

RIVANNA WATER & SEWER AUTHORITY

**RAGGED MOUNTAIN RESERVOIR EXPANSION
AND
SOUTH FORK RIVANNA PIPELINE PROJECT**

**DRAFT PROVISIONS REGARDING DOWNSTREAM FLOWS
AND THE
CONVEYANCE OF WATER BETWEEN FACILITIES**

May 9, 2007

I. Definitions

“Natural inflow,” when used with respect to South Fork Rivanna Reservoir, is the daily mean discharge rate listed by the United States Geological Survey for the Mechums River near White Hall, Virginia (USGS stream gage 02031000), multiplied by the factor of 2.71 (to compensate for the difference in drainage area), and converted from cubic feet per second to millions of gallons per day by multiplying by a factor of 0.65. Currently, the USGS mean discharge rates are available online at <http://waterdata.usgs.gov>.

“Natural inflow,” when used with respect to Sugar Hollow Reservoir, is the daily mean discharge rate listed by the United States Geological Survey for the Mechums River near White Hall, Virginia (USGS stream gage 02031000), multiplied by the factor of 0.18 (to compensate for the difference in drainage area), and converted from cubic feet per second to millions of gallons per day by multiplying by a factor of 0.65. Currently, the USGS mean discharge rates are available online at <http://waterdata.usgs.gov>.

“Operational” refers to the time at which a new water supply facility has been completely constructed, can be operated as intended, and is placed into active service. With respect to the Expanded Ragged Mountain Reservoir, the facility shall be deemed “operational” upon issuance of a temporary operation and maintenance certificate by the Virginia Department of Conservation and Recreation.

“Total flow” is the rate at which all water in a stream is moving past a defined point and flowing downstream during a given interval of time. Total flow is expressed in millions of gallons per day and includes, but is not limited to, all water traveling over a dam spillway, water seeping through, around, or under a dam or spillway, water conveyed through a pipeline from a reservoir to the downstream, or water conveyed through a

hydroelectric plant from a reservoir to the downstream during the defined interval.

“Urban Water System” is the system of water supply reservoirs, intakes, pipelines, and water treatment facilities that provide potable drinking water to the citizens of the City of Charlottesville and areas of the County of Albemarle surrounding the City as defined by the Board of Supervisors. Water storage for the Urban Water System includes the Sugar Hollow Reservoir, the Ragged Mountain Reservoir, and South Fork Rivanna Reservoir.

“Useable storage” is the volume of water in a reservoir at a particular time that is available for routine withdrawal and use for water supply purposes. It consists of all that volume of water within a reservoir located above the dead storage pool (or sediment pool) up to the water surface elevation. The volume of useable storage at a particular reservoir at a given time depends upon the water surface elevation (which shall be determined by observation), and upon the then-current contour of the reservoir bottom and elevation of the dead storage pool (which shall be determined from the most recent stage-storage curves prepared by the Rivanna Water & Sewer Authority under the seal of a professional engineer on the basis of periodic bathymetric surveys).

“Total useable storage” is the sum of the Useable Storage in each of the storage reservoirs in the Urban Water System at a given time.

II. Downstream Flow Provisions

A. Before the Expanded Ragged Mountain Reservoir is Operational

1. From South Fork Rivanna Reservoir

No new requirements

2. From Sugar Hollow Reservoir

No new requirements

3. From Ragged Mountain Reservoir

No new requirements

B. After the Expanded Ragged Mountain Reservoir is Operational, But Before the Pipeline from South Fork Rivanna Reservoir to Ragged Mountain Reservoir is Operational

1. From South Fork Rivanna Reservoir

- a. If total useable storage available to the Urban Water System is equal to or greater than 2.36 billion gallons

Total downstream flow past South Fork Rivanna Reservoir must be at least 70% of the natural inflow or 1.3 mgd, whichever is greater, subject to the following exceptions

- i. No downstream flows in excess of 20 mgd shall be required
- ii. If useable storage in South Fork Rivanna Reservoir has been exhausted (i.e., the water level is at or below the lowest operable water supply intake), then total downstream flow past South Fork Rivanna Reservoir shall be whatever volume of water enters that intake unless or until the total downstream flow past South Fork Rivanna Reservoir equals or exceeds 1.3 mgd.

- b. If total useable storage available to the Urban Water System is equal to or greater than 1.36 billion gallons but less than 2.36 billion gallons

Total downstream flow past South Fork Rivanna Reservoir must be at least 50% of the natural inflow or 1.3 mgd, whichever is greater, subject to the following exceptions

- i. No downstream flows in excess of 20 mgd shall be required
- ii. If useable storage in South Fork Rivanna Reservoir has been exhausted (i.e., the water level is at or below the lowest operable water supply intake), then total downstream flow past South Fork Rivanna Reservoir shall be whatever volume of water enters that intake unless or until the total downstream flow past South Fork Rivanna Reservoir equals or exceeds 1.3 mgd.

- c. If total useable storage available to the Urban Water System is less than 1.36 billion gallons

Total downstream flow past South Fork Rivanna Reservoir must be at least 30% of the natural inflow or 1.3 mgd, whichever is greater,

subject to the following exceptions

- i. No downstream flows in excess of 20 mgd shall be required
- ii. If useable storage in South Fork Rivanna Reservoir has been exhausted (i.e., the water level is at or below the lowest operable water supply intake), then total downstream flow past South Fork Rivanna Reservoir shall be whatever volume of water enters that intake unless or until the total downstream flow past South Fork Rivanna Reservoir equals or exceeds 1.3 mgd.

2. From Sugar Hollow Reservoir

- a. When the water level in Sugar Hollow Reservoir is above the lowest operable water intake and the Expanded Ragged Mountain Reservoir is initially filling
 - i. If the useable storage in Ragged Mountain Reservoir is equal to or greater than 1.53 billion gallons

Total flow past Sugar Hollow Reservoir must be at least 100% of the natural inflow to Sugar Hollow Reservoir; or 10 mgd, whichever is less
 - ii. If the useable storage in Ragged Mountain Reservoir is equal to or greater than 1.1 billion gallons but less than 1.53 billion gallons

Total flow past Sugar Hollow Reservoir must be at least 100% of the natural inflow to Sugar Hollow Reservoir; or 2 mgd, whichever is less
 - iii. If the useable storage in Ragged Mountain Reservoir is equal to or greater than 0.66 billion gallons but less than 1.1 billion gallons

Total flow past Sugar Hollow Reservoir must be at least 100% of the natural inflow to Sugar Hollow Reservoir; or 1 mgd, whichever is less

- iv. If the useable storage in Ragged Mountain Reservoir is less than 0.66 billion gallons

Total flow past Sugar Hollow Reservoir must be at least 100% of the natural inflow to Sugar Hollow Reservoir; or 0.4 mgd, whichever is less

- b. When the water level in Sugar Hollow Reservoir is above the lowest operable water intake, the Expanded Ragged Mountain Reservoir has completed its initial fill, and a permanent operation and maintenance certificate has been issued by the Virginia Department of Conservation and Recreation

- i. If the useable storage in Ragged Mountain Reservoir is equal to or greater than 1.53 billion gallons

Total flow past Sugar Hollow Reservoir must be at least 100% of the natural inflow to Sugar Hollow Reservoir; or 10 mgd, whichever is less

- ii. If the useable storage in Ragged Mountain Reservoir is less than 1.53 billion gallons

Total flow past the Sugar Hollow Reservoir must be at least 100% of the natural inflow to Sugar Hollow Reservoir; or 2 mgd, whichever is less

- c. When the water level in Sugar Hollow Reservoir is at or below the lowest operable water intake

RWSA must fully open the downstream flow control device supplied from the lowest operable water intake and leave it in the fully open position until the water level in Sugar Hollow Reservoir is again higher than the lowest water intake

- 3. From Ragged Mountain Reservoir

RWSA must provide a total flow past the dam of at least 23,800 gpd

C. After Both the Expanded Ragged Mountain Reservoir and the Pipeline from South Fork Rivanna Reservoir to Ragged Mountain Reservoir are Operational

1. From South Fork Rivanna Reservoir

- a. If total useable storage available to the Urban Water System is equal to or greater than 2.36 billion gallons

Total downstream flow past South Fork Rivanna Reservoir must be at least 70% of the natural inflow or 1.3 mgd, whichever is greater, subject to the following exceptions

- i. No downstream flows in excess of 20 mgd shall be required
- ii. If useable storage in South Fork Rivanna Reservoir has been exhausted (i.e., the water level is at or below the lowest operable water supply intake), then total downstream flow past South Fork Rivanna Reservoir shall be whatever volume of water enters that intake unless or until the total downstream flow past South Fork Rivanna Reservoir equals or exceeds 1.3 mgd.

- b. If total useable storage available to the Urban Water System is equal to or greater than 1.36 billion gallons but less than 2.36 billion gallons

Total downstream flow past South Fork Rivanna Reservoir must be at least 50% of the natural inflow or 1.3 mgd, whichever is greater, subject to the following exceptions

- i. No downstream flows in excess of 20 mgd shall be required
- ii. If useable storage in South Fork Rivanna Reservoir has been exhausted (i.e., the water level is at or below the lowest operable water supply intake), then total downstream flow past South Fork Rivanna Reservoir shall be whatever volume of water enters that intake unless or until the total downstream flow past South Fork Rivanna Reservoir equals or exceeds 1.3 mgd.

- c. If total useable storage available to the Urban Water System is less than 1.36 billion gallons

Total downstream flow past South Fork Rivanna Reservoir must be at least 30% of the natural inflow or 1.3 mgd, whichever is greater, subject to the following exceptions

- i. No downstream flows in excess of 20 mgd shall be required
- ii. If useable storage in South Fork Rivanna Reservoir has been exhausted (i.e., the water level is at or below the lowest operable water supply intake), then total downstream flow past South Fork Rivanna Reservoir shall be whatever volume of water enters that intake unless or until the total downstream flow past South Fork Rivanna Reservoir equals or exceeds 1.3 mgd.

2. From Sugar Hollow Reservoir

- a. When the water level at Sugar Hollow Reservoir is at or above the spillway elevation of 975 feet

Sugar Hollow Reservoir will be spilling water on a daily basis and no additional downstream flow is required

- b. When the water level at Sugar Hollow Reservoir is below the spillway elevation of 975 feet

- i. If the water level in Sugar Hollow Reservoir is above the lowest operable water intake

Total flow past Sugar Hollow Reservoir must be at least 90% of the natural inflow to Sugar Hollow Reservoir; or 10 mgd, whichever is less

- ii. If the water level in Sugar Hollow Reservoir is not above the lowest operable water intake

RWSA must fully open the downstream flow control device supplied from the lowest operable water intake and leave it

in the fully open position until the water level in Sugar Hollow Reservoir is again higher than the lowest water intake

3. From Ragged Mountain Reservoir

RWSA must provide a total flow past the dam of at least 23,800 gpd

D. Compliance with Downstream Flow Provisions

1. When the water level at Sugar Hollow Reservoir is at or above the spillway elevation of 975 feet and no water is being conveyed from the reservoir via the existing pipeline to Ragged Mountain Reservoir, the facility shall be deemed to comply with the “100% of natural inflow” downstream flow provision.
2. Prior to operation of the expanded Ragged Mountain Reservoir, the downstream flow control device at Sugar Hollow Reservoir shall be calibrated as accurately as practicable, and the device will be marked with indicated release rates of 0.4 mgd, 1 mgd, 2 mgd, or and 10 mgd. After the expanded Ragged Mountain Reservoir is operational, Sugar Hollow Reservoir shall be deemed to comply with applicable downstream flow provisions if the downstream flow control device has been set to the appropriate indicated release rate and related water intakes, pipelines, and outfalls have been properly maintained and are in good working order.
3. If RWSA becomes aware that the quality (or other physical characteristics such as temperature) of water that would be passed downstream to comply with these downstream flow provisions is such that the passing of such water downstream might cause injury to downstream aquatic resources, and if RWSA further determines that it would be practicable to reduce or eliminate the passage of such water downstream from any of its facilities, then RWSA may notify the DEQ of such circumstances and request authorization to reduce or halt the relevant downstream flow temporarily. DEQ may grant such authorization for up to thirty (30) days per request if, in its best professional judgment, downstream aquatic resources would be best protected thereby.
4. Compliance with these downstream flow provisions shall be excused if it is not reasonably possible to perform the required acts due to acts of God,

war, sabotage, vandalism, dam safety or maintenance requirements, natural disasters or emergencies declared by competent authorities, or similar exigent circumstances beyond the control of the Rivanna Water & Sewer Authority.

5. The required rates of downstream flow at South Fork Rivanna Reservoir and Sugar Hollow Reservoir shall be determined and the rates of downstream flow shall be adjusted as necessary twice per week. When the required rate of downstream flow depends upon the natural inflow to the reservoir, the downstream flow shall be calculated by determining the average of the natural inflows for the three most recent days for which data are available. No adjustment to the rate of downstream flow shall be required unless the current calculation of downstream flow differs from the previously calculated downstream flow by more than ten percent.
6. The downstream flow rates specified herein are calculated on the basis of measurements of multiple natural phenomena which vary continuously. Those natural phenomena cannot be, and are not, measured with laboratory accuracy or precision. Nor do measurements made at one time or at one place reflect conditions prevailing at another time or another place. Thus, the downstream flow rates specified herein are subject to substantial potential error, as are the corresponding measurements of actual downstream flow rates. In recognition of these facts, no violation of the downstream flow provisions herein will be found unless the measured actual downstream flow rate is more than ten percent below the applicable downstream flow rate specified herein. Furthermore, to give system operators adequate opportunity to develop and consistently implement appropriate compliance procedures, no violation of the downstream flow provisions herein will be found during the first two years of their application.

III. Provisions Regarding Water Conveyance Between Facilities

- A. Except as set forth below, the Rivanna Water & Sewer Authority may convey water between and among its reservoirs and/or water treatment plants at rates up to the capacities of the conveyances involved
- B. After both the Expanded Ragged Mountain Reservoir and the pipeline from South Fork Rivanna Reservoir to Ragged Mountain Reservoir are Operational

1. There shall be no conveyance of water from Sugar Hollow Reservoir to Ragged Mountain Reservoir or Observatory Water Treatment Plant via the existing pipeline
2. There shall be no conveyance of water from South Fork Rivanna Reservoir into Ragged Mountain Reservoir when the water level at the Expanded Ragged Mountain Reservoir is at or above the spillway elevation
3. When the water level at South Fork Rivanna Reservoir is below its spillway elevation and water is released from Sugar Hollow Reservoir to the Moormans River at a rate substantially in excess of the applicable downstream flow specified herein for the purpose of conveying water into South Fork Rivanna Reservoir for water supply, the Rivanna Water & Sewer Authority will reduce the rate of flow released through the flow control device at Sugar Hollow Reservoir by no more than fifty percent (50 %) per day until the applicable downstream flow specified herein is achieved.
4. Compliance with these water conveyance provisions shall be excused if reasonably necessary to preserve public health, safety or property from threats due to acts of God, war, sabotage, vandalism, dam safety or maintenance requirements, natural disasters or emergencies declared by competent authorities, or similar exigent circumstances beyond the control of the Rivanna Water & Sewer Authority.