors inadvertently walking on them ,and several other reasons . I program the computer to change zones when the flow rate is exceeded by more than 15% , indicating a greater than normal leak . I monitor each irrigation system periodically during the day if a leak has occurred I only need to look at the controller to tell the size of the leak and its location .

3. Water education program .

Presently I am the only operator of this irrigation system but should I employ someone to operate the system that person will be trained in the system operation to insure that all water conservation measures are adhered to . I will also continue my education in conservation and water management practices as the information becomes available .

4. Evaluation of potential water reuse options .

I have no waste water or water that is discharged that is not utilized .

5. Water use reductions during water shortage emergencies .

I will comply with all water use reductions during water shortage emergencies declared by the local governing body or the Director of DEQ .

It is very evident through the system incorporated on this farm as well as all my farms good water management is a priority . I strive to achieve maximum use and efficiency from every gallon .

Hermitage Farms Nursery

3100-001 / NEW

APPLICATION FOR GROUNDWATER WITHDRAWAL PERMIT
HERMITAGE FARMS NURSERY. FRANKTOWN – NORTHAMPTON COUNTY, VA

ATTACHMENT (Section 5).

JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED

Nature of Activity Utilizing Water and Documentation of Beneficial Use

The Hermitage Farms Nursery is located approximately one-half mile south-southwest of Franktown, Virginia. The operation is located on two parcels that total approximately 200 acres. Currently, 29.5 acres are in production on the facilities western parcel. The western parcel has approximately 20.7 acres of land yet to be developed. The eastern parcel has approximately 50. There are three modes of irrigation utilized at this facility: overhead/broadcast irrigation, drip irrigation, and hand watering.

The current operation consists of four water use regimes distributed amongst 8 production wells. The facility operates 3 green/propagation houses (2 wells), 10.2 acres of drip irrigation land (2 wells), 19.3 acres of overhead irrigation land (2 wells) and six homes (2 wells). Each of the irrigation demand operations has increased in size year-over-year. Currently the facility operates only its western parcel with plans to expand into its eastern parcel (50 additional acres) after the remaining 20.7 acres on the western parcel are fully developed. The facility can meet the current and future demand of the western parcel operation with its current well configuration. The eastern parcel, when developed, will require two additional supply wells to meet the demand.

When the facility has finishes its planned expansions there will be a total of: 70.4 acres of drip irrigation land and 29.4 acres of overhead irrigation resulting in approximately 100 acres of irrigated land. The facility has no plans to increase its potable demand which is currently less than 5% of the total withdrawal.

Current Consumption and Demand

Groundwater withdrawal data was collected and analyzed between January 2007 through December 2008. With two years of complete data, the system was assessed in terms of its documented consumption and its projected expansion. As the facility has four separate usage demands it was imperative to separate each use type so they may be analyzed in reference to their individual withdrawal well.

Residential and potable withdrawals are attributed to two wells specifically (#1 DEQ# 165-551 and #2 DEQ# 165-554). A partial potable use (at the facilities main office) is sourced from the combined propagation wells. However, potable use from those wells is negligible (less than 500 gallons a day). The current monthly mean for well #1 is 9,795 gallons per month. The current monthly mean for well #2 is 22,083 gallons per month. As expansion of potable use is not planned, the 99% percentile will be used to approximate the maximum likely demand. No expansion algorithm will be applied.

The first usage regime (Hand watering) is derived from the facilities' propagation wells. Well #4 (DEQ 165-555) and Well #8 (165-556). These wells supply water to the greenhouses and to a minor extent to the office (less than 500 gallons per day). These wells alternate their production, which accounts for their very similar withdrawals. Propagation Well #4 (165-555) does produce a slightly higher volume of water. The facility currently has the materials to construct a fourth greenhouse with plans to add a fifth within ten years.

The second usage regime (Overhead watering) is derived from two wells which are essentially pond recharge wells. Well #5 (DEQ 165-550) and well #6 (165-557) recharge the "Branch pond" and the "Back pond" respectively. The water withdrawal supplements the overhead irrigation required for the plants that can not be irrigated by drip irrigation. The total of the facilities 19.32 acres of Overhead watering area is currently divided into 5 subsections. Sections "A", "B", and "C" are serviced by the Branch pond and total approximately 12 acres of land. Sections "D" and "E" are serviced by the Back pond and total approximately 7.4 acres. The area serviced by the Branch Pond system will not be extended. However, the Back pond area plans to expand into two additional subsections "F" and "G". This expansion is approximately 10.1 additional acres.

The third usage regime (Drip Irrigation) is based on withdrawals taken from the facilities "P&P" wells. Old P&P (Well #3, DEQ #165-552) and New P&P (Well #7, DEQ #165-553) supply water to an above ground storage tank which forwards water to the drip system. Currently 10.2 acres of drip irrigation land are in production. The water withdrawals associated with these wells are essentially equal. However, well #3 does produce approximately 2% more water.

The table below details the facilities basic monthly withdrawal statistics based on the last two years of data:

Well#,DEQ#	Well Name	Average	Max	Deviation	Weighted Average
#1, 165-551	Old Office	9,887	17,300	3,261	11,654
#2, 165-554	Trailers	21,855	34,780	4,586	24,148
#3, 165-552	Old P&P	182,066	423,700	127,376	224,525
#4, 165-555	Prop 1	6,985	10,790	2,544	8,257
#5, 165-550	Branch pond	18,554	250,100	56,627	27,219
#6, 165-557	Back Pond	387,366	1,772,200	597,738	736,047
#7, 165-553	New P&P	167,779	521,800	144,774	252,230
#8, 165-556	Prop 2	6,692	10,100	2,374	7,978
Total					1,292,058

The weighted average statistics were compiled in order to account for the actual distribution of withdrawal based on the actual demand. The weighted average statistics are provided as an addendum to this section.

Future Consumption and Demand

Hermitage Farms has increased the scale of its operation each year. The future demand is based on the volume of expansion that is likely to occur within the next ten years. The weighted averages above are based on a unit basis relative to the type of consumption experienced at each well. The current demand has been reduced to an average that correlates to a "per unit" use. To expand the demand, the weighted average is applied to the total demand that is anticipated during the next permit term (Ten-Years).

The demand unit-types are:

- Prop1 and Prop2 = Greenhouses = 3 currently
- Old P&P = Drip irrigation acreage = 5.1 currently
- New P&P = Drip irrigation acreage = 5.1 currently
- Old Office = Homes = 2 currently
- Trailers = Home = 4 currently
- Back Pond = Overhead Irrigation acreage = 7.38 currently
- Branch Pond = Overhead Irrigation acreage = 11.94 currently

Incorporating the weighted average data, a per-unit table can be made:

Well Name	Weighted Average, gallons	Current unit demand	Per unit demand
Old Office	11,654	2 homes	5,827 gal/home
Trailers	24,148	4 homes	6,037 gal/home
Old P&P	224,525	5.1 acres	44,024 gal/acre
Prop 1	8,257	1.5 greenhouses	5,505 per/Ghouse
Branch pond	27,219	11.94 acres	2,279 gal/acre
Back Pond	736,047	7.38 acres	9,9735 gal/acre
New P&P	252,230	5.1 acres	49,457 gal/acre
Prop 2	7,978	1.5 greenhouses	5,318 gal/Ghouse

The total future demand (monthly average) is added to the current demand:

Well Name	Per unit demand	Total Projected demand	Total Future Per Unit Demand
Old Office	5,827 gal/home	2 homes	11,654 gal
Trailers	6,037 gal/home	5 homes	30,186 gal
Old P&P	44,024 gal/acre	10.4 acres	457,855 gal
Prop 1	5,505 per/Ghouse	2.5 greenhouses	13,763 gal
Branch pond	2,279 gal/acre	11.94 acres	27,219 gal
Back Pond	9,9735 gal/acre	17.48 acres	1,743,374 gal
New P&P	49,457 gal/acre	10.4 acres	514,352 gal
Prop 2	5,318 gal/Ghouse	2.5 greenhouses	13,296 gal
Total			2,811,699 gal

The tables above reflect the changes expected to occur on the facilities Western Parcel. In addition to these changes, the facility will expand its drip irrigation operation into the Eastern Parcel. The eastern parcel contains approximately 50 acres of arable land. The documented drip irrigation rate stated above can be averaged to determine the order of demand anticipated for the expanded drip irrigation system. The formula below illustrates the drip irrigation demand for the Eastern Parcel:

$$OldP\,\&\,P^{monthly\_rate}_{Gallons/acre} = 44{,}024_{gallons/acre}$$

$$NewP\,\&\,P^{monthly\_rate}_{Gallons/acre} = 49{,}457_{gallons/acre}$$

$$Average = \left(\frac{44{,}024_{gallons/acre} + 49{,}457_{gallons/acre}}{2}\right) = 46{,}741_{gallons/acre}$$

$$46{,}741_{gallons/acre} * 50_{acres} = 2{,}337{,}025^{monthly}_{gallons}$$

The total weighted, normalized monthly and annual demand is:

$$2{,}337{,}025^{EastParcel}_{gallons} + 2{,}811{,}699^{WestParcel}_{gallons} = 5{,}148{,}724_{gallons/month}$$

$$5{,}148{,}724^{normalized}_{gallons/month} * 12_{months/year} = 61{,}784{,}688_{gallons/year}$$

This facility has a seasonal component with respect to its production. As such, the withdrawals of each month will not be consistent. To account for the highest monthly demand, the data was analyzed to account for the average monthly demand. In general the percentage of annual consumption is:

January	1.1%
February	0.9%
March	1.7%
April	3.1%
May	5.1%
June	7.4%
July	9.7%
August	19.0%
September	26.8%*
October	18.9%
November	4.7%
December	1.1%

The total sum of percentages equals 98.2%. The additional 1.8% is to be distributed equally for all months. As September is the month with the greatest demand and additional 0.15% is added to the 26.8% in order to asses this months likely maximum demand.

The following equation derives the likely maximum monthly withdrawal:

$$26.95\%_{Annual\_total\_withdrawal}^{September} * 61{,}784{,}688_{gallons/_{year}} = 16{,}650{,}973_{gallons}^{September}$$

The maximum annual and monthly withdrawals with this permit application are"

- **61,784,688 gallons per year (maximum)**
- **16,650,973 gallons per month (maximum)**

Apportionment of Withdrawal to Individual Wells (existing wells)

The permitted yield will be produced from eight existing wells. Each well is monitored and yields differing amounts of water in order meet demand.

[1]Apportionment of Withdrawals	**Well-#1** (DEQ #165-551)	**Well-#2** (DEQ #165-554)	**Well-#3** (DEQ #165-552)	**Well-#4** (DEQ #165-555)	**Well-#5** (DEQ #165-550)	**Well-#6** (DEQ #165-557)	**Well-#7** (DEQ #165-553)	**Well-#8** (DEQ #165-556)
January	1,538	3,985	60,437	1,817	3,593	230,125	67,895	1,755
February	1,259	3,260	49,448	1,486	2,940	188,284	55,550	1,436
March	2,378	6,158	93,403	2,808	5,553	355,648	104,928	2,713
April	4,336	11,229	170,322	5,120	10,125	648,535	191,339	4,946
May	7,133	18,474	280,208	8,423	16,658	1,066,945	314,784	8,138
June	10,349	26,805	406,576	12,222	24,170	1,548,117	456,745	11,807
July	13,566	35,137	532,944	16,020	31,683	2,029,288	598,707	15,477
August	26,573	68,825	1,043,911	31,380	62,059	3,974,894	1,172,724	30,317
September	37,482	97,079	1,472,464	44,263	87,536	5,606,693	1,654,159	42,762
October	26,433	68,462	1,038,416	31,215	61,733	3,953,974	1,166,552	30,157
November	6,573	17,025	258,231	7,762	15,352	983,263	290,095	7,499
December	1,538	3,985	60,437	1,817	3,593	230,125	67,895	1,755
Annual Estimated Usage	139,158	360,424	5,466,796	164,334	324,995	20,815,894	6,141,373	158,763

The wells planed for the facilities eastern parcel have not been constructed yet. The apportionment attributed to these wells will be approximately 50/50. The approximate withdrawal of 28,044,474 gallons would be shared equally by both production wells.

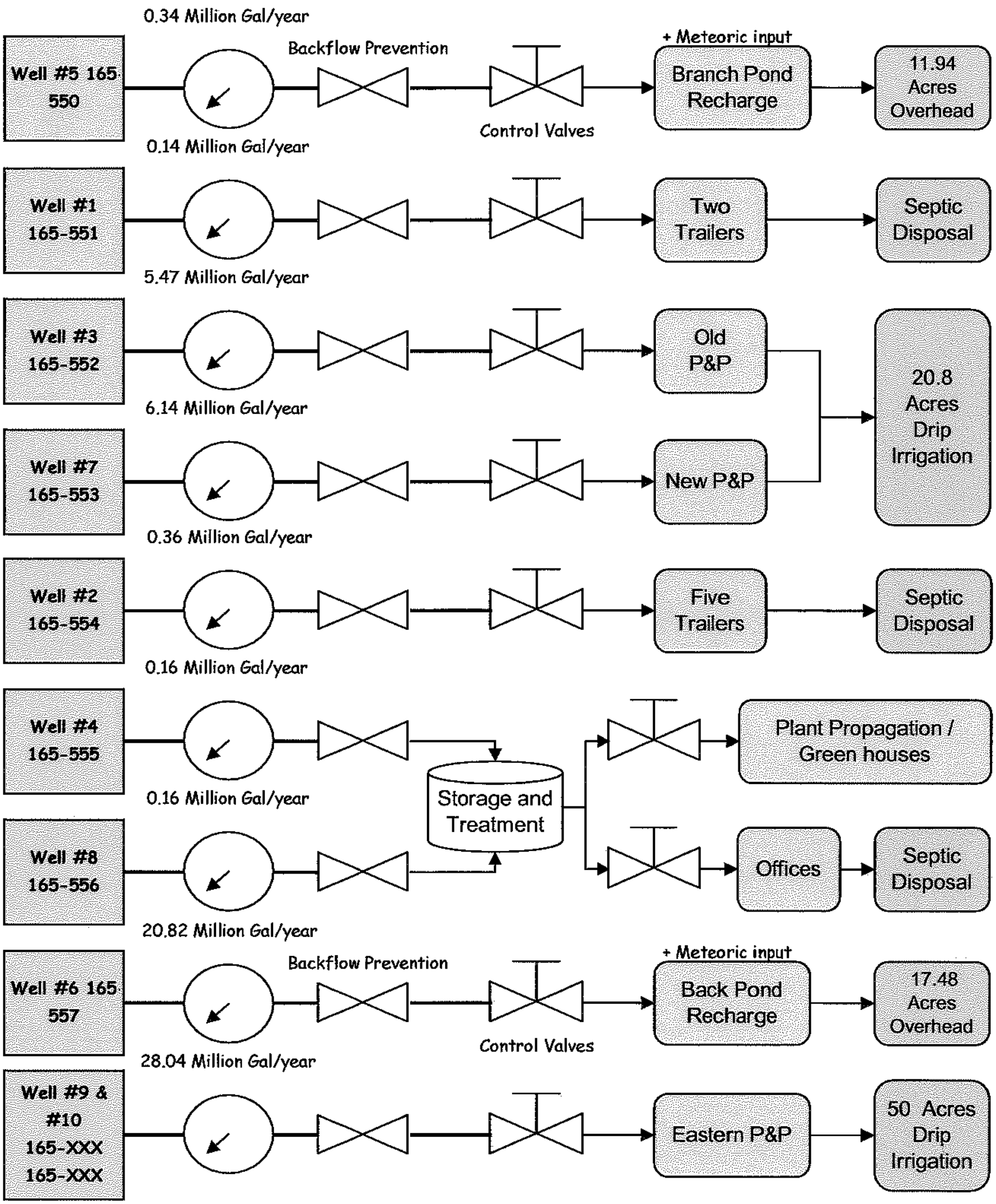


FIGURE 2. Site Schematic

GROUND WATER WITHDRAW PERMIT
HERMITAGE FARM NURSERY
Franktown, Virginia

MSA, P.C.
ENVIRONMENTAL SCIENCES, PLANNING, SURVEYING
ENGINEERING & LANDSCAPE ARCHITECTURE
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DATE:	SCALE:	MSA JOB #:
1/21/2009	NTS	06778

WATER CONSERVATION AND MANAGEMENT PLAN

HERMITAGE FARMS NURSERY
7483 MASON FARM ROAD
FRANKTOWN, VIRGINIA

NORTHAMPTON COUNTY, VIRGINIA

MARCH 2009

Table of Contents

1.0 GENERAL INFORMATION

The Hermitage Farms Nursery, herein referred to as the "facility", is a nursery located in Franktown, Virginia. The facilities' operational area consist of approximately 100 acres. Nearly 95% of groundwater withdrawals at this facility is utilized for plant irrigation; the remainder of the water withdrawn is utilized as a potable source for the employees and staff residing onsite.

Normal operation at this facility requires water withdrawals in order to provide a sustainable resource for the onsite irrigation demand. Because this property is located within the Eastern Virginia Groundwater Management Area – as defined by the Virginia Department of Environmental Quality [VDEQ] – a Water Conservation and Management Plan has been prepared in accordance with the Ground Water Management Act of 1992, Chapter 25 (§62.1-254 et seq.) of Title 62.1 of the Code of Virginia. The purpose of this document is to analyze water supply and demand issues facing the facility and develop a reasoned and justifiable response for water conservation and management. This document is intended to help guide the Hermitage Farms Nursery employees and management in responsible operation and policy management decisions related to the utilization of groundwater. Lastly, this document meets the permit requirement by VDEQ for a water conservation and management plan. Water conservation measures are those physical facilities, equipment, and/or devices utilized with certain methods, techniques, policies, practices, and procedures, which reduce water consumption, improve water use efficiency, reduce water loss or waste, increase water recycling or reuse and ultimately result in a reduction of water demand. Water management consists of a plan to implement water conservation measures.

This Water Conservation and Management Plan, referred to herein as the "Plan", includes identification of water demand and water source and then shall provide guidance to implement water management and conservation measures.

2.0 WATER DEMAND

Water demand at this facility is primarily associated with irrigation practice. Irrigation at this facility is administered in three ways: overhead/broadcast irrigation, drip irrigation, and targeted hand watering. The remainder of the water used on-site is for potable consumption. There are limited opportunities to conserve water beyond what is currently conserved; The facility was awarded with the "2007 Ground Water Award" by the Eastern Shore of Virginia Ground Water Committee. This award recognized the efforts the facility has made in the protection of groundwater though both water reuse and reclamation efforts.

In order to discuss the conservation and management potential, each water use regime shall be evaluated separately. The facility currently operates on 29.5 acres with plans of expanding an additional 70 acres within the next ten years. Targeted hand watering occurs within the facilities greenhouses. Water used in the greenhouses is dedicated to plant propagation. Targeted watering is applied as needed with little waste as the young seedlings are not capable of surviving inundation. Any water that is not absorbed by the seeding beds may fall to the ground where it may either infiltrate or sublimate in to water vapor. As greenhouses are designed to retain heat and moisture (as humidity), any water not utilized by seedlings is therefore functional as an environmental control.

The facility currently operates 10.2 acres of drip irrigation area. Drip irrigation water is withdrawn directly from the wells and applied to the plants through a series of low flow drip emitters. Due to the controlled application of water possible through drip irrigation practices, there are limited opportunities to conserve additional water beyond the current practice. There are only as many emitters used as there are plants requiring irrigation. Water is applied as needed and only when the demand for non-meteoric water is present.

The facility also operates 19.3 acres of overhead irrigation area. Overhead irrigation is utilized for the plants that have either been removed from drip irrigation, are being prepared for shipment, or have short maturation cycles. The facilities' overhead irrigation practice is rate based and is limited when meteoric inputs are both anticipated and active. Water utilized for overhead irrigation is mostly sourced from reclaimed waters. The facility, as previously mentioned, was recognized for its efforts in incorporating the usage of reclaimed water. The primary source of reclaimed water is generated by Shore Memorial Hospital in the form of treated waste water effluent. The facility also has a large engineered reclamation basin which collects as much storm and overhead irrigation water as possible.

3.0 WATER SUPPLY

The following section presents a general overview of water resources available to the facility. The facility is not tied to any municipal water supply. There are eight deep wells at the facility that currently supply adequate quality and quantity of groundwater.

Although this region receives approximately 42 inches of precipitation per year, the facility is not able to capture and store all of the water that falls as rain. However, the facility does have an active reclamation system in place that captures as much meteoric water as possible. During periods of peak demand, surface water resources are not reliable as a result of high rates of evaporation, evapotranspiration and low inputs from precipitation. Groundwater has been used as a supplement to its reclamation system for many years without issues in terms of quality or quantity. Groundwater is a reliable source of water during the peak demand period (summer months).

4.0 WATER CONSERVATION MEASURES

The following conservation measures are currently implemented:

- No unnecessary groundwater withdrawals will be used. Water withdrawn under the facilities Ground Water Withdrawal Permit is withdrawn for the purposes listed below:
    - Supplementing surface withdrawals
    - Providing water directly to drip irrigation areas
    - Providing water for potable consumption
    - Overhead irrigation when required
    - Mixing of chemicals or fertilizers

- The facility does not distribute water outside of the its boundaries.

- Drip and overhead broadcast systems are routinely inspected (weekly) to ensure that proper flows are applied. No water beyond the current established demand will be applied. Pooling of water in overhead irrigation areas will not be permitted.

- The facility will continue to utilize Shore Memorial's treated wastewater as a source of surface water.

- The facility will continue to utilize lined overhead irrigation areas. These areas are designed to collect all and any water that is not utilized by plants. Each collection area is engineered to direct water to one of the facilities many lined stormwater ditches. These ditches are graded and connected to the facilities rear collection pond. The water in this pond is treated with aeration in order to improve the quality.

- Encourage employees to conserve water through the use of regular conversational reminders, posters and/or bulletins posted in message areas or bulletin boards.

- *Water Reuse Evaluation*: Water is reused at this facility. Water is collected from both stormwater run-off and from treated wastewater streams. This recovered water is used to recharge two of the facilities storage ponds. The water collected supplies the overhead irrigation areas. Additional areas of water reuse are not feasible as drip irrigation does not produce waste and potable use water can not be processed on site for reuse (septic treatment).

This conservation and management plan examined all water uses and presents management measures in Section 5.0.

5.0 WATER MANAGEMENT MEASURES

The following management measures will be implemented with regard to the water supply including groundwater from the facilities' wells and surface sources.

- Water Loss Reduction:
  - (a) The facility conducts monthly records review to find excessive usage that may indicate a leak in the system or significant change in operations.
  - (b) The facility will conduct routine inspections of all above ground water piping systems and storage tanks for any indication of leaks daily.
  - (c) The facility will conduct routine observations along surface pathways of underground potable water piping systems for indications of leaks monthly.
  - (d) Any leak discovered in the potable water storage/supply system will be repaired as soon as is practical or will be bypassed so as to minimize loss of water.
- The facility utilizes a water collection and treatment system to recover, treat, recycle, and reuse wastewater and stormwater.
- Mandatory water use restrictions will be implemented during water shortage emergencies declared by the local governing body or the Director of DEQ. Non-essential uses of water will be restricted. In addition, facility personnel will be prohibited from general washing of buildings, paved surfaces, or equipment. The facility will comply with penalties for demonstrated failure to comply with mandatory water use restrictions.

Tankard Farm

3100-001 / NEW

#5

APPLICATION FOR A GROUND WATER WITHDRAWAL PERMIT .

Justification for the amount of withdrawal requested:

In 1999, Charles Tankard started raising fescue sod for sale commercially. Vegetable crops may need irrigation 3 to 4 times a growing season on average. Sod, however, requires irrigation approximately 9 months per year. This will necessitate a considerable increase in water usage to maintain our present crops. Consequently, it is imperative that an application be made for a larger ground water withdrawal.

At the present time, the Tankard farm has approximately two hundred forty-five (245) acres irrigated from both the pond and the wells. Around sixty-three (63) acres are in sod and one hundred eighty-two (182) acres are in vegetable crops.
Estimated water usage is 80,641,440 gallons per year. The pond is expected to yield approximately 35% of the water and the well will supplement the remaining 65%. This is the worst case scenario. In years with normal rainfall, the pond will do better that the above estimate. As a consequence, well #165-435 will not be used as much. On extreme drought years, the crops on the Tankard farm will need about 51,840,000 gallons for survival from well #165-435.

APPLICATION FOR A GROUND WATER WITHDRAWAL PERMIT .

Water conservation and Management Plan:

1. Land Preparation: Certain farming practices can help aid in the conservation of water. Cultivation of the land before irrigation is one of these practices. This practice of loosening and stirring up the soil so that water absorbsion happens more quickly prevents the water from turning into runoff. After irrigation, cultivation is not performed for several days so that the crop has time to absorb as much of this moisture as possible.

The need for irrigation is determined by the use of tensioneters, which determine the moisture content of the soil.

The irrigation schedule is determined by crop management guides which give the information on how frequently and how much to irrigate. Small young plants do not need as much water as a fully mature plant. The water requirements of a mature plant that is supporting the development of fruit, especially as it approaches harvest, requires considerably more water.
Different soil types hold water longer than others. Bojac sandy loam does not hold moisture as long as nimmo sandy loam. Since these are two of the primary

soils on the land we farm, our irrigation schedules are adjusted to take these soil types into consideration.(The soil types determination cited comes from maps supplied by the U.S. Department of Agriculture Soil and Conservation Service in cooperation with Virginia Polytechnique Institute.

Environmental factors constantly alter the irrigation schedules.
Early morning and night irrigation is an important step in water conservation. Watering at these times slows down the evaporation rate, thus requiring less water to be applied at one time. Timing is essential during irrigation so that these water saving effects can be preformed while at the same time providing the plant with ample nutrition to continue prospering during their growing period.

Irrigation during high wind conditions is not highly regarded upon when considering water conservation. It is generally understood that if irrigation is preformed under high winds that a very uneven application of water will be applied to the intended crop. Also, under high wind conditions the evaporation rate of water is greatly increased, therefore less water is able to reach the intended plant. With these considerations in mind, it would be the best judgment for all involved to wait for lower wind conditions to begin the application process.

Since our operation uses a pond as the primary water source, the pond's water supply is monitored carefully. Surface water from our pond, which was dug with an excavator, is used as long as it is able to supply the needed water. This pond measures five hundred (500) feet long by sixty (60) feet wide and fourteen (14) feet deep. During periods of excess moisture, the ground around the pond holds moisture. As the pond is pumped down, springs close to the surface help recharge this pond. We have had the sediment cleaned out to keep the natural springs working at their best potential.

This pond is located at a low elevation point on this farm with many surrounding fields sloped in the direction of the pond. This provides a natural way to collect surface water from the runoff from the rainwater. Also, a drainage ditch that drains excess water from the fields empties into this pond.

After long periods of dry conditions and pumping from this pond, this water supply is depleted and fails to provide for the needs of my crops. At this time, the well (DEQ #165-435) pump will be used to supplement the pond. The well's water will be discharged into the pond to assist the natural spring action.

The water saving practice employed when recharging the pond is the system of buried eight (8) inch 160 psi PCV pipe used to transport the water from the well to the pond. This system is extremely efficient and there is no water loss.

2. Water loss reduction program:

A. Types of irrigation systems used:

The main system called a center pivot is a machine that moves very slowly in a circular motion around the field applying water. For conservation needs, the center pivot contains drop pipes in order to get the water application closer to the ground. This in turn prevents an uneven application to the crops and also prevents the excess irrigation of unintended areas. Another conservation advantage to the center pivotal operation is the ability to lower the water pressure output and adjust the speed of the machine to move slower. This function creates less water use per cycle and ensures a more thorough, healthier distribution of water.

The second type of irrigation system used here on the Tankard Farm is the hard hose irrigation or traveling gun. This system also is used with water conservation in mind, however it is less conservation friendly. Even though these systems are not as efficient as the pivotal systems, they still work to ensure some type of water conservation. These gun systems contain nine nozzle selections that are used based on wind conditions. Six are ring nozzles and three are taper borer nozzles, all of different sizes. Like stated before a certain nozzle is chosen at the time application based on wind speed, direction and many other factors.

2. B. Pump Station Inspections:

Transporting the water from its source to these irrigation systems is one main conservation issue. Here on the Tankard Farm water is drawn from the pond and pumped to each of these systems through underground pvc pipes. When chosen, these pipes were selected because of their conservative and sturdy nature. Since they are buried underground there is hardly no risk of puncturing and it can be assumed that these pipes are almost completely leak proof, and provide the utmost conservation of water.

The equipment used to transport the water for irrigation are diesel engines driving centrifugal pumps. These engines and pumps do not start and stop automatically. An operator, who is always Charles Tankard, starts these pumps after checking all systems that lead to and from the pump. The operator also sets the engine speed, checks the water pressure and checks visually for leaks every time the engine is started. This is done one (1) to four (4) times daily, depending on the system used.

Ultimately, if leaks do exist, the pressure will not be sufficient to run the pump and irrigation will not be possible. Consequently, any leaks or irregularities are repaired immediately.

2. C. Water conveyance:

The water is supplied by an eight (8) inch 160psi PVC pipe buried thirty-six (36) inches deep.

These pipes either seal 100% or are blown apart, like a city water main, causing a visible eruption. When this happens, the pump has been designed with safety switches which will cut the pump off and the water flow is ceased.

The mainline piping was installed by burring the pipe to a depth of thirty-six (36) inches. Also, at the end of each pipe a thrust block was installed through the use of poured cement.

Leaks are detected through visual inspection, as noted above. (The operator also sets the engine speed, checks the water pressure and checks visually for leaks every time the engine is started. This is done one (1) to four (4) times daily, depending on the system used.

Ultimately, if leaks do exist, the pressure will not be sufficient to run the pump and irrigation will not be possible. Consequently, any leaks or irregularities are repaired immediately by the operator.) The process for repairs would involve digging up the damaged section of pipe and replacing it.

2. D. Irrigation system inspections:

Inspections of the connections between the sprinkler assemblies an supply line are made visually by the operator each time the system is used . The inspections are checked for leaking water. When no leaks are observed, the irrigation system is operating as designed.

Hard hose gun systems contain nine nozzle selections that are used based on wind conditions. Six are ring nozzles and three are taper borer nozzles, all of different sizes. Like stated before a certain nozzle is chosen at the time application based on wind speed, direction and many other factors.

The operator determines that the system is set properly by consulting the manuals that come with the irrigation system that is being used. Nozzle output is determined by size and pressure needed. Field lengths are known to the operator, so the cart travel speed can be adjusted to apply the correct amount of water to the particular crop in the field.

Inspections are performed each time the system is used and at least hourly during its use.

Since inspections are performed so frequently and repairs are made immediately, written records of each incident are not maintained.

2. E. Irrigation system control equipment:

These irrigation systems are designed to be started manually. They are operated by diesel power units with centrifugal pumps. These units are designed with safety shut off switches that sense water pressure decline. Such built-in safety switches would shut down water flow in the case of a pipe line or coupling break. The simplicity of this system is what makes it so desirable. When everything shuts down, water loss and flooded fields are no longer an issue.

This equipment is inspected visually. Again, the pressure gauges tell all that the operator needs to know.

These inspections are made up to four (4) or more times a day when the system is in use.

Since inspections are performed so frequently and repairs are made immediately, written records of each incident are not maintained.

2. **F.** Water control structures for runoff:

Each of the fields have buffer strips of grass to contain water.

This strip allows the water to soak in to the soil instead of becoming runoff.

3. Water use education program:

Education is a major factor in utilizing the water management plan. Tankard Farm's employs mostly seasonal help, however one to two employees are maintained year round. The seasonal help are not qualified to operate the irrigation systems, on the other hand the full time employees are extensively trained in water pump usage and operation. Their training includes the basic operational features of an irrigation pump such as turning on and off the system and resetting certain speeds based on weather conditions. However if any problems are observed they are instructed to immediately turn the system off and contact their supervisor. The majority of the time the main operator of the system is mostly the farmer himself, unless the instructed employee is sent to do the operation.

4. Evaluation of potential water reuse options:

   The pond on the Tankard Farm is located at a low elevation point on this farm with many surrounding fields sloped in the direction of the pond. This provides a natural way to collect surface water from the runoff from the rainwater. Also, a drainage ditch that drains excess water from the fields empties into this pond.

5. Water use reductions during water shortage emergencies:

   If the local governing body or the Director of DEQ declare mandatory water use reductions during water shortage emergencies, the operator, Charles Tankard will comply with the water usage restrictions that are imposed.

Webster Processing Plant

3100-001 / NEW

Permit Part 5
Justification for the Amount of Withdrawal Requested

5.1 NATURE OF ACTIVITY UTILIZING WATER AND DOCUMENTATION OF BENEFICIAL USE

Webster Investors, LLC (Webster) is developing a currently unused property located in Cheriton, Northampton County, Virginia. The project site is the former KMC Foods, Inc. Property, located off Sunnyside road, just east of Cheriton. The location of the site is shown in Figure 5-1. Base on information provided in previous site studies, the site was in operation from the 1920s to 1988 and was used as a farming and canning operation. The site included several buildings that were previously used by KMC Foods, Inc. for the processing and canning of vegetables. A total of five production wells were located on the project site. The production wells are currently out of service and are in the process of being abandoned. These wells are discussed further in Section 8.

The proposed development includes an industrial park and a tomato repackaging facility to be operated by East Coast Brokers and Packers (ECBP). The installation of new groundwater production wells and wastewater treatment facilities will be required to serve the industrial park and the repackaging facility. The total water usage will consist of the water usage for the industrial park plus the water usage for the repackaging facility. The installation of two groundwater production wells is planned for the development. One well (Production Well #1) will provide the water supply for potable, domestic, and sanitary use to the employees of the tenants of the industrial park. The second well (Production Well #2) will supply water solely to the repackaging facility. A line drawing showing the flow of water through the facility is shown in Figure 5-2.

5.2 WATER DEMAND ESTIMATES

The industrial park is currently under development and there are no tenants or water users, with the exception of a small office building located on-site. Because the facility is currently under development, there are no historical water usage records for tenants and employees. Therefore, this section provides a water demand estimate for the development. A water demand estimate for the industrial park section of the development is provided in Section 5.2.1. A water demand estimate for the tomato repackaging facility is provided in Section 5.2.2.

5.2.1 Industrial Park

As noted previously, there are no historical water usage records for this facility. Therefore, water usage has been estimated for the industrial park using water consumption rates provided by the Virginia Department of Health (VDH) guidance for determining the design capacity of waterworks. The VDH guidance provides daily water consumption rates for a variety of uses such as dwellings, schools, shopping centers, hospitals, etc. The VDH guidance does not provide water consumption rates for industrial parks. Therefore, water consumption rates for shopping centers was used as the basis for estimating water consumption rates for the industrial park because this use appeared to be the closest to industrial park use.

Water consumption provided in the VDH guidance is based on gallons per day (gpd) per 1,000 square feet (sq. ft.) of floor space. The VDH water consumption rate for shopping centers is 200-300 gpd per 1,000 sq. ft. of floor space. Therefore, the water demand estimate for the industrial park was based on the total floor space of the buildings (excluding the tomato repackaging facility) and a more conservative estimate of 100 gpd per 1,000 sq. ft. of floor space.

Site development plans show the site divided into seven parcels, identified as Parcels A through G. Parcel F is the parcel that the repackaging facility will be developed on and is excluded from this estimate. Water demand estimates for the repackaging facility are provided in Section 5.2.2. The total projected area of building space is 140,600 square feet. The building area per parcel is summarized in Table 1.

Table 1. Building Area Summary by Parcel	
Parcel ID	Building Area (feet^2)
A	15,000
B	15,000
C	22,500
D	24,000
E	41,600
G	22,500
Total area:	140,600

The daily water demand was estimated based on a usage rate of 100 gallons per day per thousand square feet. Therefore, the estimated daily water demand for the industrial park is

$$140{,}600 \text{ feet}^2/1{,}000*100 \text{ gpd} = 14{,}060 \text{ gallons per day.}$$

This water demand is equal to 309,320 gallons per month (0.309 million gallons (MG) per month) based on 22 days of operation per month (average 30 days per month minus eight weekend days per month). Because The industrial park is expected to operate full time year-round, there should be minimal seasonal variation. Therefore, the estimated annual water demand for the industrial park is 3.71 MG per year. Because this estimate is based on the projected total area when the industrial park is fully developed, the projected water demand is not expected to increase significantly over the 10-year permit period.

5.2.2 East Coast Brokers and Packers Tomato Repackaging Facility

The ECBP tomato repackaging facility will be the largest water user at the site. A description of the tomato repackaging process and a water demand estimate are provided below.

Description of the Tomato Repackaging Process

Currently, ECBP tomato processing plants on the Eastern Shore manage the harvesting and packing of tomatoes for shipping and retail sales. Harvested tomatoes are brought to the plants in large plastic bins. Tomatoes are dumped from the bins into wash flumes on the production lines where they are washed in a sodium hypochlorite solution. After the washing process, tomatoes are packed in 25# boxes for shipping.

In the tomato repackaging process, tomatoes that have already been harvested and boxed are sorted by certain criteria such as size, color, ripeness, etc. and are repackaged to meet the special requirements of commercial customers, such as grocery stores and restaurant chains. Tomatoes can also be repackaged into packages of specific quantities or specialty packages, depending on customer requirements.

Even though the tomatoes have gone through a washing process prior to boxing and shipping, repackaged tomatoes are washed again during the repackaging process because of additional handling. The tomato repackaging production line consists of a wash tank or flume and an overhead spray rinse. The wash tank is filled with a heated sodium hypochlorite solution on a daily basis. The tomatoes are then placed in the wash tank for initial cleaning. The tomatoes then leave the wash tank on a roller or conveyor belt where they are rinsed with clean water by an overhead spray. The wash water is recirculated and reused during production. However, the wash tank is emptied and the equipment is pressure washed and cleaned on a daily basis. The wash tank is then refilled prior to the next production run. Although the wash water is recirculated and reused, some water loss results from wet tomatoes leaving the wash tank and from evaporation from the tank. Some of this water is made up by rinse water from the overhead spray rinse flowing back into the wash tank.

Estimated Daily Water Demand

Water will be used in the repackaging facility in the repackaging process (process water) and as potable water for the facility employees. The principal water use will be process water associated with the repackaging production line. Process water is used in the repackaging process in three principal areas; the tomato wash tank, the overhead spray rinse, and pressure washing and cleaning the repackaging machinery. Additional water will be required to supply potable and sanitary water for use by facility employees and management.

The repackaging machinery that will be used at the ECBP facility will be constructed by Tri-Pak Machinery, Inc., located in Harlingen, Texas. According to information provided by Tri-Pak, repackaging machines are custom built to the requirements of the particular facility. Based on the requirements for the ECBP facility, Tri-Pak provided the following water use specifications for the production machinery. The wash tank volume will be 6,700 gallons and will be filled on a daily basis; the overhead spray rinse will use between 20 to 30 gallons per minute (approximately 9,600 to 14,400 gallons per day); and pressure washing and cleaning the machinery will use approximately 1,000 gallons per day. These estimates are based on an eight-hour workday.

According to ECBP, the repackaging production line will require between 50 and 80 workers to operate the production line. Because the facility is currently under development, there are no historical water usage records for facility workers. Therefore, the VDH Guidance for Conducting a Comprehensive Public Drinking Water Supply Needs Assessment was used to estimate the potable water demand for employees. The Guidance Document provides daily consumptive use estimates for a variety of uses, including dwellings, restaurants, hospitals, etc. The consumptive use category most closely related to the repackaging facility is "Factories, per person, per eight-hour shift." The guidance document lists a consumptive use range of 15 to 35 gallons per worker per day. Based on a projected maximum 80 workers and using a consumptive use of 15 gallons per day, the estimated potable water demand is 1,200 gallons per day.

A daily water demand estimate based on one production line, a 25 gpm (average) flow rate for the overhead spray and 15 gallons per worker per day is provided in Table 2. This estimate is based on an eight-hour workday. Because this work is seasonal, longer workdays are required at times during the summer months when harvesting and packing is busiest on the Eastern Shore. Therefore, this table also contains a water demand estimate base on a 12-hour workday. The 12-hour workday estimate assumes that the water volumes required for the wash tank and washing and cleaning remain the same, and water usage for the overhead spray and potable water increases by four hours (eight hours x 1.5).

Table 2. Total Estimated Daily Water Demand (one production Line).

Usage	Wash Tank	Overhead Spray (20 gal/min)	Washing & Cleaning	Potable Water	Total Demand (8-hr day)	Total Demand (12-hr day)
1 Prod. Line	6,700	12,000	1,000	1,200	20,900	27,500

East Coast Brokers and Packers plans to begin production with a single repackaging line to repackage large, round tomatoes. According to ECBP, their expansion plans include adding a second repackaging line within two years to repackage Roma tomatoes, and a third line to repackage grape tomatoes within four years. Based on the water usage assumption above, the daily water demand for three repackaging lines is provided in Table 3. The daily water demand for three repackaging lines is used to estimate the monthly and annual water demand, which is discussed in Section 5.3.

Table 3. Total Estimated Daily Water Demand (three production Lines).						
Usage	Wash Tank	Overhead Spray	Washing & Cleaning	Potable Water	Total Demand (8-hr day)	Total Demand (12-hr day)
3 Prod. Lines	20,100	36,000	3,000	3,600	62,700	82,500

5.3 MONTHLY AND ANNUAL DEMAND

The total monthly demand is the sum of the total estimated demand from the tomato repackaging facility plus the total estimated demand from the industrial park. The total annual demand is the sum of the total monthly demand for 12 months.

The monthly demand for the industrial park is projected to be relatively uniform over a 12-month period. The industrial park is projected to operate full time (eight hours per day) year-round. Based on an estimate of 22 workdays per month, the monthly demand for the industrial park is 309,320 gallons per month.

In addition to farms on the Eastern Shore, ECBP also owns land and raises tomatoes in Florida and Georgia. For this reason, ECBP plans to operate the repackaging plant year-round. During the summer months, they will repackage tomatoes harvested on the Eastern Shore. In the off-season, they will harvest tomatoes in Florida and Georgia and ship them to the Webster facility for repackaging and shipping to markets in the northeast.

In the off-season, plant operation is expected to be eight hours per day, five days per week according to ECBP. Therefore, the monthly water demand for off-season operation is based on 22 workdays per month (average 30 days per month minus eight weekend days). However, due to a seasonal increases in production on the Eastern Shore during the summer months, ECBP expects that the plant will be in operation for longer periods. In addition, there are generally two crops of tomatoes produced on the Eastern Shore and two harvests during the summer months. Therefore, the monthly demand for two months during the summer (July and September) was based on 15 days of eight-hour workdays plus 15 days of 12-hour work days.

Based on the above estimates, the total average and maximum monthly water demand for one year for the Webster site is summarized in Table 4.

Table 4. Total Estimated Monthly and Annual Water Demand.					
	Repackaging Plant			Industrial Park	Total Demand
Month	Process Water	Potable Water	Plant Total	Potable Water	(gallons/month)
January	1,300,200	79,200	1,379,400	309,320	1,688,720
February	1,300,200	79,200	1,379,400	309,320	1,688,720
March	1,300,200	79,200	1,379,400	309,320	1,688,720
April	1,300,200	79,200	1,379,400	309,320	1,688,720
May	1,300,200	79,200	1,379,400	309,320	1,688,720
June	1,300,200	79,200	1,379,400	309,320	1,688,720
July	**2,043,000**	**135,000**	**2,178,000**	309,320	**2,487,320**
August	1,300,200	79,200	1,379,400	309,320	1,688,720
September	**2,043,000**	**135,000**	**2,178,000**	309,320	**2,487,320**
October	1,300,200	79,200	1,379,400	309,320	1,688,720
November	1,300,200	79,200	1,379,400	309,320	1,688,720
December	1,300,200	79,200	1,379,400	309,320	1,688,720
Annual Total:	17,088,000	1,062,000	18,150,000	3,711,840	21,861,840

Bold - Represents maximum estimated monthly demand.

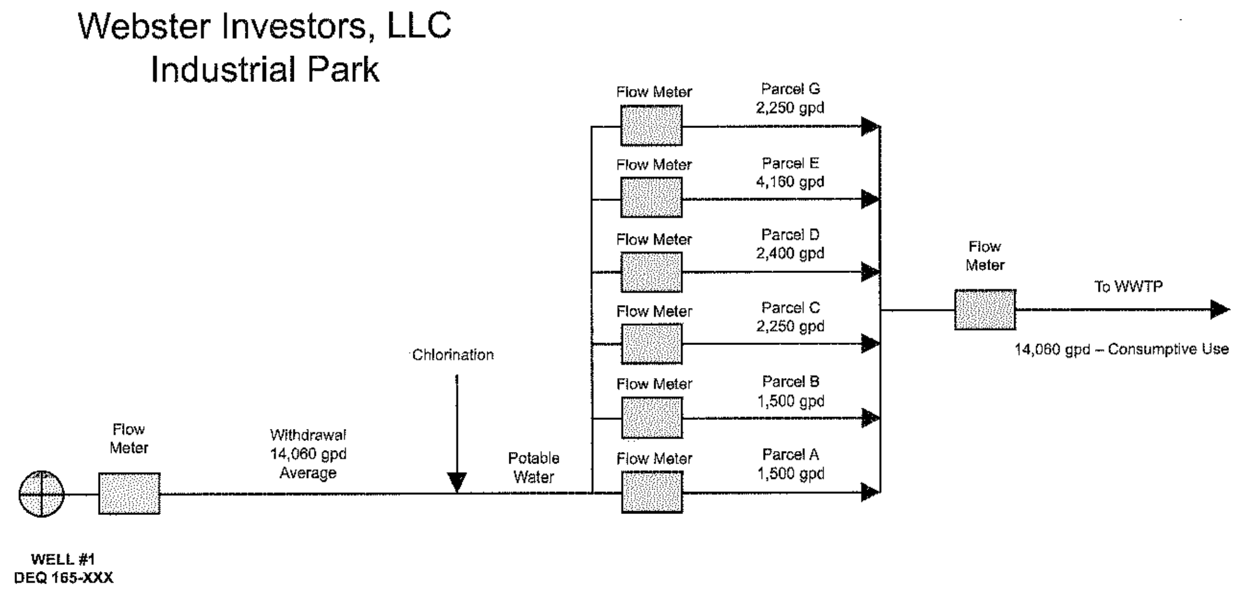
Based on these estimates, the maximum total monthly water demand is approximately 2,487,000 gallons and the maximum annual demand is approximately 21,862,000 gallons.

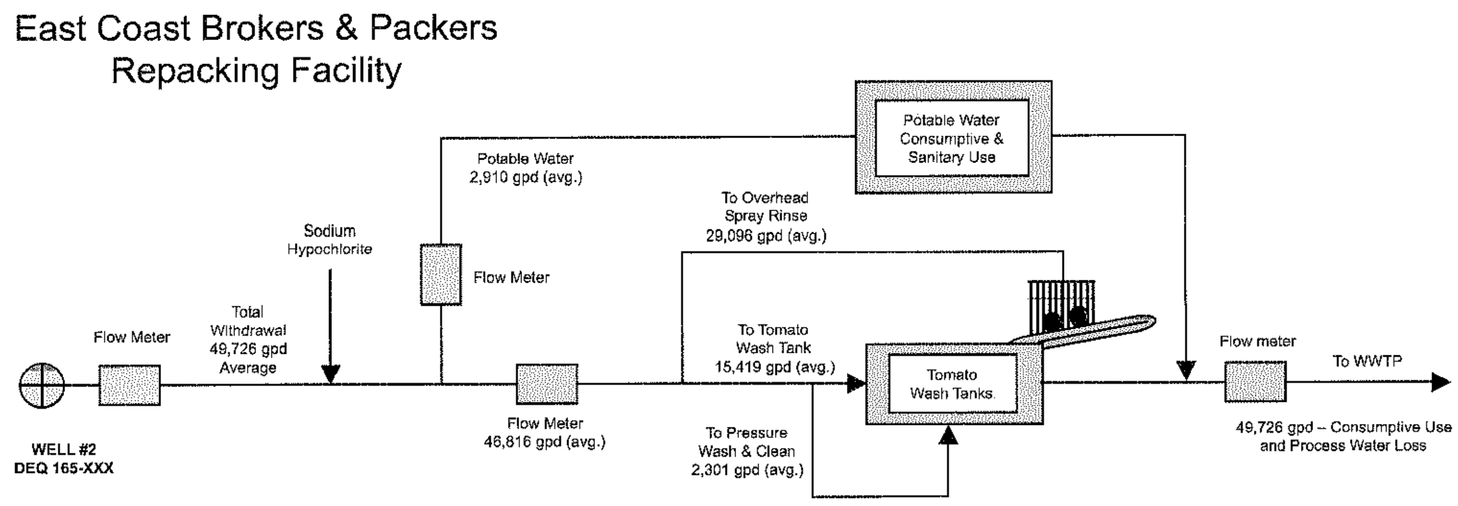
5.4 10-YEAR WATER DEMAND PROJECTION

The monthly and annual water demand estimates are based on full development of the industrial park and full production at the repackaging facility. Therefore, the monthly and annual water demands provided in Table 4 are considered to be maximum projected demands and little increase in demand is expected over the 10-year permit period. Therefore, demand projection is 218.62 MG for the 10-year permit period.

5.5 APPORTIONMENT OF WITHDRAWAL FROM INDIVIDUAL WELLS

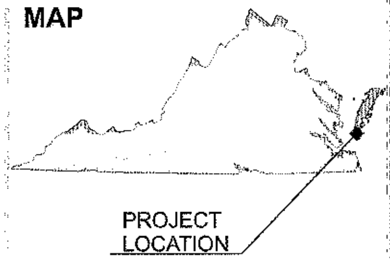
As discussed in Section 5.1, Well #1 will provide the water supply for potable, domestic, and sanitary use to the employees of the tenants of the industrial park, and Production Well #2 will supply water solely to the repackaging facility. Therefore, Production Well #1 will produce approximately 3.71 MG per year, or approximately 17% of the total withdrawal, and Production Well #2 will produce approximately 18.15 MG per year, or approximately 83 % of the total withdrawal.





Water Flow Line Drawing
NOT TO SCALE

VICINITY MAP



SOURCE:

Cheriton, Virginia

Environmental
Groundwater
Hazardous Materials
Geotechnical
Industrial Hygiene

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GeoEnvironmental Resources, Inc.
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WATER USE LINE DRAWING

Webster Property
Cheriton, Virginia

PROJECT NUMBER	DRAWING NUMBER
120-5135	5-2

Report Of Engineering Services

Water Conservation And Management Plan

Webster Processing Plant

21131 Webster Road
Cheriton, Virginia 23310

Prepared for

Webster Investors, LLC
16464 Courthouse Road
Eastville, Virginia 23347

Attention: Mr. Joseph J. Corrado

Prepared by

Brian C. Parker, R.E.M. and Philip T. Rogan, P. G.

Friday, August 28, 2009

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Table of Contents

WATER CONSERVATION AND MANAGEMENT PLAN

Webster Investors, LLC
21131 Webster Road
Cheriton, Virginia 23310

1.0 Introduction

Webster Investors, LLC (Webster) is developing a currently unused property located in Cheriton, Northampton County, Virginia. The project site is the former KMC Foods, Inc. Property, located off Sunnyside Road, just east of Cheriton. The site was in operation from the 1920s to 1988 and was used as a farming and canning operation. The site included several buildings that were previously used by KMC Foods, Inc. for the processing and canning of vegetables.

The proposed development includes an industrial park and a tomato repackaging facility. The installation of new groundwater production wells and wastewater treatment facilities will be required to serve the industrial park and the repackaging facility. The total water usage will consist of the water usage for the industrial park plus the water usage for the repackaging facility. The installation of two groundwater production wells is planned for the development. One well (Production Well #1) will provide the water supply for potable, domestic, and sanitary use to tenants and employees of the industrial park. The second well (Production Well #2) will supply water solely to the repackaging facility.

Normal operation at the industrial park and repackaging facility will require the production of variable amounts of groundwater from the planned groundwater production wells.

1.1 WATER CONSERVATION

Conservation of water has reached a new level of awareness. In some cases, conservation may represent a practical alternative to supply augmentation, or at least complement supply augmentation. Fresh groundwater supplies, like other natural resources, are a limited commodity which must be managed wisely to preserve the well-being of future generations. Efforts to conserve existing supplies and the efficient allocation of water resources should be made at each stage of the water supply planning process.

Water conservation measures are those physical facilities, equipment, or devices utilized in conjunction with certain methods, techniques, policies, practices, and procedures which result in reduced water consumption, improved water use efficiency, reduced water loss and waste, increased water recycling or reuse, and ultimately result in a reduction or minimization of water demand. Water management consists of a plan to implement water conservation measures.

This Water Conservation and Management Plan (the Plan) includes identification of water demand and water resources and then provides guidance to implement water management and conservation measures.

1.2 REGULATORY REQUIREMENTS

The Groundwater Management Act of 1992 was approved in April 1992. It requires a Groundwater Withdrawal Permit (GWP) for groundwater withdrawals of 300,000 gallons per month or more within declared Groundwater Management Areas (GMAs). Currently, there are two Ground Water Management Areas in the state, the Eastern Virginia Ground Water Management Area (EVGMA) and the Eastern Shore

Ground Water Management Area (ESGMA). Groundwater Withdrawal Regulations (9VAC25-610-100) require that applications for new GWPs within GMAs include a water conservation and management plan approved by the Virginia Department of Environmental Quality (VDEQ). An approved water conservation and management plan must include:

- Requirements for the use of water saving plumbing and processes, including, where appropriate, the use of water saving fixtures in new and renovated plumbing as provided in the Uniform Statewide Building Code.
- A water loss reduction program.
- A water use education program.
- An evaluation of potential water reuse options.
- Requirements for mandatory water use reductions during water shortage emergencies declared by the local governing body or the Director of DEQ, including, where appropriate, ordinances prohibiting the waste of water generally and requirements for mandatory water use restrictions, with penalties during water shortage emergencies.

The Webster property is located within the ESGMA. Therefore, a water conservation and management plan is required for this facility.

1.3 PLAN OBJECTIVES

The primary objective of this Water Conservation and Management Plan is to provide a documented, effective conservation and management strategy designed to minimize the demand for groundwater at the Webster property, and to demonstrate compliance with the Groundwater Management Act of 1992. The specific measures and management strategies to be used at the Webster site are presented in detail first, then are briefly summarized in the concluding section.

2.0 Water Demand

Water demand at the Webster property is for a variety of purposes, including process water for the cleaning and repackaging of tomatoes, and general potable water requirements (sanitary water, drinking water, and process water, as required) for employees of the repackaging facility and the tenants of the industrial park. The largest water demand at the Webster site will be for process water for tomato cleaning and repackaging.

2.1 TOMATO PROCESSING

Repackaged tomatoes are washed and rinsed prior to repackaging. The production line consists of a wash tank or flume and an overhead spray rinse. The wash tank is filled with a heated sodium hypochlorite solution on a daily basis. The tomatoes are then placed in the wash tank for initial cleaning. The tomatoes then leave the wash tank on a roller or conveyor belt where they are rinsed with clean water by an overhead spray. The wash water is recirculated and reused during production. However, the wash tank is emptied and the equipment is pressure washed and cleaned on a daily basis. The wash tank is then refilled prior to the next production run.

Although the wash water is recirculated and reused, some water loss results from wet tomatoes leaving the wash tank and from evaporation from the tank. Some of this water is made up by rinse water from the overhead spray rinse flowing back into the wash tank. Lost wash water is also slowly replaced with fresh solution throughout the day. Process wastewater will be managed by land application in rapid infiltration basins (RIBs) which are proposed to be constructed at the facility.

2.2 POTABLE WATER (GENERAL USE)

The rest of the water demand will be for general potable water usage for processing plant employees and for tenants and employees at the industrial park. This water will primarily be used for sanitary and domestic needs, such as drinking water and food preparation (breakfast, lunch, etc.). Employees will commute to and from work and there will be no permanent residents on-site. Therefore, other domestic uses such as baths/showers, watering lawns and gardens, etc. are not considered to be significant uses.

3.0 Water Supply

The EPA designated the Columbia and Yorktown-Eastover aquifer system as a sole source aquifer (SSA). A SSA is defined as one which supplies at least 50% of the drinking water consumed in the area overlying the aquifer. In addition, these areas have no alternative drinking water source(s) which would physically, legally, and economically supply all those who depend upon the aquifer for drinking water.

Because there are no other water resources such as lakes, rivers or reservoirs in the area that could potentially provide a reliable water supply at the Webster site and there is no municipal water supply pipeline from Cape Charles to the Cheriton area, all water used at the Webster facility will be supplied by groundwater.

4.0 General Conservation Measures and Management Strategies

The following conservation measures will be implemented as part of the strategy to manage groundwater supplies.

- No unnecessary groundwater withdrawal will be permitted by the industrial park management.
- Facility management, both industrial park management and East Coast Brokers and Packers (ECBP) management, will periodically review water use and will implement changes where possible and practical to better manage water used and increase water conservation. The periodic review will include but not be limited to the following:
  - Monthly visual inspections for water loss and leak detection
  - Weekly observation of all pumps and storage tanks
  - Daily evaluation of water reuse and recycling for production purposes
- All permanent plumbing fixtures throughout the facility (both the tomato processing facility and the rest of the industrial park) shall contain low-flow fixtures and 1.6-gpf toilets. Any older plumbing that may be in place from the preexisting structures shall be replaced with newer, more efficient models as needed within the scope of the Unified Statewide Building Code recommendations.
- The facility does not and will not use groundwater for landscape irrigation purposes.
- The facility management shall encourage employees to conserve water through the use of regular reminders. These reminders may include but are not limited to verbal reminders, and posters or bulletins posted in message areas or on bulletin boards.
- *Water Reuse Evaluation*: A significant portion of the water used at this facility (tomato processing) cannot be reclaimed or reused.

Specific water conservation measures and management strategies are presented here. The ultimate goal of these measures is to minimize the need for, and use of, pumped groundwater.

5.0 Water Saving Plumbing and Processes

In addition to the water required for tomato preparation and packing, potable water will also be required for sanitary and drinking water purposes for packing plant employees and future tenants of the industrial park. Plant employees and industrial park tenants will commute to and from the site. Therefore, potable water use will be primarily for sanitary purposes (e.g., flushing toilets and washing hands), for drinking water, and most likely some minimal food preparation (e.g., for breakfast or lunch).

There will be no permanent residences or tenants, therefore, there will be no additional demand for dinner preparation, showers/baths, washing clothes, etc. For this reason, plumbing fixtures will mostly be limited to faucets and toilets. All plumbing fixtures utilized at the facility shall be efficient, low-flow or water saving fixtures as provided in the Unified Statewide Building Code recommendations. As listed below, these requirements are consistent with the Federal Energy Policy Act of 1992 and regulations established in the Code of Federal Regulations (CFR) at 10 CFR 430.32. Plumbing fixtures used in all new construction at the facility and in any remodeling and/or replacement in existing structures shall not exceed the following flow rates:

- Lavatory faucets 2.2 gallons per minute at 60 psi
- Lavatory replacement aerators 2.2 per minute at 60 psi
- Kitchen faucets 2.2 per minute at 60 psi
- Kitchen replacement aerators 2.2 per minute at 60 psi
- Metering faucets 0.25 gallon per cycle
- Shower heads 2.5 per minute at 80 psi
- Toilet 1.6 gallons per flush
- Urinal 1.0 gallons per flush

Flow meters will be installed on the production wells to accurately account for both monthly water usage and total water usage. Flow meters will also be installed on supply lines for the tomato preparation processes to accurately account for the monthly and total water demand for tomato processing.

In addition to tracking groundwater withdrawal rates and process water usage, flow meters will also be installed on individual supply lines for each of the tenants/buildings, which will allow groundwater use to be monitored and tracked separately at each tenant/building.

6.0 Water Loss Reduction

At least once per year, a water loss audit will be conducted to determine the volume and nature of water lost and unaccounted for water within the industrial park and the repackaging plant. The primary purpose of the audit is to identify potential sources of water loss that might escape detection by normal meter readings. Because the water supply systems will be relatively simple and serve a limited number of people or connections, there are a limited number of areas where water losses might go undetected. Examples include:

- Water meter errors or malfunctions
- Leaks or breaks in the water distribution lines
- Drainage or leaks from water storage tanks

All leaks or breaks will be repaired immediately when identified. Any nonfunctioning water meter will be replaced immediately when found. At the time the leak or break is identified or a broken meter is found, an estimated volume of the amount of water lost will be reported. All records of lost or unaccounted for water will be maintained by the industrial park management.

7.0 Water Use Education

A key factor in reducing water use by facility tenants and employees is the development of a water use education program. It is extremely important to educate users on the various aspects of the water industry and information on how water is produced and why we need to conserve, especially in a sensitive area such as the Eastern Shore where groundwater is in a limited supply. The goal of the water use education program will be to make the facility tenants and employees understand their water sources, the problems associated with supplying water, and how changes in consumer behavior can lower the cost of supplying water and conserve limited groundwater resources.

The industrial park is limited in size and will have a limited number of tenants and employees. Therefore, the Water Use Education program need not be as comprehensive or complex as might be required for a larger public water supply system serving a general population, including private residences, commercial and industrial users, and public uses such as schools and fire protection. Therefore, the facility will use bill inserts and educational brochures or posters in its water use education program:

<u>Bill Inserts</u> - The industrial park will bill tenants for water usage. Therefore, the principal item that will be included in the water use education program will be bill inserts. Inserts will be included on a regular basis (but not less than once every six months) in water bills sent to the tenants that will include water conservation techniques and leak detection strategies, as appropriate. This method can be useful for showing the tenant how water conservation benefits both the tenant and the industrial park. Tenants benefit by reducing their water bills and the industrial park benefits by preserving its groundwater resources.

<u>Brochures or Posters</u> - Brochures and posters that provide information on water use and conservation will be placed in the buildings in the industrial park where employees will have access to the information.

8.0 Evaluation of Water Reuse Options

The purpose of the Virginia Water Reclamation and Reuse Regulation (9VAC25-740) is to promote and encourage the reclamation of wastewater and water reuse in a manner that is protective of the environment and public health, and as an alternative to discharging treated effluent to state waters. Water reuse options include:

- Irrigation, including agricultural, municipal, and residential
- Urban reuse:
  - Ornamental landscape features (e.g., ponds and fountains)
  - Fire protection
  - Dust control and concrete mixing on construction sites
  - Vehicle and window washing
  - Sanitary use in public, commercial, and industrial buildings
- Industrial Reuse:
  - Cooling water
  - Boiler make-up water
  - Industrial process water
- Indirect potable reuse (reclaimed water that is discharged to a water body that is used as a raw water supply for another treatment plant).

Due to the rural location and low population density in the local area around the facility, there are no large users or industrial processes that could use reclaimed water at the present time. In addition, there are no surface water bodies in Northampton County that can be used as a raw water supply. Therefore the urban, industrial, and indirect potable water reuse options are not considered to be viable water reuse options at the present time.

The only viable potential water reuse option at the industrial park would be for landscape irrigation. However, any potential landscape irrigation usage would probably require a relatively low water volume and it would be cost prohibitive to treat the water for landscape irrigation.

For these reasons, water reuse at the industrial park or in the surrounding community is not considered to be viable at this time because of the relatively small amount of water used, the seasonal nature of the irrigation demand, and the potential difficulty and expense of treating, storing, and distributing reclaimed water.

9.0 Mandatory Water Use Reductions

Requirements for mandatory water use reductions during local or regional water shortage emergencies typically involve local ordinances that provide for restrictions and penalties that may be applied during a declared water shortage emergency. Mandatory water use restrictions will be implemented during water shortage emergencies declared by the local governing body (Northampton County), the director of DEQ, or the Governor.

Potential water use reduction strategies for the industrial park and tomato processing plant are relatively limited compared to potential strategies for municipal systems that serve larger populations consisting of private, public and commercial users. However, water use reduction at the facility will include, but is not necessarily limited to, the following:

- General washing of buildings, paved surfaces, or equipment will be prohibited.
- Production at the processing plant and industrial park may be reduced or limited n the event that groundwater withdrawals exceed any temporarily mandated emergency withdrawal limits.
- Facility tenants/businesses will not be permitted to water lawns or landscaping.
- It is not anticipated that there will be permanent (seasonal or year-round) residents. However, potential tenants may have clothes-washing requirements (e.g., for work clothes or uniforms). In this case, use of washing machines will be limited to full capacity loads only.
- The facility will inspect the supply/distribution lines from the production wells to the users for evidence of leaks on a regular basis. Any leaks detected will be fixed as quickly as possible, or the production well will be shut off until the leak can be repaired.
- The facility will comply with any applicable penalties for failing to comply with the mandatory water use restrictions.

Appendix D

Enacted Ordinances

Virginia's Eastern Shore

MALCOLM PIRNIE

CHAPTER 53: WATER PROTECTION

Section

Cross-reference:

For provisions regarding the minimum separation distances: subsurface absorption systems and wells, see § 154.069

§ 53.01 AUTHORITY AND PURPOSE.

(A) *Authority.* This chapter, to be cited as the Ground Water Protection Ordinance of Northampton County, Virginia, is hereby ordained, enacted, and published by the Board of Supervisors of Northampton County, Virginia pursuant to the provisions of Title 15.2, Chapter 22, Article VIII Code of Virginia, 1950, as amended.

(B) *Intent and purposes.*

(1) *Intent.* This chapter is intended to be in accord with and to implement the goals, objectives, and policies set forth in the Comprehensive Plan of Northampton County adopted by the Board of Supervisors of Northampton County.

(2) *Purposes.*

(a) The regulations that follow are part of a comprehensive and longrange program to implement reasonable provisions, not inconsistent with applicable state water quality standards, to protect surface and ground water as defined in VA Code § 62.1-255. More specifically, the purpose of these regulations is to require variations in the sizes of lots based on whether a public or community water supply or sewer system is available and used, as in accord with VA Code § 15.2-2283.

(b) The Eastern Shore of the state depends entirely on a limited supply of ground water for potable water demand, as well as for most non-potable demands. For this reason, the Eastern Shore of Virginia has been designated a Virginia Ground Water Management Area under the Ground Water

Management Act of 1992, VA Code Title 62.1, Chapter 25. In 1997 the U.S. Environmental Protection Agency designated the aquifers beneath the Eastern Shore of Virginia, with the exception of Chincoteague Island and Tangier Island, as an EPA Sole Source Aquifer.

(c) Under the Ground Water Management Act of 1992, the state has adopted regulations that are implemented by the Department of Environmental Quality. These regulations apply only to individual ground water withdrawals in excess of 300,000 gallons in a single month. The Eastern Shore of Virginia Ground Water Supply Protection and Management Plan (1992) and the Technical Analysis for Ground Water Ordinances on the Eastern Shore of Virginia (2001) document the potential for multiple individual ground water withdrawals in close proximity to each other to exceed the 300,000 gallons per month threshold that would require a ground water withdrawal permit for a single well.

(d) Threats to ground water on the Eastern Shore may be placed into three general categories: (1) saltwater intrusion; (2) hydraulic head depression; and (3) contamination from surface sources. Certain residential developments, commercial businesses and industries that are served by individual private wells can have adverse effects on ground water levels and quality. Certain ground water withdrawals that individually do not exceed the state limit may, in aggregate with other nearby users, greatly exceed that amount. These aggregated withdrawals have the potential to have as much impact on the ground water resource as an individual permitted withdrawal. This ground water protection ordinance is intended to ensure protection and wise management of the ground water resource for both existing uses and future growth in the county.

(Ord. passed 6-23-03)

§ 53.02 DEFINITIONS.

For the purpose of this chapter, the following definitions shall apply unless the context clearly indicates or requires a different meaning.

ADVERSE EFFECT. Reductions in ground water levels or changes in ground water quality that limit the ground water use associated with any ground water user lawfully withdrawing or authorized to withdraw ground water at the time of application approval.

APPLICANT. An individual, partnership, association, or corporation proposing to use ground water as a source of potable water supply.

AQUIFER. A stratum or zone below the ground surface that will yield water in a usable quantity to a well.

AREA OF IMPACT. The areal extent of each aquifer where more than one foot of drawdown is predicted to occur due to a proposed ground water withdrawal.

CENTRAL SYSTEM. A water or wastewater system that serves 33 or more properties.

CLOSED-LOOP GROUND-SOURCE HEAT PUMP WELL. A well consisting of a sealed loop of plastic pipe buried beneath the earth's surface to allow heat transfer between the fluid and the pipe in the earth.

CLUSTER SYSTEM. A water or wastewater system that serves fewer than 33 properties.

DEEP AQUIFER. A confined or semi-confined aquifer, typically referred to as the Yorktown-Eastover aquifer and typically occurs greater than 50 feet below the surface.

DEVELOPMENT, NEW. The new construction, or substantial alteration, of residential, commercial, industrial, institutional, recreation, transportation, or utility facilities or structures which involves an increase in impervious surface.

EQUIVALENT RESIDENTIAL CON-NECTION. A volume of water used equal to a residential connection which is 400 gallons per day unless supportive data indicates otherwise.

GROUND WATER. Any water, except capillary moisture, found under the ground surface in the zone of saturation or beneath the bed of any stream, lake, reservoir or other body of surface wholly or partially within the boundaries of this Commonwealth, whatever the subsurface geologic structure in which such water stands, flows, percolates or otherwise occurs (As defined in VA Code § 62.1-255).

HYDROGEOLOGIC INVESTIGATION. An evaluation to define the hydrogeologic characteristics of an aquifer or confining unit including, but not limited to, pumping tests.

IMPERVIOUS SURFACES. Areas that do not allow significant quantities of water to penetrate.

MASS OR COMMUNITY SUBSURFACE DRAINFIELD. A sewage disposal system or systems which will discharge effluent to a single absorption area or multiple absorption areas with or without combined flows, such that the loading rate applied to any acre, in accordance with Virginia Sewage Handling and Disposal Regulations, exceeds 1,200 gallons per day.

MITIGATION. Actions necessary to assure that all ground water users within the proposed development and other existing ground water users, who experience adverse impacts as a result of the new withdrawals, continue to have access to the quantity and quality of water needed for their uses.

OBSERVATION WELL. A well for obtaining information on hydraulic characteristics and water quality of an aquifer.

PRODUCTION WELL. A well designed to supply adequate yield and water quality for its intended use and meeting County and Health Department requirements.

SALT WATER INTRUSION. Encroachment of saline or brackish water into an aquifer that results in adverse effects.

STABILIZED YIELD. Measured drawdown in the well at the end of a minimum eight-hour constant rate pumping test.

TWO-WELL SYSTEM. An individual or centralized well system that consists of separate wells for potable and non-potables uses. In such a system, the well(s) for non-potable uses are screened in the water table aquifer.

WATER TABLE AQUIFER. The uppermost, unconfined water-bearing unit, typically occurring within 40-90 feet of the land surface.

WELLHEAD PROTECTION. The assessment of potential threats to ground water, and planning and managing land uses to prevent contamination and overuse of groundwater supplies.

(Ord. passed 6-23-03)

§ 53.03 GENERAL REQUIREMENTS.

(A) Any new developments that have an average density more than I Equivalent Residential Connection (ERC) per 1/2 acre for any contiguous area of the development with 33 or more ERCs, or 50 or more ERC for cluster developments, will be required to have one of the following ground water protection measures:

(1) A centralized wastewater collection and treatment system (WCTS).

(2) Septic drainfields that are designed for 1.5 times normal capacity.

(3) An exception to the requirements of division (A), including the installation of alternative on-site wastewater disposal systems, may be granted upon approval of a variance by the Northampton County Board of Zoning Appeals, as described in § 53.04.

(B) All new developments of 33 or more ERC, cluster developments with 50 or more ERC, or new developments with 4 ERC or more located within 1/4 mile of an aggregated groundwater withdrawal of 33 or more ERC, must submit to the Zoning Administrator the measures that will be taken to prevent over pumpage of ground water, in addition to the requirements of division (A) of this section. Ground-source heat pumps used for heating or cooling are restricted to using closed-loop ground-source heat pump wells as specified in the Virginia Department of Health Regulations 12 VAC 5-630-10 *et seq.* Ultra-low-flow plumbing fixtures are required, as specified in the Virginia State Wide Building Code, as well as one of the following measures:

(1) Two-well systems.

(2) A centralized water supply system.

(3) An exception to the requirements of division (B) may be granted upon approval of a variance by the Northampton County Board of Zoning Appeals, as described in § 53.04.

(Ord. passed 6-23-03)

§ 53.04 VARIANCE.

(A) *Granting variances.* The Northampton County Board of Zoning Appeals has the authority to grant a variance to the requirements of § 53.03 in cases where it can be demonstrated that a development will have no adverse impact on ground water resources, or that alternative measures will protect ground water. In order to be considered for a variance, an application must be submitted to the Northampton County Department of Planning and Zoning.

(B) *Initial application.*

(1) At a minimum, the application shall contain the following information:

(a) Site plan or subdivision plan showing the number and sizes of lots. A location plan showing the relative location of the area within Northampton County shall also be included.

(b) An analysis of average and maximum daily water demands to be supplied by the proposed production wells.

(c) 1. Identification of proposed well screen depths and results of a hydrogeologic investigation. The hydrogeologic investigation shall, at a minimum, report the information required by the Commonwealth of Virginia Water Well Completion Report Form (Form GW-2) and Virginia Department of Health Uniform Water Well Completion Report Form. The stabilized yield and water levels required under Item 2 of Form GW-2 shall be determined from constant pumping rate of the well.

2. The number of observation wells to be constructed as part of the hydrogeologic investigation shall, at a minimum, comply with the number specified in the table below. Construction and location of the observation wells can be such that they may be converted to production wells, pending approval by the Virginia Department of Health.

Number of ERCs	Number of Observation Wells
< 33	2
33-75	5
76-100	6
101 - 200	7
> 200	Add One Additional Well Per 100 Lots (e.g.: 201-300 lots = 8 wells; 301-400 lots = 9 wells)

(d) Water quality analyses of ground water at the proposed development. At a minimum the following will be analyzed for: Calcium, magnesium, iron, manganese, potassium, sodium, chloride, sulfate, nitrate, alkalinity, total dissolved solids, and fecal coliforms. Sample depth shall coincide with proposed well screen depth.

(e) Physical characteristics that identify soil type and slopes, quantity of green space, impervious surfaces, and storm water management plan.

(f) Proposed ground water development plans, including number of wells, location of wells, capacity per well and well screen interval.

(g) Mitigation measures that, at a minimum, comply with the requirements listed in division (E) of this below.

(2) The Zoning Administrator will review the variance application and present a staff report to the Northampton County Board of Zoning Appeals. After reviewing the application, and after conducting a public hearing, the Board of Zoning Appeals may act on the variance application. Approval of the application will be determined based on the applicant's ability to demonstrate that the proposed potable water well(s) will have no adverse effect on the quality or quantity of ground water within the proposed development and adjacent areas. If, during the application review process, the Zoning Administrator or Board of Zoning Appeals determines that supplemental information is required to evaluate the applicant's proposed ground water use, the Zoning Administrator will notify the applicant in writing what supplemental information the applicant must submit prior to the Board of Zoning Appeals rendering a decision on the application. Supplemental information that may be required of the applicant is described in division (C) below.

(C) *Supplemental Information.* The following supplemental information may be required by the Zoning Administrator or Board of Zoning Appeals to provide additional data necessary to adequately evaluate the application for potable water wells. The specific information required will be determined on a case-by-case basis.

(1) Water quality analysis for samples collected from overlying and/or underlying aquifers.

(2) A ground water flow model to predict the ground water levels and amount of drawdown resulting from the proposed withdrawals. At a minimum, the model will predict the area of impact from the proposed withdrawals. The ground water flow model can vary from simple analytical calculations to more complex computer based one-dimension, two-dimensional, and three-dimensional flow models.

(3) Salt water intrusion model to predict the potential for movement of brackish ground water resulting from the pumping. The salt water intrusion model may be either a two-dimensional or three-dimensional model and may account for both lateral and vertical movement (upcoming) of ground water. Specific requirements for evaluating salt water intrusion will be determined on a case-by-case basis.

(4) A wellhead protection model accepted by the US EPA, such as the US EPA WHPA model to evaluate the susceptibility of the wells to contamination.

(D) *Application review.* The application will be reviewed by the Zoning Administrator and may also be reviewed by other agencies/parties, such as the Eastern Shore of Virginia Ground Water Committee, as determined by the Zoning Administrator. The applicant is responsible for the cost of any third-party engineering review of the application, if agreed to by the applicant. If the applicant does not agree to pay for the cost of third-party engineering review, the application shall be considered withdrawn.

(E) *Mitigation plan.*

(1) In cases where it is determined that an adverse effect is likely, the applicant has the option of providing a plan to mitigate these effects. If the Northampton County Board of Zoning Appeals determines that the mitigation plan adequately addresses the adverse effects, the Zoning Administrator will approve the application. If the Northampton County Board of Zoning Appeals determines that the proposed potable water wells will have an adverse effect on the quality or quantity of ground water within the proposed development and adjacent areas that are not mitigated, the Zoning Administrator will issue a letter denying the application.

(2) Types of mitigation considered are:

(a) Implementation of Best Management Practices (BMP's).

(b) Compensation to adversely impacted ground water users.

(3) Best Management Practices may include, but are not limited to, recharge basins, buffer areas, or other site-specific methods that will eliminate the adverse impact to the ground water resource and other existing ground water users. The applicant must provide information on the intended BMP such as site plans, adequately document how the BMP will prevent adverse impacts to the ground water resource or other existing ground water users, and provide a monitoring plan where applicable to demonstrate that the BMP is performing as designed.

(4) Alternatively, where the variance request applies to a variance from the water supply requirements, the applicant shall provide and implement a plan that will compensate existing ground water users for adverse effects on their ability to use the ground water resource. The mitigation plan is non-exclusive and may not be applied or construed to bar a claimant's recourse to conventional legal or equitable remedies in the event of loss or impairment of water supply. At a minimum, the Mitigation Plan will conform to the Virginia Department of Environmental Quality requirements for permitted users in a Ground Water Management Area. Specifically, the plan must include.

(a) The rebuttable presumption that water level or water quality declines that cause adverse impacts to existing wells within the area of impact are due to the proposed withdrawal.

(b) A commitment by the applicant to mitigate undisputed adverse impacts due to the proposed withdrawal in a timely fashion.

(c) A speedy, nonexclusive, low-cost process to fairly resolve disputed claims for mitigation between the applicant and any other claimant.

(d) The requirement that the claimant provide documentation that they are the owner of the well; documentation that the well was constructed and operated prior to initiation of the applicant's withdrawal; the depth of the well, the pump, the screens, and any other construction information that the claimant possesses; the location of the well with enough specificity that it can be located in the field; the historic yield of the well, if available; historic water levels for the well, if available; and the reasons the claimant believes that the applicant's withdrawals have caused an adverse impact on the well. The mitigation plan extends to comparable replacement wells installed by existing groundwater users after the effective date of the permit. Existing groundwater users shall not be prejudiced by exclusion from the mitigation plan by virtue of their repair or replacement of existing wells with comparable wells.

(5) An example Mitigation Plan may be obtained from the Virginia Department of Environmental Quality.

(Ord. passed 6-23-03)

§ 53.05 OIL-WATER SEPARATION REQUIREMENTS.

(A) *General.* All new commercial or industrial facilities with the potential to discharge oil-contaminated stormwater, wash water, or other process wastewater shall be required to treat the discharge by oil-water separation technology. These facilities include, but are not limited to, automotive service shops, automotive maintenance facilities, machinery maintenance facilities, and vehicle washing facilities. Parking areas used by the customers and employees of commercial and industrial facilities shall be exempted from this requirement.

(B) *Design.* Oil-water separators must be designed to collect and treat all water that has a reasonable potential to contact oil, grease, or other petroleum products. For washing facilities, the devices(s) must be sized (at a minimum) to treat the maximum flow of wash water. If the device(s) are intended to treat stormwater, they must be sized (at a minimum) to collect and treat the peak flow that would result from a two-year, one-hour storm event.

(C) *Maintenance.* The facility operators must visually inspect the oil-water separator(s) at least monthly, and oil/solids must be removed as needed to ensure proper operation. All oil-water separators must be inspected for system integrity at least annually by qualified individuals, and records of the inspections must be maintained at the facility for a minimum of three years and provided to the Zoning Administrator if requested. All oil removed from the devices must be recycled or otherwise disposed of according to the requirements of the Resource Conservation and Recovery Act (RCRA).

(D) *Exception.* The requirements of this section may be waived for car washing facilities that operate under a General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Car Wash Facilities. In order to be granted an exception, the owner or operator must provide a written request for exception to the Northampton County Zoning Department, as well as a copy of their general VPDES permit. Other exception requests may be made by applying for a variance in accordance with § 53.04. Such variance application shall be accompanied by a technical justification prepared by a civil engineer.

(Ord. passed 6-23-03)