New Kent COUNTY VIRGINIA

C. Michael Lang, PG
Assistant Director of Public Utilities
7051 Poindexter Road
New Kent, VA 23124
Phone 804-966-9678
Fax 804-966-7135

May 31, 2019

Ms. C. Erinn Tisdale
Commonwealth of Virginia
Department of Environmental Quality
PO Box 1105
Richmond, Virginia 23218

Ref: Proposed Central Water System
REVISION - Ground Water Withdrawal Application Renewal
DEQ Permit #GW0006700

Ms. Tisdale:

As you are aware, the County has recently received a request to provide water to Charles City County for the existing Roxbury Industrial Park and the proposed Chickahominy Power site. The most practical source for this water is the Farms of New Kent Water System (soon to be Central Water System). The proposed addition of these uses to the pending renewal withdrawal amount is still less than the currently permitted amount. Our consultant has confirmed that the requested withdrawal amount meets the technical criteria for permit issuance.

Attached you will find the following revisions to the County's pending Groundwater Withdrawal Application renewal:

- Revised & signed complete application (for replacement)
- Revised Narrative of Items not Answered on the Application Form (for replacement)
- Revised Figures 1 & 3 (for replacement)
- Chickahominy Power Water Conservation & Management Plan (for addition to APPENDIX B)
- Revised APPENDIX D-Line Drawing of Water Flow (for replacement)
- New APPENDIX E-Charles City County Route 106 Corridor Master Plan Excerpts (for addition)

Please do not hesitate to contact me if you have any questions or concerns regarding this withdrawal permit application revision.

Sincerely,
Department of Public Utilities, New Kent County

CML

C. Michael Lang, PG
Assistant Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
APPLICATION FOR A GROUNDWATER WITHDRAWAL PERMIT

1. APPLICANT INFORMATION: FIN 54-6001445

Owner: New Kent County Department of Public Utilities Phone: 804 966 9625

Owner Address: 7051 Poindexter Road, New Kent, VA 23124
(Street, City, State, Zip Code)

Email: cmlang@newkent-va.us

2. FACILITY INFORMATION:

Facility/System Name: Central Water System (formerly Farms of New Kent)

Facility Address: 7347 Vineyards Pkwy & 7650 Olivet Church Road New Kent, VA 23124
(Street, Road, or Route location, City, State, Zip Code)

Contact Name: C. Michael Lang, PG Title: Asst. Director DPU Phone: 804 966 9625

Email: cmlang@newkent-va.us

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

3. PREAPPLICATION MEETING DATE: May 17, 2018

4. TYPE OF APPLICATION:

- ☐ Existing withdrawal, not previously permitted
- ☐ New or expanded withdrawal
- ☐ Modification of permit Number _____
- ☑ Reapplication for existing permit Number GW0006700 with modification
- ☐ Reapplication for existing permit Number _____ without modification

For Reapplications:

Existing withdrawal permit amount 239,850,000 gallons per year (Day, Month, Year)

Date of expiration of existing Groundwater Withdrawal Permit June 1, 2019

5. REQUESTED WITHDRAWAL AMOUNT:

231,580,000 Maximum gallons per year,
43,420,000 Maximum gallons per month
2,351,800,000 Maximum gallons per 10 year permit term*

(*For seasonal or occasional withdrawal applications such as irrigation or drought relief)

6. TYPE OF USE:

- ☑ Public Water Supply – Municipal
- ☐ Public Water Supply – Non Municipal
- ☐ Non Public Water Supply Potable Use
- ☐ Industrial
- ☑ Commercial
- ☐ Agriculture (Irrigation, Livestock)
- ☐ Supplemental Drought Relief
- ☐ Surface Water and Groundwater Conjunctive Use

Does the requested volume include a portion for irrigation? Yes ☑ No ☐

7. FEE SUBMITTED: $ 9000.00 **DATE** 8/22/2018 ☐ Agricultural Application – No Fee

OFFICE USE ONLY

Date Application Received _____ Application No. _____

Date Fee Received _____ Amount _____ Date LGOF Received _____

8. JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED:

Description of beneficial use:

a. Describe the nature of the activity and the proposed beneficial use of groundwater.

b. Include an overview of system design and operation and a description of the product produced or the service provided.

c. If the request is for a public water supply include an estimation of the percentage of the withdrawal for human consumptive use as defined in the application instructions. Additionally, attach a complete copy of the Virginia Department of Health Water Works Operation Permit and Engineering Description Sheets or equivalent.

d. If the system contains conjunctive use (combination of surface water and groundwater sources), describe the system components and identify the apportionment between surface water and groundwater contributions

Documentation of beneficial use:

Attach documentation demonstrating that the annual, monthly, and permit term amount of groundwater volume requested is the smallest amount of volume necessary to support the proposed beneficial use and that the amount is representative to support similar uses when adequate conservation measures are employed.

Water demand projections:

a. Include documentation to support the intended beneficial use over a ten year permit cycle such as population and water demand projections and expansion plans.

b. Describe special treatment (i.e. RO, EDR) when proposed.

c. Include descriptive text and all calculations showing how the total amount of water required to produce a product or provide a service was determined.

d. Include specific requirements for each category of applicant: Public Water Supply, Agricultural, Commercial, and Industrial are described in the accompanying Application Instructions.

Line Drawing:

a. Attach a line drawing showing the water flow through the facility/system.

b. Indicate wells, meter locations, sources of surface intake, and treatment, or other operations generating wastewater.

c. Construct a water balance on the line drawing by showing average flows between intakes, treatment units and discharge points.

This portion of the application submittal may be waived at the pre-application meeting if there are no planned modifications to the system including new wells and a satisfactory drawing is on file with the Department. Check the box below if this information was waived at the pre-application meeting.

☐ Requirement for a line drawing of the system waived.

Apportionment of withdrawal to individual wells:

a. Attach an operational pumping schedule for applications with multiple wells.

b. Indicate whether the withdrawal from each well is daily, seasonal or intermittent.

c. Describe the frequency of use and pumping volume for each well for each month in a calendar year.

This portion of the application submittal may be waived at the pre-application meeting if there are no planned modifications to the system including new wells and satisfactory apportionment information is on file with the Department or if the wells are operated equally. Check the box below if this information was waived at the pre-application meeting.

☐ Requirement for apportionment of withdrawal to individual wells waived.

9. ALTERNATIVES ANALYSIS

Attach an analysis as described in the accompanying Application Instructions that evaluates alternative sources of water supply and the availability and use of lower qualities of groundwater that can still be put to beneficial use.

10. WATER CONSERVATION AND MANAGEMENT PLAN:

Provide, as a stand-alone attachment, a Water Conservation and Management Plan which is an operational plan prepared as described in the accompanying Application Instructions that will be referenced and implemented by the permittee. The plan should be consistent with local and regional water supply plans in the applicant's geographic area developed as required by 9VAC25-780.

11. WASTEWATER TREATMENT AND DISPOSAL:

Will wastewater be generated as a result of the withdrawal of groundwater?
☑ YES ☐ NO *(If yes, check the appropriate box below.)*

☐ Septic Tank and Drainfield

☐ Land Application

☑ Public Sewer Parham Landing WWTP & Roxbury Industrial WWTP
(Name of system)

☐ State Waters _____
(Name of water body)

Permit # _____

☐ Application for a discharge permit from the Department of Environmental Quality has been submitted.

12. WELL LOCATION(S):

Locate all wells (existing, proposed, abandoned, out of service), along with the facility property boundaries (note that operations on contiguous properties even if beneficial uses are different may be considered for inclusion into a single permit) and/or water supply service area associated with the application on:

a. A United States Geological Survey 7 1/2 minute topographic map or copies of such maps. This map should contain the quadrangle name, the scale of the map, and a north arrow.

b. A detailed location map for each existing and proposed well. The detailed location map must be of sufficient detail that all wells may be easily located for site inspection.

This portion of the application submittal may be waived at the pre-application meeting if there are no planned modifications to the system including new wells and satisfactory maps and drawings are on file with the Department. Check the boxes below as appropriate if this information was waived at the pre-application meeting.

☐ Requirement for United States Geological Survey map waived.

☐ Requirement for detailed location map waived.

13. EXISTING WELL INFORMATION

Complete the following existing well information table unless appropriate well construction information is on file with the Department and this portion of the application submittal was waived at the pre-application meeting. Check the box below if this information was waived at the pre-application meeting.

Additionally, for re-applications, check the box below if the pump intake depths have not changed since issuance of the previous permit. If the pump intake depth has changed, then the complete information for that well should be submitted in the following table and a revised GW-2 form will need to be submitted showing the current pump intake depth.

☐ Requirement for well construction information waived.

☐ Pump intakes have not changed since previous permit issuance.

8. EXISTING WELL INFORMATION

Complete the well information worksheet for all existing wells associated with this application. **ATTACH** 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.

Well Name	Owner well #	DEQ Well #	Depth (ft.)	Pump Capac. (gpm)	Pump Set (ft)	Well* Type	Well** Status	Screen Interval(s) (ft.)	Office Use Only		
									Latitude	Longitude	El
Colonial Downs	#2	163-168	865	820	357	P	ACT	455-475, 515-565, 590-620, 690-740, 812-822, 838-848			
Legends	#1	163-145	852	900	350	P	ACT	441-481, 544-554, 558-618, 696-726, 818-838			
Legends Monitoring Well	MW-1	163-167	831	N/A	N/A	M	ACT	441-481, 561-621, 701-721, 821-831			
Talleysville Well #1	#1	163-141	886	1200	393	E	ACT	480-505, 525-550, 620-640, 760-855			
Talleysville Well #2 (Rt 618 Well)	#2	163-183	585	1200	388	P	ACT	425-480, 482-522, 533-558			
Observation Well - Middle Potomac		163-184	512	N/A	N/A	M	ACT	430-450, 492-512			
Observation Well - Aquia		163-185	315	N/A	N/A	M	ACT	295-315			

Attach additional sheets if necessary

* Well Types: (P) Production, (M) Monitoring, (E) Emergency Standby, (R) Drought Relief, (S) Aquifer Storage & Recovery (D) Permanent Dewatering, (O) Other - Specify
** Well Status: (Act) Active, (Abn) Abandoned, (Alt) Altered From the Original Construction, (OSS) Out of Service

9. PROPOSED WELL INFORMATION

Complete the proposed well information worksheet for all proposed wells associated with this application. Contact the appropriate DEQ Regional office to obtain DEQ well identification numbers prior to the start of drilling operations. Reference the DEQ well identification number on all drilling documentation. A DEQ well identification plate must be attached to each completed well. Contact the DEQ RO at least two weeks prior to the start of drilling operations for each proposed well.

Well Name	Owner well #	Depth (ft.)	Pump Capac. (gpm)	Pump Set (ft)	Well* Type	Well** Status	Screen Interval(s) (ft.)	Office Use Only			
								DEQ Well #	Latitude	Longitude	El
Tallyesville Replacement Well	#1A	886	1200	393	P	REP	480-505, 525-550, 620-640, 760-855				

Attach additional sheets if necessary

*Well Types: (P) Production, (M) Monitoring, (T) Test, (E) Emergency Standby, (R) Drought Relief, (S) Aquifer Storage & Recovery, (D) Permanent Dewatering, (O) Other - Specify

** Well Status: (NEW) New, (REP) Replacement Well, (ALT) Altered

15. LOCAL AND AREA WIDE PLANNING REQUIREMENTS:

Include a completed Local Government Ordinance Form (LGOF from the local governing body of the county, city or town in which the withdrawal is to occur, indicating that the location and operation of the withdrawing facility is in compliance with all ordinances adopted pursuant to Chapter 22 (§ 15.2-2200 et seq.) of Title 15.2 of the code of Virginia.

If the LGOF is not enclosed, include documentation demonstrating that the county, city or town failed to respond within 45 days to such a request made by the applicant by certified mail, return receipt requested. 9VAC25-610-94(2)(i)

16. MITIGATION PLAN:

Pursuant to 9VAC25-610-110(D)(3)(g) of the Groundwater Withdrawal Regulations, if the DEQ's technical evaluation determines the predicted area of impact extends beyond the property owned by the applicant and/or other groundwater users exist within the area of impact, a mitigation plan is required. Since the area of impact most often extends beyond the applicants property, it is recommended that a mitigation plan be submitted at the time of application to reduce application processing time. In the event that the results of the technical evaluation show that the area of impact remains on the applicant's property or there are no groundwater users within the area of impact, DEQ staff will inform the applicant that a mitigation plan is not required. A model mitigation plan is available from the Department.

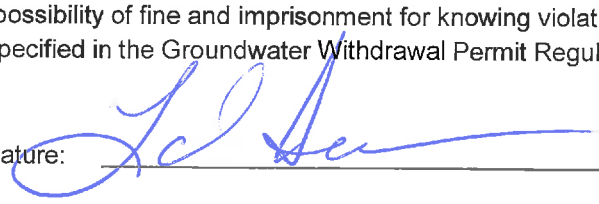
17. ADDITIONAL INFORMATION REQUIRED BY THE BOARD

Refer to the Preapplication Meeting Form and ensure that any additional information requested at the meeting is included in the application. If requested information is not complete when the application is submitted, include a time frame for completion of the required activities. Check the box below if additional information was not requested at the pre-application meeting.

☐ Additional information not requested at pre-application meeting.

18. CERTIFICATION AND SIGNATURE

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 Groundwater Withdrawal Permit Regulation 9VAC25-610-10 *et seq.*

Signature: 

Date: May 31, 2019

Printed Name: Lawrence A. Dame

Title: Director, New Kent Public Utilities

Phone: 804 966 9678

GROUNDWATER WITHDRAWAL PERMIT APPLICATION
CENTRAL WATER SYSTEM
(formerly Farms of New Kent Water System)
NEW KENT COUNTY
DEPARMENT OF PUBLIC UTILITIES
***Revised* November 2018**
***Revised* May 2019**

Narrative of Items Not Answered on the Permit Application Form

ITEM 8: JUSTIFICATION FOR THE AMOUNT OF WITHDRAWAL REQUESTED

Description of Beneficial Use

The Proposed Central Water System will combine the existing Farms of New Kent & Colonial Downs Water Systems. This will become the backbone of a unified water distribution system to connect the majority of New Kent DPU's water customers. In the near term, the Central System will rely upon select existing wells for water supply. Ultimately, this will become the distribution system for an alternate water supply other than, or in conjunction with, groundwater.

Figure 1 shows the proposed service area on a 7.5-minute USGS Quadrangle with well locations. Figures 2A-2D show detailed well location maps.

Three wells will withdraw potable groundwater from the Potomac Aquifer exclusively for public water supply under revised VDH Operational Permit #4127190 (currently Farms of New Kent Water System). When interconnected, water will be supplied primarily from two wells, Talleysville #1A (replacement well – currently under construction) & Talleysville #2. A third well, the Colonial Downs Well, will provide backup supply and pressure as needed. All three wells are equipped with high capacity submersible pumps, producing flows of approximately 800-1200 gpm, depending on head conditions. All three wells have intake screen, grout & pump setting depths to withdraw water exclusively from the Potomac Aquifer, without impact to the overlying aquifers. The Central Water System will supply the existing Farms of New Kent & Colonial Downs Planned Unit Developments (PUDs), as well as the existing subdivisions of Greenwood Estates, Kenwood Farms, Rochambeau Estates, Deerlake, and Quinton Estates. The water system will also serve VDOT I-64 Safety Rest Areas, Watkins Elementary School, commercial customers (existing & proposed) businesses at the I-64 Exit 211 interchange, and businesses at the Route 249/Route 612 roundabout.

Recently, a request has been received to provide water to the Route 106 Industrial Corridor (including the Chickahominy Power Project) in Charles City County.

Because no additional storage will be added at this time (in fact storage tanks at Colonial Downs will be demolished), the Central Water System will be limited by the storage capacity of the Farms of New Kent elevated storage tank to the current VDH permitted withdrawal of 1.976 MGD. Copies of the VDH Waterworks Construction Permits are included as Appendix A.

The current permitted withdrawal for these water systems combined is 407.36 MGY, with approximately 85% allocated for human consumptive use in the form of cooking, bathing, drinking and sanitation. The balance is for landscape irrigation, primarily residential. Industrial zoning is included within the service area at the I-64 Exit 211 interchange. However, currently there are no manufacturing or water consuming processes in use. There is one car wash in the Colonial Downs service area which reportedly recycles their wash water.

For the upcoming permit period (2020-2035), the total requested withdrawal is 231.58 MGY (0.63 mgd), of which approximately 74% is for human consumptive use. The peak monthly withdrawal has been estimated at 43.42 MG (avg. month*2.25) or 1.45 MGD. A higher than normal multiplier has been applied for summer use, due to:

- Residential & commercial irrigation needs,
- Increased tourism-based use at businesses at two I-64 interchanges, and the I-64 Safety Rest Areas,
- Additional summer time cooling needs at the proposed Chickahominy Power project, and
- Increased use at public & private swimming pools, as well as golf course clubhouses.

Documentation of Beneficial Use

The requested amount is reflective of the documented historical use for several categorized user groups and is consistent with previously permitted amounts & permitted amounts for similar uses. All reasonable water conservation measures are being employed to minimize water use from the potable aquifer, and to minimize non-essential uses and water waste in general. Up to 50 MGY (approximately) of bulk irrigation needs for two golf courses & the Colonial Downs Racetrack have been replaced with reclaimed water from the Parham Landing WWTP.

Existing Water Conservation Measures & Drought Response Plan

In 2010 the County Board of Supervisors adopted the *New Kent County Water Supply Plan*, which includes the County's *Water Conservation & Management Plan*. The plan outlines many water-conserving practices & procedures which the County has employed, including the following within the Farms of New Kent & Colonial Downs Service Areas specifically:

- Replaced 100% of the commercial irrigation (golf courses, racetrack) need with reclaimed water.
- Low flow fixtures in accordance USBC have been installed in all new and renovated construction.
- Rate study to review existing minimum use charges, as well irrigation water rates, in an effort to promote water conservation.
- Review of individual irrigation systems for rain sensors and low-flow design.
- Reduced the water storage tank washout cycle from every other year to every 3rd year, and employed in-service ROV inspections instead of manual inspections, reducing the need for tank draining by 67%.

The *Water Conservation & Management Plan* includes the County's *Drought Response & Contingency Plan*. This plan provides parameters for drought declaration & implementation of tiered emergency use restrictions. These measures will be employed based on one of the following:

- A precipitation deficit corresponding to the drought Watch, Warning, or Emergency stage, as identified by the Virginia State Climatology Office,
- a declaration of water emergency by the Executive Director of the Department of Environmental Quality,
- Mutual agreement between the New Kent County Board of Supervisors and the Department of Public Utilities that a drought declaration is warranted.

A copy of New Kent County's Water Conservation & Management Plan is included as Appendix B. Revisions to the plan will be considered for the County's upcoming *Water Supply Plan Update.*

Chickahominy Power has provided their own Water Conservation & Management Plan developed for the proposed facility. A copy is also included in Appendix B.

Projected Water Demands

The demand projections are based in part on the existing use categories presented in original GWWP application for this project. With 10+ years of historical use data to rely upon, and utilizing population growth projections from the Weldon Cooper Center at the University of Virginia's July 2017 estimates (http://demographics.coopercenter.org/population-data-all/), as well as the County's 2010 *Water Supply Plan,* these demand projections represent a realistic outlook of the future growth for the Central Water System. The table below outlines New Kent County's population growth projections.

Population Projections for New Kent County

Year	2010	2017	2020	2025	2030	2035	2040	2045
Population	18,429*	21,709†	22,465	24,706	26,946	28,995	30,964	32,973
Pop. Increase from 2017	--	--	756	2,997	5,237	7,286	9,255	11,264
% increase over 2017	--	--	3.5%	13.8%	24.1%	33.6%	42.6%	51.9%

* 2010 actual US Census population
† New Kent County July 2017 estimate
Source: UVa Weldon Cooper Center for Public Service – Demographics Research Group

The County's *Water Supply Plan* predicted the annual need for the former water systems that will comprise the Central Water System at 370.631 MGY for calendar year 2017. This was not realized for a number of reasons, including:

- Slower buildout than predicted in the approved FONK, Brickshire & Greenwood IV subdivisions due to economic factors
- The use of reclaimed water to completely satisfy commercial irrigation needs
- Improved water efficiency at the VDOT Safety Rest Areas & East Coast Gateway Welcome Center

In spite of slower than predicted growth County-wide, New Kent was identified by the Weldon Cooper Center as the second fastest growing locality in Virginia since 2010, with a 17.8% increase in population.

The table below outlines the annual water need predicted in the 2010 *Water Supply Plan,* compared to the existing permitted amount.

Predicted Water Demand (mgy) – *2010 Water Supply Plan*

Water System	Existing Permitted Withdrawal	Year				
		2017	**2020**	**2030**	**2040**	**2050**
Farms of New Kent	239.850	103.021	130.229	213.514	296.590	327.987
Colonial Downs	226.400	231.026	257.093	378.486	505.744	639.387
Kenwood/Greenwood†	--	30.014	32.044	32.187	32.384	32.877
Quinton Estates†	--	6.570	6.570	6.570	6.570	6.570
Total Proposed Central Water System	466.250	370.631	425.936	630.757	841.288	1006.821

† Permits terminated following construction of the Route 249 Waterline

A copy of the water demand projections from the County's *Water Supply Plan* for these service areas are included as Appendix C.

Farms of New Kent (FONK)

The FONK Planned Unit Development is currently permitted for 239.85 MGY. Water use has been well documented in the original withdrawal application and subsequent *Annual Water Use Reports* to DEQ. A total of 2,360 residential units was approved in the original PUD agreement. In 2017, a PUD amendment was approved allowing 200 additional units. Existing residential neighborhoods include Viniterra (Landbay I), The Arbors (Landbay IV) and Four Seasons (Landbay V), representing a diverse range of pricing & demographics.

Though initially slow to develop due to economic factors, recent years have seen a significant rise in residential building permits, to the point where the first phases of The Arbors and Four Seasons are almost built out. Development plans for Section II of The Arbors (171 lots) are under review. Most residential lots in these neighborhoods are irrigated from the potable water system.

Also included in the PUD agreement was up to 880,000 ft^2 of commercial space, including the New Kent Winery and the Viniterra Golf Course, and a clubhouse/pool for each residential section. The New Kent County Visitors Center is located within the PUD as well. Future commercial proposals include an Inn/Spa at the winery, an 8,350 ft^2 Fire Station (under contract), and unspecified retail/commercial space.

Route 106/I-64 Interchange (Exit 211 – New Kent County)

The FONK service area (but not part of the FONK PUD) includes approximately 16.5 million ft^2 of existing & proposed commercial/industrial space located south of I-64 on Route 106. Travel related services include:

- Pilot Travel Center (6,400 ft^2 connected in 2011)
- Burger King (3,000 ft^2, constructed in 2015)
    - Includes a pad site for an additional 6,250 ft^2 commercial building
- Love's Travel Stop & Country Store (21,000 ft^2 combined, constructed in 2017)
- Wilco/Hess Travel Center site plan (15,200 ft^2, approved in 2014, now owned by Speedway, LLC)
- Virginia Natural Gas Area HQ (10,000 ft^2 with outparcel, currently under expeditated review)

Also included in the service area is the Fisher Property, a 146-acre, County-owned parcel currently being marketed by the Economic Development Authority.

Roxbury Industrial Park/Route 106 Industrial Corridor/Chickahominy Power (Charles City County)

New Kent County has received a request to provide water to the Route 106 Corridor in Charles City County. This includes the Chickahominy Power project, as well as the existing Roxbury Industrial Park. Future commercial, industrial & residential growth is planned for the Route 106 Corridor and is detailed in the Route 106 Corridor Master Plan, currently being prepared by Bowman Engineers. A copy of relevant excerpts from the Route 106 Corridor Master Plan is included in Appendix E.

While situated in the Route 106/Roxbury area, the privately-funded Chickahominy Power project is being developed independently of the Route 106 Corridor. The project is a serious proposal in the final phases of design, representing an investment of approximately $1.3 billion. The project has met the regulatory requirements to begin construction. DPU entered an agreement to provide water to Chickahominy Power in May 2019. Commercial operations are expected to begin June 2022. Based on estimates provided by Chickahominy Power the industrial water need is estimated at 2.5 million gallons per month on average (30 mg/year), with a peak need of 3.5 million gallons per month. The potable water need is estimated at 26,700 gallons per month, or 0.32 mg/year. The total estimated need is for Chickahominy Power is 30.32 mg/year.

The Roxbury Industrial Park is an existing unpermitted use that has recently exceeded GWWP permitting thresholds several months out of the year. In conjunction with Chickahominy Power, Charles City County has requested to operate a "consecutive water system" to supply the existing Roxbury Industrial Park, and provide for some modest expansion. Since the Route 106 Corridor Master Plan has yet to be completed, the request is to provide for the 2017 annual use in the existing Roxbury Industrial Park (3.68 mg/year).

Additional future water need has been identified for residential development (52.56 mg/year) & expansion of the commercial/industrial sector (4.82 mg/year). Since these projects are currently in the planning phase, and no definitive funding or water supply has been identified at this time, they are not included in the requested withdrawal for the permit timeframe.

Self-Supplied Users

Several existing businesses/industries are technically situated within the current service area; however, public utilities are not available yet to those sites. All self-supplied users in this area utilize only domestic water, none use water for manufacturing or processing. The sum of self-supplied users within the existing/proposed service area is estimated not to exceed 2000 GPD.

Kenwood/Greenwood

The former Kenwood/Greenwood Water System was permitted for a withdrawal of 26.31 MGY prior to its interconnection to the FONK water system in 2015. This interconnection was performed as an operational, maintenance & management cost savings measure for DPU, with the added benefit of reducing permit administration costs for the Commonwealth of Virginia (DEQ & VDH). The interconnection also corrected a water supply deficit identified in the *2010 Water Supply Plan.*

This water system included up to 575 residential units within the contiguous neighborhoods of Kenwood Farms, Greenwood Estates, Deerlake & Rochambeau Estates (formerly Tunstall). Due to their price point, home sales remained strong in these subdivisions throughout the previous permit period. At this time, Kenwood Farms & Deerlake are completely built out. Greenwood Estates is in its fourth phase, with an additional 45 acres zoned for Residential use remaining. Plans for Phase 2 of Rochambeau Estates have been approved. It is highly likely that these neighborhoods will be completely built out by the end of the 15-year permit period.

A small commercial allocation was included in the *2010 Water Supply Plan*, for the parcels zoned "Business" at the Route 249/Route 612 intersection. Since that time, 24,000 ft^2 New Kent Mini-Storage & 9,100 ft^2 Dollar General have been connected to the water system. A site plan for Quinton Retail Center, an 8-acre commercial site, has already been approved and includes about 41,500 ft^2 of commercial space. All are considered small to moderate users and should not contribute substantially to the overall demand.

Quinton Estates

The former Quinton Estates Water System was permitted for 6.57 MGY prior to its interconnection to the FONK water system in 2015. This interconnection was performed as an operational, maintenance & management cost savings measure for DPU, with the added benefit of reducing permit administration costs for the Commonwealth of Virginia (DEQ & VDH). This water system provided for the 79 existing homes in Quinton Estates, which is completely built out.

Kentland PUD

The Kentland PUD is served by the Colonial Downs Water System is currently permitted for 226.40 MGY and serves the Colonial Downs Horse Racetrack, VDOT I-64 Safety Rest Areas & the Kentland Planned Unit Development. The components of the development & water use have been well documented in the original withdrawal application and subsequent *Annual Water Use Reports* to DEQ. A total of 3,200 residential units was approved in the original PUD agreement. Residential neighborhoods include Brickshire, Bel Green and Oakmont Villas, representing a diverse range of pricing & demographics. Though initially slow to develop due to economic factors, recent years have seen a significant rise in residential building permits. Multi-family & patio-style units at Bel Green & Oakmont Villas have developed rapidly, while estate sized lots in Brickshire have come on-line more slowly.

Kentland Development

All homes in the Kentland PUD utilize landscape irrigation from the potable water system. The majority have individual irrigation systems, while the initial phases of Oakmont Villas are maintenance-free, utilizing a common irrigation system. Some of the common landscaping (medians, entrance areas) in the Brickshire neighborhood is also irrigated.

Kentland Commercial

Also included in the PUD agreement was approximately 2.2 million ft^2 of commercial space, as well as the Brickshire & Royal New Kent golf courses (including clubhouse & pool for each) and the Colonial Downs Horse Racetrack.

VDOT Rest Areas

The Colonial Downs Water System also serves the Commonwealth of Virginia Department of Transportation's New Kent Safety Rest Areas & East Coast Gateway Welcome Center. These are Virginia's most visited rest areas, serving almost 3.4 million visitors in 2013 (http://www.virginiadot.org/info/resources/2013_Average_Visitors.pdf). The Westbound Safety Rest Area is a LEED-certified building & collects rainwater for toilet flushing.

Commercial irrigation of the Brickshire & Royal New Kent Golf Courses, as well as Colonial Downs Horse Racetrack, has entirely been replaced by alternate supplies, in the form of rain water & reclaimed water. These businesses utilize reclaimed water from DPU's Parham Landing WWTP for irrigation & dust control, while Royal New Kent also collects storm water from the Oakmont Villas neighborhood. These businesses formerly relied on the potable Potomac Aquifer for irrigation water either from the public water system, or on-site irrigation wells.

By-Right Development, Minor Family Subdivisions & Other/Future Residential

Various withdrawal amounts for each water system were included in the *2010 Water Supply Plan* to support unspecified future residential development which may be by-right (no

rezoning needed) or may have been approved in the years following completion of the plan. Keeping in mind that the water supply for by-right developments would be groundwater sourced anyway, DPU has allowed by-right development to connect to the public water supply at their own cost. The only connections to date are the 17-lot Crestwicke Subdivision, located along the Route 249 waterline extension. Constructed in 2016, six building permits to date have been issued for modest single-family homes. This subdivision is on course to build out well before the end of the permit period.

Two homes along the interconnecting waterline were also connected, due to poor water quality from failing shallow wells. In one case, the residence was connected at the request of the Virginia Department of Transportation, after runoff from a road construction project apparently fouled the well. DPU will continue to allow rural connections under these circumstances.

Several proposed by-right developments have inquired about the feasibility of connecting to the water system more recently. Ware Estates has submitted a preliminary plan & performed hydraulic modeling for an 88-lot development along Airport Rd, near Quinton Estates. Mr. Dan Skelton has met with County departments regarding 27 large lots along Pine Fork Road and has commented that the adjacent property can accommodate a 48-lot subdivision.

When constructed, the Route 618 Waterline will connect Talleysville Well #2 (on Route 618) to the FONK water system at the rest areas, via 16-inch waterline along Routes 618 & 617, creating a single water system. One 37-acre parcel zoned for Economic Development along this route is currently listed for sale.

Based on this information, the by-right estimates included in the *2010 Water Supply Plan* need adjustment based on the opportunities presented by the water system interconnections.

By-right development density varies based on the ratio of developable area versus Resource Protection Area (RPA) on the parcel, however, the maximum allowable ratio is one residence per 1.5 acres, and most large properties remaining in New Kent are approximately one-third to one-half RPA. Therefore, a reasonable estimate of by-right housing density is one residence per 2.5 acres.

The table below outlines know by-right development with potential to connect to the Central Water System.

By-right Development (existing & potential) – Proposed Central Water System						
Parcel	**TM#**	**Connection by**	**Acres**	**Number of potential lots**	**Average lot size (acres)**	**Status**
Crestwicke	21-45 (now divided)	Tap Rt. 249 waterline	30.21	17 (actual)	1.8	Constructed
Ware Estates	20-8-8	Upgrade & Extend Airport Rd waterline	171.55	88 (proposed)	1.9	In design
Skelton	21-74	Upgrade line through Quinton Estates	85.2	27 (calculated)	3.2	Proposed
Artzberger/Bisczat (Starr proposal)	21-76 21-77 21-79 21-80 21-81	Upgrade line through Quinton Estates (with Skelton)	125.7	50 (estimated)	2.5	Discussed
Adams	**22-8**	Tap Rt 618 waterline	37.23	15 (estimated)	2.5	Discussed as part of easement negotiations
		TOTALS	449.89	197		

Central Water System - Future Water Need

Future water needs for the proposed Central Water System include the continued buildout of the previously approved PUDs (Kentland & Farms of New Kent), approved subdivisions, (Greenwood Estates, Rochambeau Estates & Crestwicke), and potential by-right development. While it is difficult to predict exactly where the residential construction will occur, the consolidation of these neighborhoods represents the bulk of potential new housing inventory within the County, as well as the full variety of housing options available from multi-family family attached (townhomes), affordable small lot patio homes, mid-level single family homes and large lot estate homes.

Due to fluctuating inventory, and non-linear development of new subdivisions in each of these PUDs, it is difficult to say which subdivisions will build out and at what rate. However, it is assumed that these subdivisions compete among themselves for buyers, and growth in water demand overall will generally follow the population growth of the County.

For the upcoming permit term, the residential water use categories have been consolidated across all developments. While water use varies per development and price point within the housing market, the consolidated water system will have a full spectrum of housing options,

and affordable (lower water use) housing will outnumber estate-style, high end homes. The 2017 average of 132 gpd reflects many homes currently under construction, or in their first year of occupancy. A reasonable average of 175 gpd/unit for residential housing (not including irrigation) is being requested. 175 gpd/unit allows for full occupancy and is lower than per unit withdrawals approved in the previous permits, as well as other permits within New Kent County and similar developments within the Groundwater Management Area.

DPU is requesting the previously permitted 150 gpd/unit, for 120 days/year (expressed as 50 gpd, year-round), for residential irrigation. This request is limited to the developments of the FONK & Colonial Downs PUDs, where sewer service is currently provided (and therefore irrigation rates can be tracked via irrigation meters). Within those neighborhoods, irrigation meters are installed on most, but not necessarily all services.

By the end of the permit term, it is anticipated that the by-right developments of Crestwicke & Ware Estates Subdivisions will be built-out, for a total of 109 homes, at an average daily use of 165 gpd/connection. Other by-right developments may be included however, the total number of connections is still estimated at 109.

In spring of 2019, a complete renovated Colonial Downs Racetrack will re-open as a 24 hour/365 day per year operation. An average of 3,000 visitors per day are anticipated. With casino-style betting machines, plus live horse racing events & three restaurants, the inside water demand for food & beverage services, restrooms and cleaning is expected to increase significantly from the historic use. If additional events are added to the racing calendar, then demand at the horse paddocks & jockey locker rooms should likewise be expected to increase. Without comparable historical data to rely upon, the water use is estimated at 15 gpd/visitor (to include all needs: landscape/entrance area irrigation, cleaning, restroom use, racetrack operations & food/beverage service), for a total of 16.43 MGY.

The new racetrack owners' intent is to become an East Coast tourist attraction, complete with accommodations for overnight stays, to include on-site hotels & restaurants. Currently, their focus is on getting the track renovated & re-opened, however, these amenities could easily come to reality within a 5-year timeframe. This potential use will be included in the Kentland commercial water use request.

Other pending commercial/industrial development includes:

- 8,350 ft^2 fire station in Landbay V of the Farms of New Kent PUD. As with the fire station included in the recent Courthouse Water System permit application, water use is estimated at 0.2 gpd/ ft^2, to account for full time staffing (including kitchen, bunks & showers), apparatus maintenance & tanker filling.
- 4,000 ft^2 clubhouse for the Viniterra Golf Course is currently under construction. Since a temporary clubhouse is already operating for Viniterra, only a modest increase in water use is to be expected, however, it is a good indication that the golf course & surrounding community are expanding.

- 15,000 ft^2 Speedway (formerly Wilco/Hess) truck stop/travel center at the I-64 Exit 211 Interchange. The site plan & Conditional Use Permit have been approved, and road plans for a new entrance have been submitted.
- 30,300 ft^2 Quinton Retail Center (proposed as a grocery store), has been approved at the Rt 249/Rt 612 intersection, with an on-site 60,000-gallon water storage tank for fire protection. An additional 11,200 ft^2 pad site will be constructed for future retail/commercial use.
- Pool/clubhouse for Landbay IV (the Arbors) will be required once certain building permit totals are triggered.
- Abandonment of the Legends Well, and conversion of the raw water line to provide finished water, will allow connection of the Royal New Kent Golf Course Pool & Clubhouse, an existing groundwater use that was estimated at 1.0 mg/year in the previous GWWP application.

Projected Water Demand – Charles City Co. Consecutive System - Central Water System, New Kent County DPU (in million gallons)

Use Category	permitted annual use	permitted daily average (gals)	Actual Use 2017-2018				projected demand					Withdrawal Request (based on year 2035)
			annual		Daily (gals)							
			average	maximum	average	maximum average	2020	2030	2035	2040	buildout	
Chickahominy Power	--	--	--	--	--	--	--	30.32	30.32	30.32	30.32	30.32
Roxbury Industrial/ Route 106 Corridor	3.60	0.01	3.42	3.68	3.68+	3.68+	3.68	3.68+	3.68+	3.68+	60.79	3.68
TOTAL CHARLES CITY CO. DEMAND (MG)	**3.6**		**3.68**				**3.68**	**34.00+**	**34.00+**	**34.00+**	**100.11**	**34.00**

Projected Water Demand – SUMMARY - Central Water System, New Kent County DPU
(in million gallons)

	Existing Use (2009-2017 data)	projected demand					Withdrawal Request (based on year 2035)
		2020	2030	2035	2040	buildout	
Population-based Water Demands	107.27	110.98	133.05	143.25	152.25	504.64+	172.15
Static Water Demands	13.24	25.43	25.43	25.43	26.43	26.43	25.43
Charles City County (Consecutive System) Water Demands	3.68	3.68	34.00+	34.00+	34.00+	100.11	34.00
Total Projected Water Demand	124.19	140.09	192.30+	202.50+	212.50+	631.18+	**231.58**

Demand Summary

Based on the existing and projected uses outlined on the previous pages as well as the demands calculated from 2017 actual use, the water demand summary for the Central Water System is summarized in the following tables:

Projected Water Demand – Population-Based - Central Water System, New Kent County DPU (in million gallons)

Use Category	Unit of measure	2009-2019 permitted use			2017 actual use			projected demand (based on 2017 use)										Withdrawal Request Population-based Subtotal (based on year 2035)		
								population increase*	3.50%		24.10%		33.60%		42.60%		buildout				
								YEAR	2020		2030		2035		2040						
									estimated withdrawal permit period												
		permitted annual use	total units	avg gpd per unit	Total use	total units	avg gpd per unit	total units	water need	total units	water need	total units	water need	total units	water need	total units	water need	total units	water need	total units	avg gpd per unit	water need
Approved Residential	per lot	310.95	4629	184	66.16	1503	121	1556	68.48	1865	82.10	2008	88.39	2143	94.34	6414	283.27	2008	175	128.26
Residential irrigation	per lot	58.30	3689	132	29.81	875	93	906	30.85	1086	36.99	1169	39.83	1248	42.51	5760	195.52	1169	50	21.33
Commercial/Non-residential	ft^2	19.68	1,500,000	0.04	10.46	278,000	0.015	287,730	10.83	344,998	12.98	371,408	13.97	396,428	14.92	500,000+	18.25+	400,000	0.10	14.60
By-right/rural residences	per lot	--			0.06	4	0.00	4	0.06	5	0.07	5	0.08	6	0.09	109	6.56	109	175	6.96
Watkins Elementary	--	0.93	--	2548	0.73	--	2000	--	0.76	--	0.91	--	0.98	--	1.04	107	1.04	--	2739	1.00
TOTAL POPULATION-BASED DEMAND (MGY)		**389.86**			**107.27**			**110.98**		**133.05**		**143.25**		**152.25**		**504.64+**		**172.15**		

* population estimates based on Weldon Cooper Center data – July 2017

Projected Water Demand – Static - Central Water System, New Kent County DPU (in million gallons)

Use Category	permitted annual use	permitted daily average (gals)	Actual Use 2009-2017				projected demand					Withdrawal Request Static Demand Subtotal (based on year 2035)
			annual		Daily (gals)							
			average	maximum	average	maximum average	2020	2030	2035	2040	buildout	
Brickshire entrance irrigation	3.00	8219	1.76	2.50	4822	6849	3.00	3.00	3.00	3.00	3.00	3.00
VDOT Rest Areas	6.00	16,438	4.03	6.05	11,041	16,575	6.00	6.00	6.00	7.00	7.00	6.00
Colonial Downs Racetrack	8.50	23,288	7.45	14.09	20,411	38,603	16.43	16.43	16.43	16.43	16.43	16.43
TOTAL STATIC DEMAND (MGY)	**17.50**		**13.24**				**25.43**	**25.43**	**25.43**	**26.43**	**26.43**	**25.43**

Line Drawing
A Line Drawing of the water process flow is attached in Appendix D.

Apportionment of Withdrawal to Individual Wells
Following the replacement of the Talleysville Well, the backup restrictions will be lifted from the Talleysville #1 water pumping station, and the system will operate in a normal alternating mode between the Talleysville wells. The Colonial Downs Well, being of lesser drinking water quality, will only operate when low pressure is sensed in the Colonial Downs vicinity (ie: high demand, fire flow, line break, etc). Otherwise, the Colonial Downs Well will be run manually once per week for approximately 30 minutes (at 800 GPM) to ensure proper operation. Therefore, under normal operations the calculation of flow apportionment to each well is as follows:

Colonial Downs Well (intermittent)	800 gpm*30 min/week * 52 weeks = 1.25 MGY
Talleysville Well #1A (daily)	50% of remainder = 115.17 MGY
Talleysville Well #2 (daily)	50% of remainder = 115.17 MGY

ITEM 9: ALTERNATIVES ANALYSIS

New Kent County has been aggressively pursuing alternative water supplies for several years. Currently New Kent Public Utilities relies exclusively on groundwater to provide potable water to end users at all of its water systems, including each of the water systems referenced above. Other than sodium hypochlorite injection for disinfection, there is no water treatment necessary for the potable groundwater supply. The existing withdrawals are from the Potomac Aquifer, which is generally regarded as being the most suitable for potable water uses because of its high capacity and because the water meets EPA Primary Maximum Contaminant Levels without treatment. In the case of the Colonial Downs Water System, fluoride levels exceed the Secondary Maximum Contaminant Level for which public notification is required. The interconnection of the Farms of New Kent & Colonial Downs water systems (to form the Central Water System) will remedy this situation. Regardless, the Potomac Aquifer is the most readily accessible source to meet the minimum quantity & quality of water acceptable for use as a potable water supply.

For the upcoming permit term, no withdrawal is being requested to provide for irrigation of the Viniterra Golf Course, Royal New Kent Golf Course, Brickshire Golf Course, nor Colonial Downs Racetrack.

Reclaimed Water
In 2011, the County constructed the Parham Landing Reclaimed Water System to provide high-quality reclaimed water from the Parham Landing WWTP for reuse at Brickshire Golf Course, Royal New Kent Golf Course & Colonial Downs Racetrack. In 2017, DPU added a fourth customer, the WestRock Log Storage Wet Yard, adjacent to the WWTP.

Reclaimed water used within the Colonial Downs service area has replaced potable groundwater uses that historically had exceeded 50 MGY total. The cost of reclaimed water (where potable groundwater was historically free), has allowed the end users to reconsider their irrigation needs, and subsequently rely on less water in general for irrigation.

Reclaimed water is a potential alternate supply for the existing irrigation uses at Oakmont Villas & Brickshire common areas (medians & entrance signs). At this time reclaimed water is most likely cost prohibitive due to the relatively small demand compared to the infrastructure needed. Existing ponds could likely be used; however, upgraded pumping facilities, NPDES & environmental permitting, revisions to the County's *Reclaimed Water Management Plan*, etc. would be required. It would also require the construction of interconnecting piping & disconnection from the potable supply. Finally, as a seasonal operation, the reclaimed system would have to be flushed twice annually with potable water (approximately 50,000 gallons), per the County's *Reclaimed Water Management Plan.*

Reclaimed water would be an ideal alternative for the Chickahominy Power project, however, DPU currently does not produce enough reclaimed water to supply this additional demand. Reclaimed water infrastructure does not extend to the Talleysville area at this time. Finally, reclaimed water is not suitable for the potable needs of the Chickahominy Power project nor the Route 106 Corridor.

Currently, DPU has contract agreements for all the reclaimed water it produces from the Parham Landing WWTP. With more sewer users joining the system every day, the volume of reclaimed water available is expected to increase in the future, by roughly the same percentage as water demands outlined above.

DPU will continue to explore all potential & practical uses of reclaimed water, with a goal of maintaining a zero-discharge wastewater treatment operation year-round, while minimizing the withdrawal from the potable aquifers.

Rainwater Collection

Rainwater is continually collected in the storage ponds at the Royal New Kent Golf Course, Brickshire Golf Course, Viniterra Golf Course & Colonial Downs Racetrack. The entire Viniterra Golf Course is graded & plumbed to direct as much storm water to the storage pond as feasible. Storm water from the Oakmont Villas neighborhood is also captured & piped to the Royal New Kent Golf Course storage pond, thereby reducing their need for potable or reclaimed water purchase from DPU. Similarly, the West Rock Log Yard collects rainwater directly, as well as site runoff (reclaimed & stormwater) in their storage pond.

Rainwater is also collected from the rooftops of the I-64 Westbound Safety Rest Area for toilet flushing. A significant drop (approximately 25%) in water use at the rest areas was realized when this system was brought on-line in 2010.

Surface Water

In the absence of reclaimed or potable water, surface water is provided to the Viniterra Golf Course for irrigation from Crump's Mill Pond under a private agreement with the owner.

Two drinking water reservoirs exist in New Kent County, however that water is supplied to Newport News & the Peninsula. Under the King William Reservoir Project, New Kent would have received up to one MGD raw water, with an option to purchase more, however that project was abandoned prior to construction.

Construction of an additional reservoir in New Kent County is problematic, mainly due to concerns over wetlands impacts. For "off-stream" reservoirs, access to ample supply of fresh water from the Pamunkey or Chickahominy Rivers is also difficult, due to tidal influence & existing users.

The County has invested heavily in researching alternate surface water supplies, including withdrawals from gravel pits near Providence Forge and a Pamunkey River withdrawal near Northbury Farm, the furthest point upstream that is within the New Kent boundary. DPU has conducted extensive environmental & historical resource reviews and landowner outreach and is currently awaiting permitting from the Army Corps of Engineers to allow an average withdrawal of up to 3.00 MGD (5.26 MGD peak) from the Pamunkey River at the Northbury Farm location. Raw river water will be delivered to a centrally located water treatment plant for distribution to the County's largest water systems. Based on the County's 2010 *Water Supply* Plan, this is expected to satisfy DPU's needs for the next 50 years.

With the permit in hand, the County plans to begin a water quality study, easement & land acquisition and treatment plant design. Design and construction of the initial 2 MGD surface water pumping station, transmission pipeline and treatment plant are expected to range up to $40 million and take several years to accomplish. As additional users or existing water system come on-line, upgrades in pumping & treatment capacity would be required. Certain high capacity wells would be maintained by the County to provide for emergencies (poor surface water quality, drought, maintenance/repair, species protection, etc.), and certain outlying small groundwater systems (Whitehouse Farms, Sherwood Estates, the Colonies) will likely not be connected in the foreseeable future. At this point, the County would become a conjunctive water user. This would allow the County to maintain control of its own supply and associated operating/capital costs and deliver water of a younger age (and therefore higher quality) to the end users. It also allows the County to maintain its groundwater assets and derive the maximum long-term value from those investments.

By-Right Development

By allowing by-right developments to connect to the public water system, these water demands can be supplied by an alternate source in the future, instead of relying on groundwater in perpetuity. Since they are added at the sole cost of the developer, connection & availability fees from these users will help fund the capital investments needed to provide the alternate supply.

Regionalization

New Kent County has conducted serious discussions with Newport News Waterworks, City of Richmond and Henrico County regarding the purchase of finished water from outside the County's boundaries. Costs for these projects range up to $40 million in design, construction and capital improvements to provide up to 2 MGD. Unit rates for water provided would be additional. Degradation of water quality is a major concern, due to water age by the time it would reach New Kent County, and ultimately the end user. Each supplier also requires a complicated agreement, including long-term contracts, compulsory investment in current and future capital upgrades, mandatory minimum service fees plus per-unit user rates. Finally, the County would cede control of its water supply to an outside entity. For these reasons, regionalization projects were deemed not to be in the best interest of New Kent County.

By providing water to Chickahominy Power and Charles City County's Route 106 Corridor, DPU will be providing these groundwater users the potential future opportunity to be supplied by an alternate supply (surface water), if the Pamunkey River Withdrawal project becomes a reality

County Interconnections

Regardless of the source, New Kent's 11 existing decentralized ground water systems represent a challenge in providing an alternate water supply. In order to efficiently get water to the end users, the County must interconnect its largest water systems into a single central system. To date New Kent has made substantial investments in this effort by:

- Hydraulically modeling all of its water systems to identify pressure zones and preferred treatment plant location, prioritizing interconnection projects by costs & benefits (2017)
- Design & construction of the Courthouse Water System, consolidating the formerly unpermitted Courthouse, Primary School, Middle School & High School public water systems (2008)
- Design & construction of the Bottoms Bridge Water System, consolidating the former Five Lakes water systems with the unpermitted Marketplace, Bi-County, New Kent Crossing & Brianwood water systems, as well as several private commercial well supplies (2007)
- Design & construction of the Rt. 249 Waterline, interconnecting the Farms of New Kent, Kenwood/Greenwood & Quinton Estates water systems (2015)
- Design of the Rt. 618 Waterline, interconnecting Farms of New Kent and Colonial Downs (in progress)

As outlined in the table on the following page, the total projected cost for design and construction of interconnected piping to connect the proposed surface water treatment plant to the five largest water systems (FONK, Bottoms Bridge, Colonial Downs, Courthouse & Parham Landing) is approximately $104 million, with approximately 10% of that total having already been expended. Approximately $68 million in additional investment is necessary before surface water becomes a practical alternative for the proposed Central Water System.

Timeline of New Kent County's Alternate Water Supply Efforts

Project		Benefit	Cost	Timetable	Status
Bottoms Bridge Water System		-Operational efficiency & system reliability -Reduces permit management costs for VDH, DPU -Brings unregulated withdrawals into the groundwater permitting system	$4,670,000†	2007	Completed
Courthouse Water System		-Operational efficiency & system reliability -Reduces permit management costs for VDH, DPU -Brings unregulated withdrawals into the groundwater permitting system	$3,500,000†	2008	Completed
Rt. 249 Waterline		-Operational efficiency & system reliability -Reduces permit management costs for DEQ, VDH, DPU -first step towards centralizing New Kent's water systems	$1,250,000†	2015	Completed
Water System Interconnection Analysis & Master Plan		-necessary to determine the cost & sequence of water system interconnection -identifies areas of high/low pressure, low flow	$95,000†	2016	Completed
Pamunkey River Withdrawal VPA permit application		-provides a 10-year window for DPU to develop a surface water source -provides an alternate supply to groundwater	$325,000†	2017	Under Review
Rt. 618 Waterline (FONK to Colonial Downs)	Design	-reduces fluoride levels for Colonial Downs water system -Operational efficiency & system reliability -Reduces permit management costs for DEQ, VDH, DPU -next step towards centralizing New Kent's water systems	$190,000†	2018	In progress
	Construction		$4,025,000*	2021 (est.)	99% Shovel-ready Funding approved
Rt. 249 Waterline Phase II Design & Construction (FONK to Bottoms Bridge)		-Operational efficiency & system reliability -Reduces permit management costs for DEQ, VDH, DPU -next step towards centralizing New Kent's water systems	$16,000,000*	2026 (est.)	Proposed Funding needed
Pamunkey River Withdrawal & Surface Water Treatment Plant Design & Construction		-Operational efficiency & system reliability -Reduces permit management costs for DEQ, VDH, DPU -reduces stress on the potable groundwater aquifer -provides supply for New Kent's water needs through 2065	$40,000,000*	2027 (before withdrawal permit expires)	Proposed Funding needed
SWTP Trunk Line & Quinton Park Waterline Extension Design & Construction			$7,875,000*		
Rt. 155 Waterline Design & Construction (Central to New Kent Courthouse)		-reduces fluoride levels for Courthouse water system -Operational efficiency & system reliability -Reduces permit management costs for DEQ, VDH, DPU -reduces stress on the potable groundwater aquifer	$9,450,000	2037 (est.)	Future
Rt. 249 Waterline Phase III Design & Construction (Central to Parham Landing)		-reduces fluoride & TDS levels for Parham Landing water system -Operational efficiency & system reliability -Reduces permit management costs for DEQ, VDH, DPU -reduces stress on the potable groundwater aquifer	$17,000,000	2047 (est.)	Future
Total Infrastructure Investment Necessary			**$104,380,000**		
†Total Infrastructure Investment to Date			**$10,030,000**		
***Additional Infrastructure Investment Needed to Provide Surface Water Supply to the Central Water System**			**$67,900,000**		

Water Conservation

With the reclaimed water program, New Kent has taken a huge step in reducing overall non-potable use from the Potomac Aquifer and becoming a regional leader in alternative water use. Additional County-wide measures include:

- Increasing block water rate structure.
- DPU review & low flow requirement for all irrigation system installations. DPU customer assistance with calculating/reducing irrigation cost.
- Shortened billing cycle, allowing customers' leaks to be identified & repaired quickly.
- Flagging billing data for high use & automatically generating leak check work orders.
- Advanced meter technology, allowing lower flows to be registered & recorded, as well as data-logging of customer use activity.
- Aggressive leak diagnosis & repair program.
- Public education efforts through County Quarterly mailers, Annual Water Quality Reports, County Fair, Envirothon, Virginia Cooperative Extension, HOA meetings, New Kent University, etc.
- Maintaining proper water quality, reducing the need for line flushing.
- Visual leak inspections during easement clearing, hydrant maintenance & water line markings.
- Annual water accountability audit for each water system.
- Reduction in the occurrence of water storage tank draining by reducing the washout cycle from every other year to every 3rd year and employing ROV inspection instead of manual inspection.

ITEM 10: WATER CONSERVATION & MANAGEMENT PLAN

A copy of the County's *Water Conservation & Management Plan*, adopted in November 2010 as part of the *County's Water Supply Plan*, can be found in Appendix B.

A copy of Chickahominy Power's *Water Conservation & Management Plan* (February 2019) is also included in Appendix B.

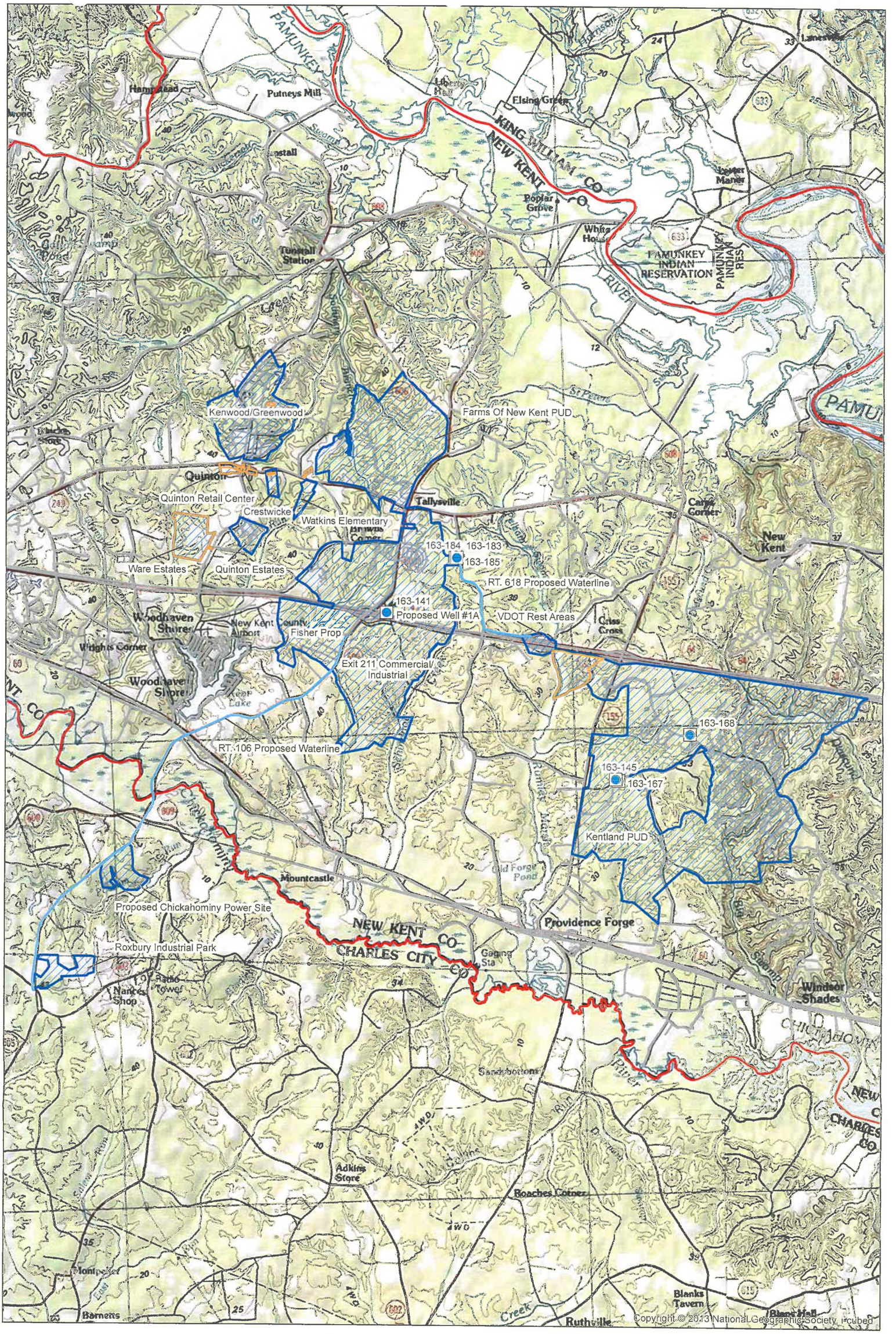


Figure 1 -Proposed Water Service Areas

Central Water System
Water Service Areas

Map Produced 5/30/2019

N

0 5,000 10,000 Feet

Legend

- Water Well
- Proposed Water Line
- Parcels
- Water Service Area
- County Boundary
- Roads

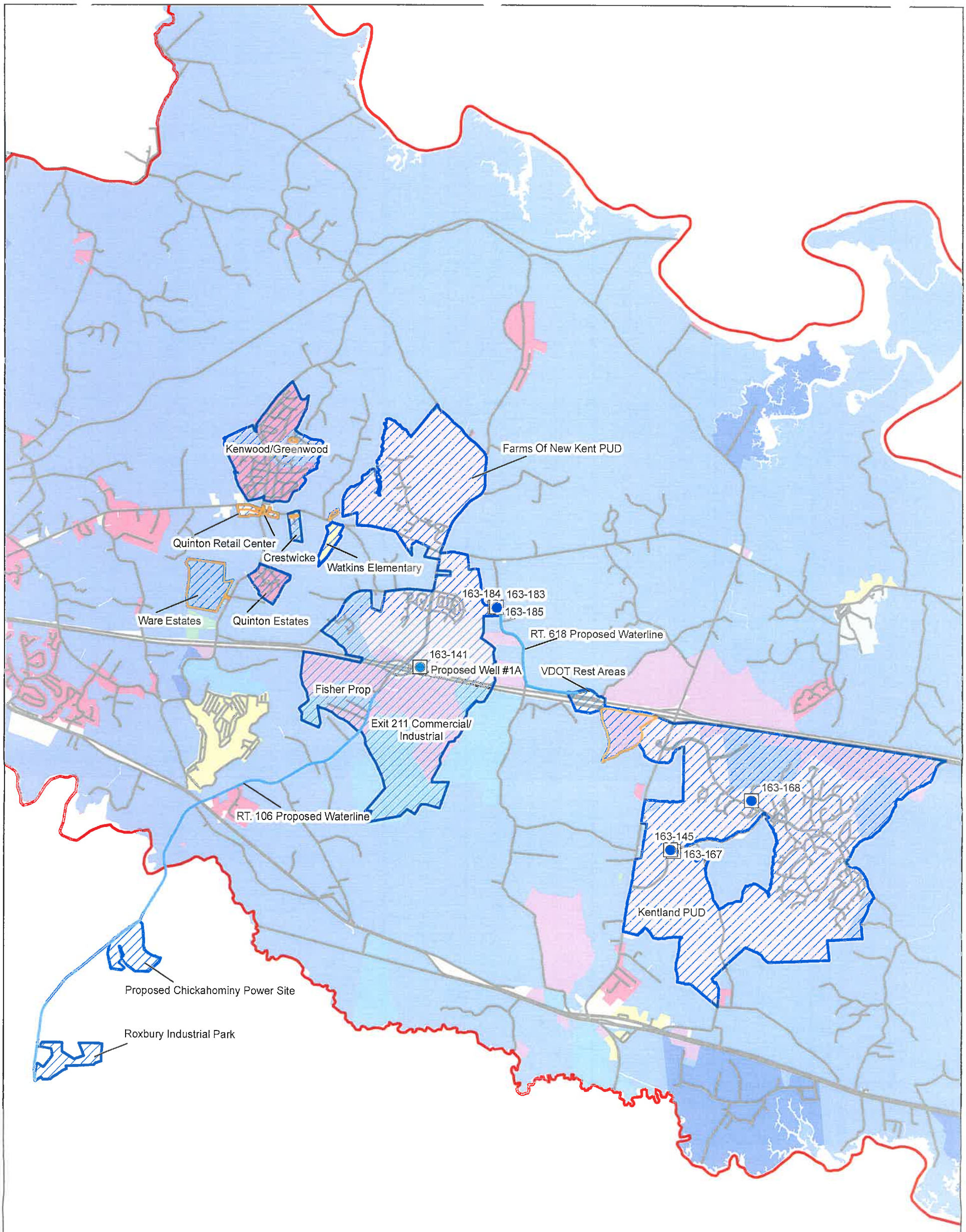


Figure 3 -Proposed Water Service Areas with Zoning

APPENDIX B

WATER CONSERVATION & MANAGEMENT PLANS

New Kent County

Chickahominy Power

Chickahominy Power Water Conservation and Management Plan

Chickahominy Power will be contracting with a contractor that specializes in the overall Operation and Maintenance of the proposed facility. It will be the responsibility of this O&M Contractor to develop and implement a comprehensive operational plan that will incorporate area reduction requirements as noted in its Water Supply Plan as available.

Features incorporated into the design include:

- Mixed bed ion exchange demineralization technology – eliminates waste stream associated with alternative reverse osmosis technology and associated water consumption
- Blowdown recovery systems for evaporative cooler and boiler – blowdowns are routed to a recovery system which removes excess chemicals and dissolved solids as necessary for reuse in the process.
- Blowdown flash steam recovery – high pressure blowdown will be routed to a flash tank where the flash steam will be recovered and reused in the process to produce power, further reducing water consumption.

The plant will include metering to monitor water supply and consumption. The plant control system will record historic data for auditing. The O&M Contractor will be responsible for maintaining all equipment with periodic inspections to ensure the processes are operating as designed and check for leaks.

It will also be the responsibility of this O&M Contractor to develop and implement a comprehensive operational plan that will incorporate area reduction requirements as noted in its Water Supply Plan as available. It is anticipated that this operational plan will include requirements that all plant personnel will be trained to:

- Restrict or terminate the use of area irrigation sprinklers
- Restrict or terminate the washing of site grounds, sidewalks, paved areas
- Restrict or terminate the washing of site vehicles
- Minimize or eliminate discretionary use of potable water

Chickahominy Power, LLC
Charles City County, Virginia

Water Conservation and Management Plan

February 2019

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1.0 INTRODUCTION

Background

Chickahominy Power, LLC is developing a nominal 1,600 megawatt natural gas-fired combined cycle electric generating facility in Charles City County, Virginia. The facility will produce enough electricity to supply approximately one million residential customers. The proposed facility is expected to be one of the most efficient and environmentally clean power generating facilities in the region and is anticipated to displace older, less efficient and less environmentally clean facilities and replace a number of coal fired generating facilities that are scheduled to be taken out of service.

The Chickahominy Power facility will be unique to the Southeastern area of Virginia given that it will be one of a very few, latest generation of natural gas-fired combined cycle electric generating facilities in operation. In view of the critical nature of the Chickahominy Power facility to the regional power grid, the operational continuance of a reliable water system is crucial to the reliable delivery of electric energy produced at the facility.

Recognizing that the location in Charles City County will necessitate efficient use of groundwater; Chickahominy Power has specifically designed the power generation facility to use the least amount of groundwater possible which represents the principal foundation of its Water Conservation and Management Plan.

1.2 Groundwater Management Area in Eastern Virginia

Under the Ground Water Management Act of 1992, Virginia manages groundwater through a program that regulates the withdrawals of groundwater in certain areas called Groundwater Management Areas (GWMA). Currently, there are two Groundwater Management Areas in the state. The Eastern Virginia Groundwater Management Area (EVGWMA) comprises all areas east of Interstate 95. The Eastern Shore Groundwater Management Area includes Accomack and Northampton counties. Any person or entity located within a declared GWMA must obtain a permit to withdraw 300,000 gallons or more of groundwater in any one month.

Chickahominy Power will be located in Charles City County, which is included in the EVGWMA.

1.3 Water Conservation and Management Plan

Applicants seeking a new withdrawal in the groundwater management area are required to develop a water conservation and management plan and submit it to DEQ. Plans will be reviewed to assure that required elements are addressed; the approved plan becomes an enforceable part of the approved groundwater withdrawal permit.

The Code of Virginia (Title 9. Environment Agency 25. State Water Control Board. Chapter 610. Groundwater Withdrawal Regulations) requires the following elements be addressed in plans for commercial and industrial users:

For nonpublic water supply applicants - commercial and industrial users:

a) *Where applicable, the plan should require use of water-saving equipment and processes for all water users including technological, procedural, or programmatic improvements to the facilities and processes to decrease the amount of water withdrawn or to decrease water demand. The goal of these requirements is to assure the most efficient use of groundwater. Information on the water-saving alternatives examined and the water savings associated with the alternatives shall be provided. Also, where appropriate, the use of water-saving fixtures in new and renovated plumbing as provided in the Uniform Statewide Building Code (13VAC5-63) shall be identified in the plan;*

b) *A water loss reduction program, which defines the applicant's leak detection and repair program. The water loss reduction program shall include requirements for an audit of the total amount of groundwater used in the distribution system and operational processes during the first two years of the permit cycle. Implementation of a leak detection and repair program shall be required within one year of the date the permit is issued. The program shall include a schedule for inspection of equipment and piping for leaks;*

c) *A water use education program that contains requirements for the education of water users and training of employees controlling water consuming processes to assure that water conservation principles are well known by the users of the resource. The program shall include a schedule for information distribution and the type of materials used;*

d) *An evaluation of water reuse options and assurances that water shall be reused in all instances where reuse is practicable. Potential for expansion of the existing reuse practices or adoption of additional reuse practices shall also be included; and*

e) *Requirements for complying with mandatory water use reductions during water shortage emergencies declared by the local governing body or water authority in accordance with §§ 15.2-923 and 15.2-924 of the Code of Virginia. This shall include, where appropriate, ordinances prohibiting the waste of water generally and requirements providing for mandatory water use restrictions in accordance with drought response and contingency ordinances implemented to comply with 9VAC25-780-120 during water shortage emergencies. The water conservation and management plan shall also contain requirements for mandatory water use restrictions during water shortage emergencies that restricts or prohibits all nonessential uses such as lawn watering, car washing, and similar nonessential industrial and commercial uses for the duration of the water shortage emergency.*

Each of the items that must be in the Plan is discussed in the following pages and describes Chickahominy Power's strategies for addressing conservation and demand management goals.

-- End of Section --

2.0 CONSERVATION AND DEMAND MANAGEMENT

2.1 Water-Saving Equipment and Processes

Chickahominy Power has been specifically designed to minimize the overall demand for water, most notably through the use of air-cooled condenser technology in lieu of a more conventional water-cooling technology to condense and reuse the high pressure steam that powers the steam turbine generators, and through the extensive use of blowdown recapture and waste water recovery systems. Process water demand, in general terms, consists of service water to operate inlet air evaporative coolers for the gas turbine systems (significantly improving plant efficiency on hot days), to produce demineralized water used as boiler make up water, and other uses including water for maintenance and cleanup. Water will also be stored on site for fire protection if needed.

The proposed rate of average water use (30 million gallons per year) and the proposed plant power output (1600 megawatts) yield a unit output of 0.002 gallons/kilowatthour. As a contrast, in a U.S. Energy Information Administration publication titled "Today in Energy – Water withdrawals by U.S. power plants have been declining", the average national usage rate in 2017 was 13.0 gallons/kilowatthour. Water withdrawal intensity in Virginia was also reported to be in the range of 20 to 30 gallons/kilowatthour. The amount of water proposed for use for the Chickahominy Power facility is drastically lower than the national average and the Virginia usage range.

Potable water will be used for domestic uses - restrooms, handwashing, minimal kitchen facilities and site irrigation purposes. The potable water supply will be from available municipal supplies and will not be associated with process water needs.

2.2 Water Loss Reduction Program

The Chickahominy Power facility will be all new construction. The design of the facility incorporates not only process equipment that reduces water demands (as described above) but also a system of water for potable water uses. Faucets and fixtures that will be installed for potable water usage will be up-to-date water efficient fixtures that are in compliance with the Uniform Statewide Building Code.

Chickahominy Power will develop a loss reduction program centered on the following:

Industrial Process

- All water use will be monitored on a daily basis (including groundwater withdrawals) to identify any values that are outside of normal usage and will necessitate investigation of piping and process equipment where there may be a leak;
- Any equipment or piping where water loss is occurring will be repaired or replaced as expediently as possible; and

Domestic Service

- Weekly reading and recording of domestic water use (i.e., non-industrial) will allow the employees at the site to identify any values that are outside of normal usage and will necessitate investigation of piping and process equipment where there may be a leak;

- Any equipment or piping where water loss is occurring will be repaired or replaced as expediently as possible; and

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- All employees will be made aware of the EVGWMA and its implications at the operation of the Charles
- City County facility.

- All employees will be made aware of the Water Demand and Conservation Plan.

- At the start of employment at the facility, every employee will be provided training regarding the importance of conserving water, the details of the company's water withdrawal permit, and the need to efficiently use water.

- On at least an annual basis, this Water Conservation and Demand Management Plan will be reviewed with staff and management.

- Management will update the Plan as needed, and provide a copy to DEQ.

2.4 Water Reuse Options

Water reuse processes have been included in the overall power generation process to the maximum extent possible. Future water reuse options will be employed as appropriate.

2.5 Requirement for Mandatory Water Use Reductions During Water Shortages

As noted in earlier section of this Plan, the facility will have contractual agreements to provide electricity to the electrical grid and those agreements must be honored even during periods of drought or other local or regional periods of water shortages.

At any time that Charles City County or the Governor of Virginia declare a drought watch, warning or emergency[1], Chickahominy Power will observe any requirements to reduce non-essential use of water. "Non- essential use of water" means usage related to the domestic uses at the facility.

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[1] "Drought Watch" is intended to increase public awareness of climatic conditions that are likely to precede the occurrence of a significant drought event.
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Chickahominy Power Water Conservation and Management Plan

Chickahominy Power will be contracting with a contractor that specializes in the overall Operation and Maintenance of the proposed facility. It will be the responsibility of this O&M Contractor to develop and implement a comprehensive operational plan that will incorporate area reduction requirements as noted in its Water Supply Plan as available.

Features incorporated into the design include:

- Mixed bed ion exchange demineralization technology – eliminates waste stream associated with alternative reverse osmosis technology and associated water consumption
- Blowdown recovery systems for evaporative cooler and boiler – blowdowns are routed to a recovery system which removes excess chemicals and dissolved solids as necessary for reuse in the process.
- Blowdown flash steam recovery – high pressure blowdown will be routed to a flash tank where the flash steam will be recovered and reused in the process to produce power, further reducing water consumption.

The plant will include metering to monitor water supply and consumption. The plant control system will record historic data for auditing. The O&M Contractor will be responsible for maintaining all equipment with periodic inspections to ensure the processes are operating as designed and check for leaks.

It will also be the responsibility of this O&M Contractor to develop and implement a comprehensive operational plan that will incorporate area reduction requirements as noted in its Water Supply Plan as available. It is anticipated that this operational plan will include requirements that all plant personnel will be trained to:

- Restrict or terminate the use of area irrigation sprinklers
- Restrict or terminate the washing of site grounds, sidewalks, paved areas
- Restrict or terminate the washing of site vehicles
- Minimize or eliminate discretionary use of potable water

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APPENDIX D

Line Drawing of Water Flow

LINE DRAWING 1

= water meter on all wells & individual services

CENTRAL WATER SYSTEM

Talleysville Well #1A
115.17 MGY

Talleysville Well #2
115.17 MGY

FONK Elevated Tank
1.976 MGD MAX

Residential
156.55 MGY

Commercial/Industrial
14.60 MGY

Natural
Rainfall

VDOT Rest Areas
6.0 MGY

Colonial Downs Well
1.25 MGY

Charles City County
Consecutive System
(see Line Drawing 2)

Kenwood/Greenwood
Quinton Estates, By-Right
48.74 MGY

Farms of New Kent
Kentland
86.49 MGY

Watkins Elementary
1.0 MGY

Colonial Downs
16.43 MGY

Brickshire Median &
Entrance Area Irrigation
3.0 MGY

Private Septic
Drainfields

Residential Irrigation
21.33 MGY

NEW KENT COUNTY SEWER SYSTEM

Parham Landing
WWTP

Brickshire
Golf Course

Colonial Downs
Racetrack

WestRock
Log yard

Natural
Rainfall

Royal New Kent
Golf Course

irrigation
pond (typ)

Chickahominy
Reclaimed Water
Distribution System

Pamunkey River

LINE DRAWING 2

= water meter on all wells & individual services

INCOMING WATER SUPPLY FROM NEW KENT COUNTY – Central Water System

Evaporation
30.00 MGY

Chickahominy Power
30.32 MGY
(see detailed attachment)

Roxbury Industrial Park
3.68 MGY

Effluent
0.32 MGY

Roxbury Industrial
WWTP

CHARLES CITY COUNTY SEWER SYSTEM

Spray Irrigation

Water Balance Diagram

Notes:

1. Demineralization is performed by Owner supplied mixed bed ion-exchange rental trailers. Trailers are off-site regenerated. No wastewater is generated.
2. Suitability of rental demineralizer system for direct treatment of well water will be evaluated during detail engineering upon availability of well water quality data.
3. Well water supply will consist of 4 x 50 gpm capacity wells. Water supply brought to or located on site by Owner. See Exhibit B Plant Design Basis Section 3.3.1 for details.
4. Rental demineralizer system will be capable of recirculating back to raw/fire water storage tank for return of poor quality demineralized water during trailer start-up.
5. Values shown may not add up due to rounding.

LEGEND
Peak Month
Average Month
gpm - gallons per minute
kgal/month - thousand gallons per month
mmgal/month - million gallons per month

REV	DRAWN	CHECK	DATE
F	CRL	NGJ	1/29/2019
E	JPC	NGJ	1/22/2019
D	CRL	JPM	11/8/2018
C	CRL	JPM	11/6/2018
B			Not Used
A			Not Used

Gemma Power Systems
Chickahominy Power Station
Combined Cycle Power Plant

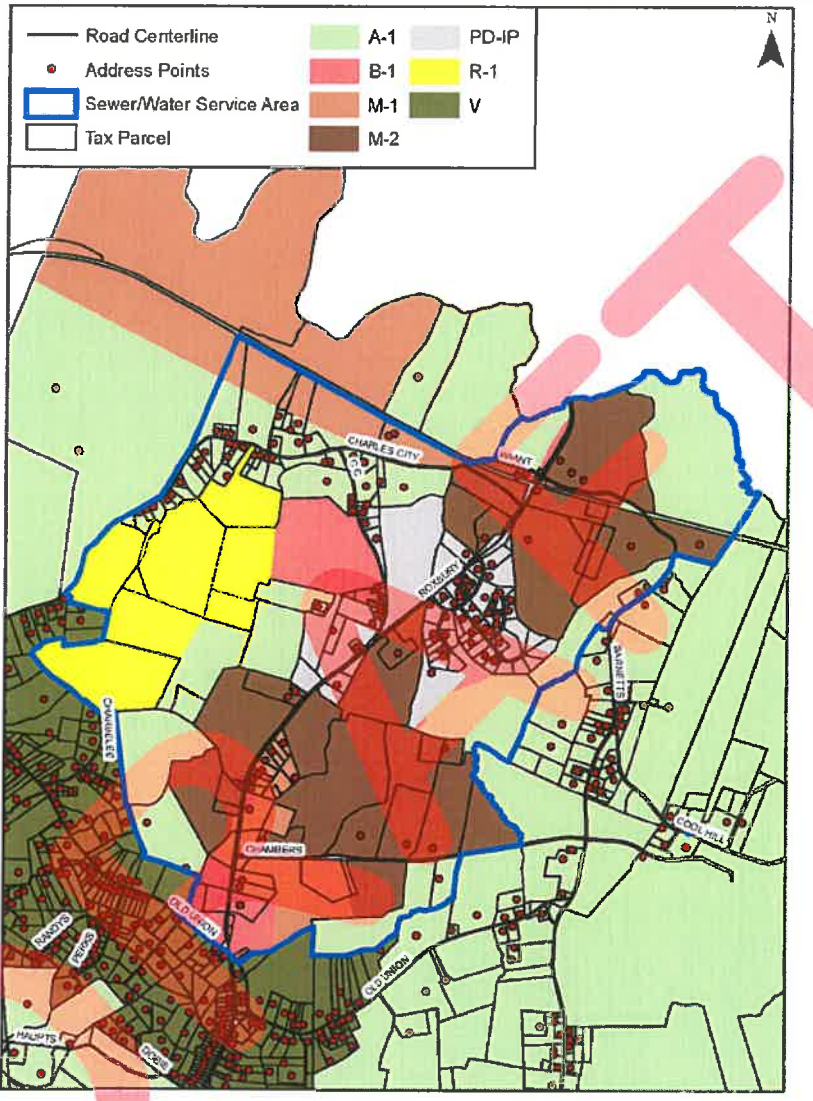
Water Balance Diagram

Dwg no: GPS-SK-WB-0001

Revision: D

APPENDIX E

Charles City County
Route 106 Corridor Master Plan Excerpts



ROXBURY ROUTE 106 MASTER PLAN
CHARLES CITY COUNTY, VIRGINIA

FIGURE II-2: ROXBURY ROUTE 106 CORRIDOR LIMITS

BOWMAN CONSULTING GROUP, LTD.
460 McLAWS CIRCLE, SUITE 120
WILLIAMSBURG, VIRGINIA 23185
(757) 229-1776
FAX: (757) 229-4683

B. EXISTING WATER USAGE EVALUATION

As stated above, the current water system capacity is rated for 19,600 gpd and is limited by the number of wells. The following table summarizes the water usage from January 2017 to December 2018 (See Appendix B):

Table III-1: Roxbury WS Water Usage Data from Jan. 2017 to Dec. 2018

Month	Total Gallons Produced	Daily Average
January-17	310,000	10,000
February-17	324,000	11,571
March-17	271,000	8,742
April-17	289,000	9,633
May-17	409,000	13,194
June-17	404,000	13,467
July-17	403,000	13,000
August-17	308,000	9,935
September-17	255,000	8,500
October-17	256,000	8,258
November-17	213,000	7,100
December-17	234,000	7,548
January-18	303,000	9,774
February-18	223,000	7,964
March-18	248,000	8,000
April-18	273,000	9,100
May-18	261,000	8,419
June-18	290,000	9,667
July-18	266,000	8,581
August-18	298,000	9,613
September-18	312,000	10,400
October-18	243,000	7,839
November-18	216,000	7,200
December-18	209,000	6,742
Average:	**284,083**	**9,344**
Total Annual Water Usage 2017 (gal):	**3,676,000**	
Total Annual Water Usage 2018 (gal):	**3,142,000**	

According to Table III-1, the annual water usage for 2017 was 3,676,000 gallons and the annual water usage for 2018 was 3,142,000 gallons. The current average water usage is approximately 9,344 gallons per day (gpd), which represents 48% of the current water system permitted capacity of 19,600 gpd.

IV. ESTIMATED FUTURE WATER CAPACITY REQUIREMENTS

As stated above, the current permitted capacity of the water system is 19,600 gpd (49 ERCs) and the average water usage is approximately 9,344 gpd.

According to Charles City County's Planning Department, it is anticipated that 360 new dwelling units will be built and approximately 440 new jobs will be created within the next 20 years. It also anticipated that Chickahominy Power will build a power plant on Chambers Road near the intersection of SR 106. Based on information provided by Chickahominy Power, they will use approximately 30 million gallons per year of water (82,192 gpd). Based on the Virginia Department of Health *Waterworks Regulations* Section 12 VAC 5-590-690-A, the average daily demand is 400 gpd for each equivalent residential connection (ERC) and 15-35 gpd for each factory employee working an 8-hour shift. Therefore, the following table represents the estimated future water capacity requirement for the Roxbury Route 106 Corridor:

Table IV-1: Estimated Future Water Capacity Requirements

Description	Total No. of Units	Avg. Daily Flow per Unit (gpd)	Avg. Daily Design Flow (gpd)	Equivalent Res. Connections (ERCs)	Annual Water Usage (Mgal)
Existing Flows	-	-	9,344	23	3.41
New Homes	360	400	144,000	360	52.56
New Jobs	440	30	13,200	33	4.82
Chickahominy Power - Domestic	45	15	675	2	0.25
Subtotal			**167,219**	**418**	**61.03**
Chickahominy Power - Process			82,192	205	30.00
Total			**250,086**	**625**	**91.28**

Therefore, the estimated future average flow rate is 250,087 gpd (625 ERCs), which exceeds the current permitted capacity of the Roxbury Industrial Park Water System.