



# **City of Hopewell**

## **Demand Side Management Plan**



## **Executive Summary**

Virginia American Water (VAW) is committed to providing safe and reliable water service to its customers in the Hopewell service district and throughout the state of Virginia. VAW's Hopewell water system is unique in many ways with its large industrial customer base, production of two grades of water and tidal source. These unique attributes provide numerous challenges from planning to operations. In an effort to ensure an adequate water supply to the customers within the Hopewell water system and in response to the Virginia State Corporation Commission's Order dated July 29, 2011, VAW proposes to implement a demand side management plan for the Hopewell water system. The plan specifically addresses the Commission's directive to "develop a demand side management plan with input from its various customer classes and submit the plan as part of its next rate case".

Demand management from a water utility perspective can often be associated with drought response plans. In such a plan, triggers typically associated with source water availability would be used to implement varying levels of conservation measures, including mandatory usage restrictions. However, there are many aspects of VAW's Hopewell water system that are unique and require different operational strategies from a "typical" water system. A typical drought response plan may not be appropriate.

Demand side management is more common with electric utilities where there is better control in isolating individual customers or sections of the distribution grid to limit system load. Examples of demand side management from an electric utilities perspective can include installing devices on individual customer connections to control/limit usage, providing incentives for off peak usage and conducting scheduled outages to conserve energy. Most of these approaches are not possible or practical in the operation of a water system.

The purpose of this plan is to address supply/production deficits that may result from reduced production capacity and/or peak demands and minimize the impact of future expansions of supply and production facilities.



## **Source of Supply Summary**

Source of supply for the Hopewell system is obtained from the Appomattox River approximately 1.5 miles upstream of the river's confluence with the James River. VAW's intakes are located in a tidal area such that the water from both the Appomattox and James River contribute to the available supply. From a supply standpoint, the system is not prone to drought or source water shortages typically associated with hot, dry weather impacts. Water production capability can however be affected by adverse raw water conditions and/or limitations in the capacity of the facilities. The Virginia Department of Health has characterized the raw water source for VAW's Hopewell water system as highly susceptible to contamination due to the various manufacturing facilities located in close proximity to the Appomattox and James Rivers.

An agreement between the City of Hopewell and the Appomattox River Water Authority provides for the release of water from the Brasfield Dam at Lake Chesdin, located approximately 20 miles upstream from Hopewell on the Appomattox River. Minimum discharge from the dam is the lesser of 100 mgd or the average daily flow into the reservoir. Flow from the Appomattox River combines with flow from the James River near the Hopewell system's raw water intakes. Calculations performed by the Virginia State Water Control Board have determined that the 1Q30 flow at the Hopewell intake is 227 mgd. The 1Q30 flow is defined as the flow occurring on the lowest-flow day during each 30-year period.

Based on a 2010 comprehensive planning study (CPS), the projected year 2025 average day represents approximately 10% of the minimum recorded river flow and the corresponding 2025 maximum day demand represents approximately 15% of the minimum recorded flow. Therefore, the current source of supply quantity is adequate for both current and future projected average and maximum day demands.

## **Production Facility Summary**

Production facilities for the Hopewell System consist of a surface water treatment plant located in downtown Hopewell. The Hopewell Water Treatment Plant (WTP) is a conventional surface water treatment facility consisting of coagulation, mixing, flocculation and sedimentation, filtration, and disinfection processes. The WTP has an overall production capacity of 36 mgd; 18 mgd potable as permitted by VDH and 18 mgd non-potable design capacity. The non-potable system is not limited by regulation and



may be operated at a higher rate of 20 mgd if necessary; however, this may affect effluent non-potable water quality.

The plant has two process trains that run parallel to each other. One treatment train supplies water to “domestic” customers, while the other supplies water to five large industrial customers located near the Hopewell WTP. Although both treatment trains produce potable grade water, the quality of water produced is slightly different. The “industrial” treatment train does not have fluoride or corrosion inhibitor added, and while this flow is filtered, it does not pass through the carbon contactors located on site. There exists a complete separation of the mains exiting the plant between the domestic and industrial trains. The industrial treatment train is not subject to drinking water standards enforced by the Virginia Department of Public Health, the agency responsible for enforcing the Safe Drinking Water Act in the Commonwealth. The plant is configured such that excess potable water can be diverted to the non-potable water system if necessary; however, due to regulation, non-potable water cannot be used to supplement the potable water system.

### **Customer Demand Summary**

In 2009, the Hopewell System served a total of 9,270 customers with an average daily demand (ADD) of approximately 19.1 mgd and a maximum day demand (MDD) of 27.7 mgd. Approximately 91% of the customer base is residential, 8% is commercial, and 1% is industrial and “other” customer categories. Although industrial customers account for less than 1% of the customer base, industrial water usage accounted for approximately 84% of the total (potable/non-potable) water sales in 2009.

From 2001 through 2003 the Hopewell Water Treatment Plant and distribution system were separated into an industrial (non-potable) side serving five large industrial customers only and a domestic (potable) side that served potable water to all customers including the five large industrial customers. Although both treatment trains are capable of producing potable grade water, the quality of the water produced is slightly different. Water usage on the non-potable side accounted for approximately 56% of the total water sales in 2009 and the potable side accounted for the remaining 44%. Summary of water sales by customer classification is presented in Table 1.



**Table 1. Water sales by customer classification (2009)**

Customer Classification	Combined potable/non-potable water sales		Potable Water Sales		Non-potable water sales	
	Avg. sales (mgd)	Percent of total sales	Avg. sales (mgd)	Percent of total sales	Avg. sales (mgd)	Percent of total sales
<b>Residential</b>	1.24	6.6%	1.24	14.8%		
<b>Commercial</b>	0.47	2.5%	0.47	5.6%		
<b>Industrial</b>						
<b>Honeywell</b>	7.91	42.0%	2.02	24.2%	5.89	56.4%
<b>Rock-Tenn</b>	3.66	19.4%	1.70	20.3%	1.96	18.8%
<b>J.R. Cogen</b>	1.38	7.3	0.001	0.0%	1.37	13.1%
<b>Aqualon</b>	1.19	6.3	1.19	14.2%		
<b>Hopewell Cogen</b>	1.02	5.4	0.001	0.0%	1.02	9.8%
<b>Dominion Cogen</b>	0.22	1.2	0.001	0.0%	0.21	2.0%
<b>Other Industrial</b>	0.36	1.9	0.36	4.3%		
<b>Other</b>	1.38	7.3	1.38	16.5%		
<b>TOTAL</b>	<b>18.83</b>		<b>8.36</b>		<b>10.45</b>	



As illustrated from these data, there is an inverse relationship when comparing customer base to water usage associated with customer classification. Furthermore, the overall effect of changes in usage related to the industrial customers has a far greater impact to operations than all other customer classes combined. This is further complicated by the fact that three of these industrial users are cogeneration facilities that operate on an “on or off” basis.

Provided there are no major changes in usage patterns from our large industrial customers, VAW does not expect any shortage of supply of potable and non-potable water within the 15-year planning horizon. With the recent upgrades completed at the Hopewell facility, there is increased capacity and operational flexibility. However, there may be instances where raw water quality may limit production capacity or short term peak demands may exceed the available production capacity.

### **Demand Side Management Plan**

The intent of the demand side management plan is to ensure an adequate and reliable supply of potable and non-potable water for all customers served by the Hopewell water system and minimize future investments related to supply and production capacity. The plan will address two scenarios: short-term supply deficits and long-term supply deficits.

Short-term supply deficits may result from reduced production capacity resulting from adverse water raw water conditions such as a chemical spill in the source water, from water treatment plant equipment failure or maintenance, from treatment chemical supply shortages, from prolonged power outages, or from peak day demands exceeding the maximum capacity of the raw water source or production facilities. Long-term supply deficits may result from increased usage from one or more large industrial customers or the addition of new customers to the system.

As illustrated in the customer demand summary, there are several large industrial customers that use a majority of the water produced by the Hopewell WTP. In the event an issue arises which compromises the ability of the Hopewell WTP to meet customer water demands, reduction in usage by these industrial customers would have the greatest and most immediate impact.



The demand side management plan will be implemented at the discretion of VAW when there is evidence that the water supply may be compromised due to reduced production capacity or increased demands.

### **Short-Term Scenario**

For the purpose of this plan, a short-term supply deficit is defined as a condition where the water demand exceeds or is projected to exceed production capacity for a period of less than 90 consecutive days.

In the event of a short-term supply deficit, the most immediate impact would come from a reduction of use by the industrial customers. To address such an event, VAW proposes to implement mandatory conservation measures to the large industrial customers. Mandatory conservation measures will be implemented for industrial customers using a percentage of the customer's average day demand based on previous year consumption. This will establish the maximum daily demand available to each industrial customer during this period. These measures will help ensure that an adequate supply of water is available to all other customers.

VAW will establish the criteria based on the available reliable production capacity using the following formula:

**Reliable available production capacity / Projected average day demand = Percent of average day demand available to customer.**

For the purpose of this calculation, VAW operations staff will determine the reliable production capacity based on actual conditions. The projected average day demand will be based on current trends. Conditions will be evaluated on a daily basis for the duration of the deficit event and adjustments to the maximum daily usage available to each industrial customer will be made as necessary.

Within 24 hours of receiving notification of mandatory conservation measure, industrial users will be expected to meet the conservation requirements. VAW may elect to read meters on a daily basis or check historical data to determine if users are in compliance



with the conservation requirements. Failure to comply with the mandatory conservation measure may impact water service to all customers.

If the deficit is expected to exceed 15 consecutive days, notice will be provided to all other customer classifications requesting voluntary conservation measures.

Upon returning to normal operating conditions, VAW will provide notification to all customers lifting the requirements for either voluntary or mandatory conservation. Typical notices to be used as part of this plan are included in Appendix A.

### **Long-Term Scenario**

For the purpose of this plan, a long-term deficit is defined as a condition where the water systems demands are nearing or projected with some certainty to exceed the production capacity into the foreseeable future. This can be associated with increased demands from existing customers and/or additional demands resulting from new customers.

The Virginia Department of Health regulations require: “At such time as the water production of a community waterworks reaches 80% of the rated capacity of the waterworks for any consecutive three-month period, the owner shall cause plans and specifications to be developed for expansion of the waterworks to include a schedule for construction; however, if it can be shown by the owner that growth within the service area is limited and will not exceed the rated capacity of the waterworks or if unusual transient conditions caused production to reach the 80% level, preparation of plan and specification for expansion will no longer be required.”

Based on a demand analysis and projections completed as part of the 2010 CPS, it is anticipated that system demands will be met by the current plant capacity through the 15 year planning horizon. The largest variable in these projections is related to industrial customer use.

Virginia American Water currently employs a number of water conservation measures including non-revenue water audits, leak detection and repair, metering of all connections including periodic replacement of meters, infrastructure maintenance/replacement program and public education programs.



In addition, as a requirement of the Virginia DEQ Regional Water Supply Plan completed in 2011, VAW has prepared a conservation plan for the City of Hopewell which addresses similar issues related to reduced supply/production capacity; however, this conservation plan is linked to the other regional partners' drought/conservation plans as directed by DEQ.

A resolution approving the Hopewell chapter of the DEQ Regional Water Supply Plan, which includes the City of Hopewell Water Conservation Plan, was adopted by the Hopewell City Council on October 18, 2011. Prior to adoption, the entire plan was advertised for public comment and a public hearing was held to hear comments. The conservation plan is attached in Appendix B.

As part of the demand side management plan and continued communication with our customers, demand projections will be reviewed regularly to aid VAW in planning for upcoming changes that may impact the existing water supply and production. At a time when demands are projected to exceed current production capacity or production rates approach 80% of permitted capacity, VAW will investigate additional conservation measures to minimize the impact and need for expansion of supply and production facilities. Measures may include, but are not limited to installation of automatic read meters with leak detection and data logging capability, conservation pricing (increasing block rate structure) and implementation of water use ordinances.



**Appendix A – Conservation Notices**

**WATER USAGE ALERT - MANDATORY CONSERVATION NOTICE**

Virginia American Water’s Hopewell Water Treatment plant is experiencing demands that are nearing or exceeding the reliable supply/production capacity of the facility. Notification is being provided to all industrial water customers requesting mandatory conservation of water. During this period it’s required that your facility’s total water consumption (all meters combined) shall not exceed the following daily limits:

Facility Name: \_\_\_\_\_

	Avg daily use (mgd)	Percent of avg day available	Max daily limit (mgd)
Potable Water	5	1.25	6.25
Non-Potable Water	5	0.8	4.0

Failure to comply with this notice may impact water service to all customers within the Hopewell service area. Virginia American Water reserves the right to read meters on a daily basis to ensure the mandatory conservation measures are being met.

If you have any questions regarding this notice, please feel free to contact \_\_\_\_\_, Operations Manager for the Hopewell area at \_\_\_\_\_.



## WATER USAGE ALERT - VOLUNTARY CONSERVATION NOTICE

Virginia American Water's Hopewell Water Treatment plant is experiencing demands that are nearing or exceeding the reliable supply/production capacity of the facility. Virginia American Water requests that all customers voluntarily reduce their non-essential water usage, such as lawn sprinkling and other outdoor water use.

If you have any questions regarding this notice, please feel free to contact \_\_\_\_\_, Operations Manager for the Hopewell area at \_\_\_\_\_.



**Appendix B - City of Hopewell – Water Conservation Plan (attached)**

# **City of Hopewell Water Conservation Plan**

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## **SECTION 1: Summary and Background**

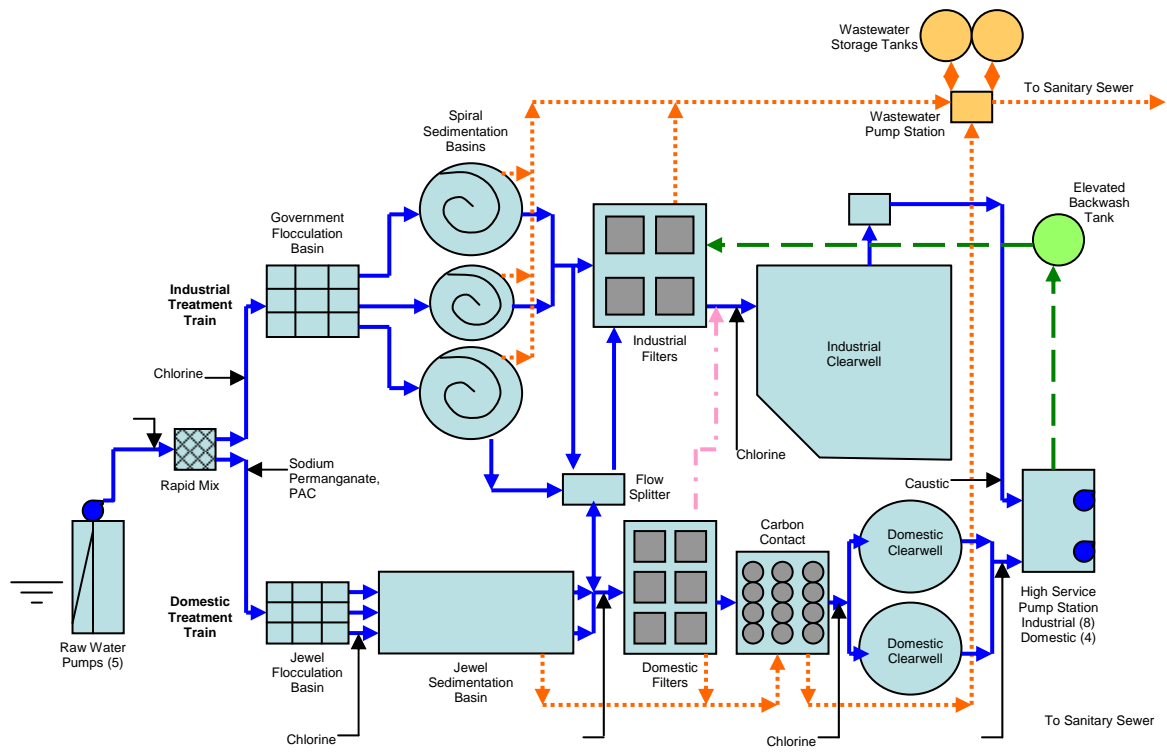
The purpose of this report is to examine possible scenarios that would require a reduction in customer load during extended peak demand periods. To date, Hopewell Operations staff has never--to the knowledge of current staff--had to issue either a voluntary, or mandatory, water conservation notice. However, in addition to complying with the requirements of the Virginia Department of Environmental Quality Water Supply Planning Program, implementation of this plan prepares the Hopewell distribution system for the unexpected.

The Hopewell system obtains its water supply from the Appomattox River approximately one mile from the confluence with the James River. The Hopewell system is supplied entirely by surface water. Calculations performed by the Virginia State Water Control Board have determined that the 1Q30 flow at the Hopewell intake is 227 MGD. The 1Q30 flow is defined as the flow occurring on the lowest-flow during each 30-year period.

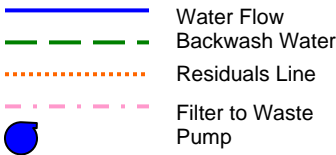
Both the Appomattox River and James River are tidally influenced water bodies. As a result, the Hopewell Water Treatment facility is not affected by typical flow-by restrictions experienced by most surface water facilities during drought conditions.

The majority of the land use within the limits of the Hopewell System is a mixture of residential, urban and industrial development. Approximately 91% of the customer base is residential, 8% is commercial, and 1% is industrial and "other" customer categories.

The Hopewell Water Treatment Plant (WTP) is a conventional surface water treatment facility utilizing coagulation, mixing flocculation, sedimentation, filtration, and disinfection processes. The plant has two process trains. One treatment train supplies water to "domestic" customers, while the other supplies water to five large industrial customers located near the Hopewell WTP. Although both trains produce "potable" water, the quality of the water is slightly different. As it stands right now, the domestic train is deemed as potable water, and the industrial train is deemed as non-potable water. The "industrial" treatment train does not have fluoride or corrosion inhibitor added. Also, while this flow is filtered, it does not pass through the carbon contactors located on site. Please note, the "industrial" treatment train is not subject to drinking water standards enforced by the Virginia Department of Health. The following exhibit illustrates both of the Hopewell WTP process trains.



### Legend



The current permitted capacity of the Hopewell Water Treatment Plant is 36 MGD. The system’s highest peak day demand of 31 MGD occurred on August 17<sup>th</sup>, 2007.

The following sections detail conservation measures, list key stakeholders, detail the implementation plan, and discuss public relations/public awareness.

### SECTION 2: Customer Uses

There are essentially three classes of potential customer uses common to the industry. Conservation methods should adequately address each of the three classes as they apply at the various levels.

**Class 1:** Essential Water Use includes, but is not limited to: residential use reasonably needed for hygiene, cleanliness and sanitation; Commercial Use by Healthcare Facilities; and Other Public Use Facilities; fire fighting capacity; and industrial use for electric power, industrial process and safety, communication, wastewater and other health needs to maintain the short term economic viability of the community.

**Class 2:** Important Uses of Water includes use by non-critical commercial operations in order to maintain their businesses, including commercial laundromats, restaurants, etc.

**Class 3:** Non-Essential Uses include all outdoor sprinkling including residential watering, golf course watering, fountains, etc., and car washing activities, use of fire hydrants for testing, flushing of the system except to ensure sanitary conditions, etc.

### **SECTION 3: Conservation Trigger Points**

Virginia American Water staff has identified several possible scenarios that could possibly require a reduction in customer load during extended peak demand periods; and determined measures to be taken to ensure that the Hopewell System maintained adequate water supply for Class 1 and 2 uses. The three scenarios examined were supply limitation, production limitation, and weather and drought conditions.

#### Supply Limitation

The Hopewell WTP is permitted for 36 MGD, which is based on the permitted withdrawal from the Appomattox River intake. Given that the 1Q30 flow at the Hopewell intake is 227 MGD, as well as the tidal influence of the water body, it is highly improbable that Hopewell WTP source of supply would impede Virginia American Water's ability to supply the Hopewell System with Class 1 and Class 2 water uses. No triggers or measures are suggested for this scenario.

#### Production Limitation

The limiting production factor, on both production trains, is filtration capacity. The reliable capacity of the domestic train is 15 MGD with a firm capacity of 18 MGD. The reliable capacity of the industrial train is 15 MGD with a firm capacity of 20 MGD. Note the there are provisions to transfer up to 6 MGD of potable water into the industrial train; however, industrial water cannot supplement the potable water system. If customer demand approaches, or exceeds, 15 MGD for either train, the ability of the Hopewell WTP to provide essential water uses could be compromised.

The following triggers are proposed for production limitation:

- I. Customer demand approaches or meets the reliable capacity of either production train in one 24 hour period.
- II. Customer demand approaches or meets the reliable capacity of both production trains in one 24 hour period.
- III. Customer demand approaches or meets the reliable capacity of both production trains for consecutive 24 hour periods.

Another possible scenario limiting production capability is raw water quality. The Virginia Department of Health has characterized the source water as highly susceptible to contamination based on land use and potential sources of contamination along the Appomattox and James Rivers.

The following triggers are proposed related to potential source water contamination events:

- I. Raw water quality reduces filtration capacity, unable to meet daily demand of either production train in one 24 hour period.
- II. Raw water quality reduces filtration capacity, unable to meet daily demand of both production trains in one 24 hour period.

- III. Raw water quality reduces filtration capacity, unable to meet daily demand of both production trains for consecutive 24 hour periods.

The associated conservation measures for each trigger are discussed in Section 4.

#### **SECTION 4: Conservation Measures**

When the regional partners of the Hopewell System's Regional Water Supply Plan announce "Voluntary Water Conservation Conditions", the Hopewell System will announce "Voluntary Water Conservation Conditions". However, if the regional partners issue a "Mandatory Water Conservation Notice", the Hopewell System may remain in "Voluntary" status, due to the consistent source of supply provided by the tidally influenced intake discussed in previous sections.

In addition, the 3 level approach discussed below lists other possible measures to reduce customer load as production capacity moves close to exceeding capacity. The level of conservation will be as directed at the discretion of local operations management based on the guidelines in Section 3.

LEVEL 1 (Voluntary Conservation):

- Request voluntary conservation via the public notice plan in Section 5.

LEVEL 2:

- Request voluntary conservation via the public notice plan in Section 5.
- Meet with Water Conservation Committee and discuss conservation of Class 1 and 2 uses.

LEVEL 3:

- Provide public notice of required conservation per the plan in Section 5. Include Water Conservation Committee and local governmental input.
- Issue notice to industrial customers that water supply may be restricted.

#### **SECTION 5: Public Awareness/Public Relations Activities**

##### **Objective**

To effectively communicate this issue to four primary audiences:

- Local officials (mayors, city administrators, fire chiefs) and community leaders (CAC's) the *possibility* of voluntary water conservation
- Voluntary conservation measures to be implemented by residential customers through mass media vehicles
- Internally communicate the issues to our own employees to prepare them to handle questions/concerns from customers within each operation
- Communication of *possible* water shortage to our industrial customers. Discussion of alternatives to reduce industrial water usage from the Hopewell Treatment Plant in order to ensure production capacity is not exceeded.

## Key Messages

The following are messages that have been assembled to assist in the communication process with internal and external stakeholders. PLEASE NOTE: Virginia American Water maintains the contact list for the stakeholders.

- ❑ Increased demand coupled with a drought could place pressure on water reserves.
- ❑ These two factors combined could create the need for voluntary water restrictions to be suggested to residential customers such as outdoor watering on even/odd days and suggested specific times for such activities.
- ❑ This request would not affect businesses such as restaurants, car washes, laundries and other industries dependent on water for production and revenue.
- ❑ Voluntary conservation methods would be introduced via various media outlets and would be rescinded immediately upon relief provided by changing weather and/or demand conditions.
- ❑ The request for voluntary usage reduction affects nonessential watering only and does not pertain to essential water use by residents.
- ❑ Virginia American Water is continuing to develop various options to maximize our resources and increase capacity for the future peak seasons.
- ❑ This is not a situation unique to Virginia American Water. Communities throughout the United States have been forced to issue conservation measures to ensure the protection of one of our most precious natural resources.
- ❑ These measures will in no way impede our ability to maintain fire protection.

## Tactics

- ❑ Face-to-face meetings with local officials and community leaders
- ❑ Localized press releases and potentially press conferences
- ❑ Public Service Announcements where applicable
- ❑ Letter to community leaders

## Media Contacts

**Print:** Hopewell News

**Radio:** Most news radio feed taken from local TV News Stations

WRVA

WHAP

**TV:** WTVR

WRIC

## **Section 6: Key Stakeholders**

### A. Key Government and Regulatory Stakeholders:

1. City of Hopewell, Director of Public Works
2. Virginia Department of Health, District Engineer

### B. Major Industrial Customers

1. Honeywell
2. Smurfit-Stone
3. James River Cogeneration
4. Hopewell Cogeneration
5. Aqualon
6. Dominion Hopewell

### **Water Users with Critical Needs for Water**

- John Randolph Medical Center
- Hopewell Dialysis Center

- ❖ The above listed entities should comprise the Water Conservation Committee. This committee should be in place to be called to order in case conservation measures are needed.

### C. Hopewell Public Official Listing

- **City of Hopewell Officials**
  - Mayor
  - City Clerk
  - Fire Chief
  - Police Chief
  - City Manager
  - Risk Management Coordinator
- **Hopewell City Council**

**APPENDIX 1**

RELEASE

(Month, Day, Year)

Contact: Doug Woodhouse

Office: 804-240-9876

After Business Hours: 1-800-452-6863

**WATER USAGE PEAK ALERT**

***VIRGINIA AMERICAN SENDS NOTIFICATION OF WATER USAGE PEAK:  
WEATHER AND DEMAND INVOKING VOLUNTARY RESIDENTIAL  
WATER CONSERVATION REQUEST***

Virginia American Water's Hopewell Water Treatment production plant set a particularly high production yesterday signaling seasonal high usage. If demand continues at this rate without a break in the weather, demand may approach the production limits of our Water Treatment Facility.

Virginia American Water asks residents to voluntarily reduce their non-essential water usage, such as lawn sprinkling, to alternating days. These voluntary conservation measures would not involve businesses or industries, only residential non-essential usage and only during the period the drought continues.

To learn more about wise water use, please visit our website at the link below for a valuable list of water saving tips.

<http://www.amwater.com/vaaw/learning-center/wise-water-use.html>

**APPENDIX 2**

RELEASE

(Month, Day, Year)

Contact: Doug Woodhouse

Office: 804-240-9876

After Business Hours: 1-800-452-6863

**WATER USAGE PEAK ALERT**

*VIRGINIA AMERICAN SENDS NOTIFICATION OF WATER USAGE PEAK:  
CUSTOMER DEMAND **MAY** REDUCE WATER SUPPLY TO SELECT  
FACILITIES*

Virginia American Water's Hopewell Water Treatment production plant set a particularly high production yesterday signaling exceptionally high usage. If demand continues at this rate, the production limits of our Water Treatment Facility may be exceeded.

Virginia American Water **may** be forced to reduce water supply to select facilities if it appears that the plant production cannot meet customer demand. For questions, comments, or concerns, please contact Doug Woodhouse at the number listed above.