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The Community Water Supply Plan: A Personal Perspective

Liz Palmer, ICF Board member

During the past 11 years, I have been witness to, and an active citizen participant in, the development of this Community's future water supply plan. It is a plan that evolved in a cauldron of arduous, painstaking work by government officials; public input and debate among scores of citizens; and, State level oversight. Ultimately, the final plan was approved by the Rivanna Water and Sewer Authority (RWSA), the Albemarle County Service Authority (ACSA), the Charlottesville City Council, the Albemarle County Board of Supervisors and the Department of Environmental Quality (DEQ). While I cannot detail within the scope of this paper every aspect of the plan's development, it is my hope that sharing my personal experience, might lead others to share my confidence and pride in what this Community has produced.

Citizen Involvement

Local water supply planning began in earnest in the mid 1990's, and from the start, citizen involvement was a hallmark of the process. I began following the process in 1997, when I first saw references to water supply options and when I first began attending community meetings relating to water supply. In order to follow the process closely, I joined the League of Woman Voters Natural Resource Committee which was, at the time, the most active and knowledgeable local citizens group in matters concerning water supply planning and watershed protection. It was through the League that I made frequent public comment.

Also early on, a citizens' ad hoc committee was formed to discuss water supply and watershed protection issues. This ad hoc committee was successful in convincing the City Council and the Board of Supervisors to convene a Joint Meeting to hear citizen watershed protection concerns. Later, when the RWSA scheduled a series of initial meetings with Federal and State Regulators, but declined to admit members of the public to these meetings, citizens scheduled a meeting of their own with the Regulators to express citizen watershed protection concerns and objectives. Still later, as the planning process seemed to be drawing to an uncertain conclusion, the Piedmont Environmental Council assembled yet another group of citizens, and citizen organizations, bent upon keeping our water supply within our South Fork Rivanna watershed. This was not only to provide higher quality water but would also serve as an important incentive to protect our watershed for generations to come.

Perhaps my most poignant memory of citizen involvement and activism was a rally organized in Scottsville to protest the future water supply alternative involving piping water from the James River to the Urban Area. Well over a hundred people assembled at the farmers' market on the banks of the James. Live Blue Grass music was provided, and a very fat Beagle paraded wearing a T-shirt on which was written, "Stop the Pipeline." Then, in an organized moment, the Mayor of Scottsville led the crowd to the foot of the

Bridge over the James, traffic was stopped, and a banner was hoisted high over the road, proclaiming, "Stop the Pipeline." I went home that afternoon with fresh bread from the farmers' market and a great sense of pride in our community and the democratic way.

The conclusion I wish you to draw from this brief recitation of citizen involvement, is that our future water supply plan was not railroaded by indifferent local and state bureaucrats, and foisted upon a passive public. At City, County and State levels, private citizens played a significant role in guiding the process. We were able to do so, in large measure, because of the responsive and open policies of our elected officials and involved government agencies.

Early History of Local Water Supply

Until 1947, this Community drew its water supply primarily from the Ragged Mountain Reservoirs, constructed at the turn of the 20th Century, and from a pipeline constructed in 1925 to deliver water from the headwaters of the Moormans River. Then, as now, community realization dawned that our perennial problem would not be water supply, but rather, water storage sufficient for periods of severe drought. Additional storage capacity was provided in 1947 by construction of the Sugar Hollow Reservoir, and in 1966 by construction of the South Fork Rivanna Reservoir (SFRR).

The Rivanna Water and Sewer Authority (RWSA) was formed by the City and the County in 1972, six years after completion of the SFRR. Some have characterized its formation as the result of a shotgun wedding between the City and the County because a united front was required by the Federal government for applications for Federal grants funding sewage treatment infrastructure. Shortly after RWSA's formation, the City turned the operations and maintenance of the SFRR over to RWSA, but retained ownership of the land. Today the RWSA maintains primary infrastructure such as reservoirs, water and wastewater treatment facilities, and large transmission lines. RWSA wholesales water to the City Public Works department and the Albemarle County Service Authority (ACSA). These organizations, in turn, retail water to customers and maintain secondary water and sewer lines.

When the South Fork Rivanna Reservoir (SFRR), a run-of-the river reservoir, was completed in 1966, it was known to have a limited life span due to heavy sedimentation. At the time, however, local government believed it was the best solution for the community. The SFRR draws from a large drainage area, almost entirely within our County's borders. The SFRR would be upstream from and close to the population center. With no other apparent alternative, the City purchased the land and the project went forward. By the early 1980's there was pressure to plan for a future when the reservoir would no longer have adequate capacity. For this reason, land on Buck Mountain Creek was purchased in 1983 to meet future demand and replace the lost capacity in the SFRR.

The Sediment

There is still much to find out about the precise causes of SFRR sediment accumulation, but there have been some studies and, of course, observation by those who live, work, and boat along the reservoir and its tributaries. A large percentage of the sediment clearly comes from the shores and beds of the rivers draining into the SFRR, most likely as the result of clear cutting of forested land, and other predatory land use practices dating back over 100 years. In the past, farmers eliminated forests to plant crops, graze animals, and sell timber. Today, deforestation for private residences,

insufficient buffers, cattle in streams, driveways on steep slopes and fording of waterways are among the modern sources of stream bank erosion and sedimentation. Some suggest that the past and present land use practices each contribute about 50% to the current problem. Samples of the sediment taken to date, albeit small samples, suggest that it is made up of 50% sand and 50% "fines"(silt and clay), with little organic material, making it ill-suited for agricultural purposes. Many have suggested that the sediment could be used for construction "fill" but little is known about its compaction properties or other measurements of suitability.

Back to the Future Water Supply Plan

This Community's early solution to the loss of storage capacity in the SFRR was simply to build a new reservoir at Buck Mountain. This option was nixed by Federal and State Regulators in the late 90's early in the planning process. The "James Spinymussel," an endangered and sentinel species of river health, resided in the Buck Mountain Creek. In addition, times had changed on the Federal and State regulatory front, bringing the construction of new reservoirs into disfavor especially when other water supply options are available. For those of us in the environmental community, building a new reservoir in the same watershed subject to the similar sedimentation pressures was unreasonable. We were relieved to have this option removed from the list.

Choosing a Water Supply Alternative

An intensive process then began. Consultants would identify a myriad of water supply options. Surely some option either by itself or in combination with others would emerge as the perfect solution to our water storage woes. Many of the alternatives suggested were fanciful. Others appeared to have merit. What we realized early on was that they were all just vague suggestions until reviewed by qualified engineers, federal and state regulators and financial experts. One by one they would be either modified and advanced or dropped completely.

Each alternative was examined to determine the "safe yield" that it would add to the system. Safe yield is a measure of the available storage of a system during the worst drought of record. Hydrologists and engineers modeled what each option could provide, based on storage volume and flow data.

A demand analysis was performed so that planners would know how much water would be needed for the future. The State Water Control Board provided guidelines on how to determine demand, how long to plan for, and how to choose an alternative by balancing practicality (cost to rate payers) and environmental cost. Regulators [the DEQ, the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers, the Virginia Department of Game and Inland Fisheries, the Virginia Department of Conservation and Recreation, and the Virginia Department of Health] also weighed in from the vantage of their individual expertise.

So many water supply alternatives were discussed and reviewed at length, it would be impossible for me to go through them all here. The larger papers produced by consultants are posted on the RWSA website and much of the process can be gleaned from those reports. As a citizen involved in the process, I can say that those reports do not do justice to the volume of work done by RWSA officials, consultants, elected officials, and citizens during this long process. I will hit the highlights of alternatives advanced and/or preferred by citizens in order to illustrate the process.

Dredging for Water Supply (my personal favorite for years)

Dredging of the SFRR seemed the most reasonable and obvious solution. After all, reservoirs around the country are dredged. A land owner in the area was willing to discuss taking the dredged material for drying. The airport had future plans to expand and needed millions of dollars worth of fill for runway construction. Regulators seemed OK with the basics.

Then RWSA came out with estimates of the amazing volume of sediment that would have to be removed to restore capacity and information on how it would be transported from the dredger in the middle of the reservoir to a drying area and then removed from the site. The invasiveness of the scenario was overwhelming but citizens countered the negatives wherever they could. Citizens contacted dredging companies, and mayors and directors of water authorities in communities where dredging had been done. Citizens even did financial studies. RWSA was urged to investigate further. I was a vocal critic of the RWSA at the time and argued strongly for an analysis of the sediment's material properties so that we could explore potential uses and thereby better understand the cost of disposal. There were actually 3 different Directors of the RWSA during this period. RWSA's present director, Tom Frederick did not take charge until June of 2004 so interaction between citizens and the RWSA was often less than ideal during transition periods. And of course the RWSA was preoccupied with dealing with the drought in 2001 and 2002, further slowing the process.

The Death of Dredging to Restore Capacity

I finally cried uncle with the publication of the consultants' report in 2004. See http://www.rivanna.org/community2.htm. While I and others remain convinced that future maintenance of the SFRR is an absolute Community obligation, it became clear that dredging is not the panacea we had all been hoping for to solve our future water storage needs. Some of the insurmountable negatives surrounding this alternative are as follows:

Hardship to surrounding residents and recreational users: there are different types of dredging methods. Regulators were likely to approve only the hydraulic method for environmental and water quality reasons. This would result in a slower removal of the material and necessitate the presence of the dredger in the reservoir for several months out of the year for many years to come. The dredger could operate only during the warmer months to avoid ice. This hydraulic method of dredging would produce liquid slurry which would need to be pumped *via* pipes up to a flat, at least football sized, drying area. Although an adjacent landowner may have been willing to allow a ravine to be used for the sediment drying, such an offer would not have satisfied regulators' requirement for a flat drying area. Other areas on the reservoir were looked at as possible sites. All had some issue with proximity, access, slope or availability. Also, odor control would be a significant issue and noise from the dredger and pumps would need to be controlled. Numerous truck loads per day (number dependent on size of truck chosen) would have to travel on Earlysville road. Would living with dredging be like living in a

construction site for years? What would be the potential problems associated with pumps, pipes, and trucks working on the sediment removal?
Sustainability: Because the material would continue to accumulate even while we were dredging, the solution would not be long lasting. Would my children or grandchildren be starting all over again?
Timing: When would the airport need the fill (if its properties were found suitable)? Would there be timing issues. Material could take up to 2 years to dry and we were limited as to how much we could remove each year because of the method of removal. We would have a continual process of pumping, drying, and hauling that nevertheless might not produce the required amount at the required time.
Cost and Safe Yield: Dredging the SFRR back to its original capacity alone would not meet the requirements determined by the demand analysis. Therefore, dredging would have to be combined with other alternatives. If we could not sell the sediment mixture for enough money to offset the cost, the inclusion of dredging in any combination of alternatives would be substantially more expensive than any other viable alternative.

What happens if we don't dredge? At one point in all this discussion, the LWV NRC, invited two well respected county employees, our then watershed manager and his boss, to meet with us and others to explain what the SFRR would look like if no dredging took place. They painted a pretty picture of a river running through a wetland. That was hard for me to buy. I had canoed on Ivy Creek in a dry hot summer and seen the algae and experienced the unpleasant odors. We were told that the South Fork Rivanna River would be different due to the high volume of water passing through. And we could always do maintenance dredging if needed. Although I have a great deal of confidence in both these former County employees' opinion, I still believe that more evaluation must be done to assure that we will not leave our children and grandchildren with an expensive burden.

I do however understand that we must, as a community, evaluate the future of the SFRR outside of the water supply planning process. What do we want the SFR reservoir to look like and how do we want to use it? Will the UVA crew team continue to row on the South Fork or will they be able to move over to the new Ragged Mountain Reservoir? We are told that the SFRR will always retain some water storage capacity and will continue to be a source of drinking water. The addition of a wetlands area could provide bird habitat and improve water quality. But what will it look like in the interim? Who will pay for maintenance dredging if needed? Should we be spending money on preserving capacity for drinking water or spending money restoring the area to a state where natural processes can take over with minimal human intervention?

Other Water Supply Alternatives

Another popular alternative was a piece meal one where we increased the interconnectivity of the reservoirs, utilizing Chris Green Lake, Lake Albemarle, and Beavercreek Reservoir for the urban area and place a bladder on the SFR Dam. This sounded good. The math seemed to work for the projected safe yield. Then we found that we could not put the bladder on the SFR Dam because it would back water up into Buck Mountain Creek and kill the spinymussel. A mathematical error was also found in calculations for storage capacity obtained with the bladder which further doused this alternative.

Then there was Ragged Mountain Reservoir (RMR) and pump storage that involved taking water from the Mechums River for storage at RMR. The Ragged Mountain Reservoir Dam would be raised 45 feet. This was popular until it was found that restrictions on withdrawal from the Mechums would cause unacceptable refill times for the enlarged RMR.

The James River pipeline was an option that morphed into something quite different as it was evaluated. When first proposed, it was a standalone project in which we would put a treatment plant in Scottsville and eventually stop using the RMR and the Sugar Hollow Reservoir. We might be able to cooperate with neighboring counties to reduce costs. As engineers advanced this option it became obvious that the pipeline to the urban area would be too long to carry treated water and maintain quality. Raw water would have to be piped. Places for treatment facilities were evaluated. The O'Hill treatment plant was the most reasonable choice. Then the DEQ expressed concern that we may be limited in withdrawal during droughts. This is when RMR entered the picture as an impoundment for this option. Because this option was not advanced further, studies to find out how much water would be available and thereby determine the size of RMR were never done.

There was significant public opposition to this option. We would be drinking water from downstream of Lynchburg, a city known to have aging sewers, a combined stormwater and sewer system and problems with overloading of the wastewater treatment plant during heavy rainfall. RWSA assured citizens that the water could be treated to a high standard. But many questioned this and felt as though contaminants existed that would not be removed with present wastewater treatment methods. Many in the community demanded that we stay in our watershed for our drinking water.

Coming Together

At this point no alternative seemed both viable and acceptable to the community. A general consensus had emerged that using the Ragged Mountain Reservoir for additional water storage made sense, much as it did at the turn of the 20th Century. This reservoir is not a run-of-the river reservoir but instead fills a natural "bowl" created by the Ragged Mountains, and thus is afforded protection against sedimentation. The lower dam in any case required attention for dam safety reasons. With a drainage area of only 1.9 square miles, few streams would be adversely affected, and the existing hiking trails could be raised to a higher elevation. The major problem, however, and the same problem with which this Community wrestled in the early part of the 20th Century, was where to get the water to fill these reservoirs at a higher pool level. An answer to this question emerged from the citizenry.

It is now generally known that a member of The Nature Conservancy came forward with the idea to provide inflow to a refurbished Ragged Mountain Reservoir by building a pipeline to it from the SFRR. At present, this Community uses only about 3% of the inflow in SFRR to meet consumptive demand, with 97% of the water spilling over the SFRR dam during periods of normal rainfall. (See, http://www.albemarle.org/upload/images/forms_center/departments/community_development/forms/Water_Resources/Water_Resources_SFRR_History_Summary_EMAIL_version.pdf) Therefore, during periods of normal weather, abundant water would be

available to meet the inflow needs of the Ragged Mountain Reservoir. During periods of severe drought, the enlarged Ragged Mountain Reservoir would provide the necessary storage, with the added advantage of being able to treat the water at Observatory Hill Treatment Plant, or returning it *via* the pipeline to the SFRR Treatment Plant. This idea was immediately embraced by everyone.

Citizens who were most concerned with water quality were happy. Environmentalists whose focus was our reliance on the North and South Fork of the Moormans River, in the headwaters of the watershed, were happy because the Sugar Hollow pipeline would eventually be decommissioned and near natural flow would be restored to the Moormans. Environmentalists who focused on land use were happy because it kept the community's water supply in our watershed furthering their ability to lobby for more protective land use policy. The business community representatives and those most concerned with price and availability were satisfied because the community would meet the future water supply needs for a price comparable to the lowest cost alternatives.

Those of us in the environmental community who had followed the water supply plan closely for many years (League of Woman Voters Natural Resource Committee, Friends of the Moormans River, Piedmont Environmental Council, and representatives from the Southern Environmental Law Center) were satisfied with the basic plan. There were still details to work out with respect to timing of projects, in stream flow specifications, etc., but the basic plan was one that afforded the maximum preservation of the watershed. The problem of the SFRR was still to be worked out but by this time it was recognized that the fate of the SFRR was a Community decision apart from long range water supply planning.

For me, finalization of our future water supply plan, and approval by this Community's governing bodies and State government, was the culmination of 11 years of civic involvement on a level I have never before experienced. It was a tremendous example of people with vastly different values and objectives coming together, to find common ground. I learned a great deal about engineering, government policy, hydrology, stream biology, and human nature in the process, and am most grateful for the opportunity to participate. This is our home and our watershed!!

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Letter on "Why dredging was not chosen as a primary water supply alternative"
By Liz Palmer

This is a letter that I wrote in response to a citizen's letter to the members of the task force. I think it helps to explain why dredging was not chosen as a primary water supply alternative.

Citizen wrote:

It seems reasonable to believe that sooner or later the reservoir will have to be dredged, so the decision at this time is not likely a simple "either/or".

My response:
Thank you for your comment concerning the South Fork Rivanna Reservoir. At one time I would have agreed with you but I have changed my opinion. Hope my response is not more that you wanted but I feel is important to explain some of what I have learned over the years about the South Fork Rivanna Reservoir (SFRR).
For many years I believed that the SFRR would turn into a mud bog without dredging. I believed that, as a manmade body of water, the community was obligated to maintain it in perpetuity and not leave it for subsequent generations. I also believed that the sediment would damage the "health" of the reservoir. My mistake: I did not properly analyze the facts within the context of the watershed and the hydrologic properties inherent in the system. My beliefs were hinged on viewing the South Fork Rivanna Reservoir as more of a lake subject to sedimentation caused by human activity up stream. I recognized it as a run of the river reservoir but just by calling it "the reservoir" I framed and tended to think of it as a separate body of water.
I now understand that the reservoir must be viewed as a widened river. As we all know, building the South Fork dam initially caused the water level of the river to rise. But The South Fork Rivanna River continued to run its pre-dam course and act as a river in the several mile section we call the reservoir. It has been filling in slowly, raising the level of the river bed a little each year. If we do not interfere with this process, the river will eventually return to a width similar to that of pre-dam river only with the river bed at a higher elevation. Some land owners will and are gaining bottom land. Others may lose a few feet of land. The force of the water will continue to push sediment through, maintaining a channel, albeit at a water depth similar to the river's pre dam state. Placing a dam on a river in the Virginia Piedmont ultimately results in a river bed raising not a mud bog of a lake.
The reservoir section of the river is an important community resource. For some it provides a place to practice sport. For others it is a place of peace and early morning stillness. It provides wildlife habitat. Most importantly it has been our principle storage facility for many years. But in reality it is not the best place for water storage. It continually looses capacity at an average rate of 1% per year. With our growing population, this presents us with an inverse relationship between demand and supply. The solution to this storage conundrum is ***large scale*** dredging which must take place at regular intervals to maintain full capacity. Whether the dredging schedule is the 9 to 5- five days per week-120 days per year for the 50 year planning period as suggested in the original RWSA report or the recently proposed 24/7- 365 day/year- 3 year stretch followed by yet to be defined periodic smaller operations, dredging this approximately 2.5 mile stretch of river is an industrial operation and would interfere with the other valued uses of this section of the river. This is why many want to first define what we dredge for, if we dredge. If we dredge to maintain a channel for boating and sculling, then much less material needs to be removed and we are not under pressure to maintain original capacity.
Because the community is very much dependent on a stable water supply, prudent water planners must choose solutions that provide the most long term stability. The need to retain original capacity for 50 years and beyond presents us with unknowns concerning long term disposal options, continued community support from those living around the river reservoir and the dredging scheduling issues associated with maintaining full

capacity during wet and dry times. These are some of the reason why planners have shied away from continuing to use the reservoir section of the river as our principle water storage area.

In addition, dredging alone will not supply the needed water for 2055. It is also true that we have significant aging infrastructure problems in the Ragged Mountain system that must be and are addressed in the approved Water Supply Plan and are not addressed by dredging. But even with these important issues aside, the community has shown prudence in identifying a long term water storage facility less prone to sedimentation.

If you made it to the end of this.. Thank you for your time. Liz Palmer, Task Force member representing the Albemarle County Service Authority

Analysis of Water Supply Reexamination Resolution

By Ridge Schuyler

November 21, 2008

Background: On November 3, 2008, Charlottesville City Council adopted a resolution to provide an expert review of the major elements of the local Community Water Supply Plan. On November 25, 2008, the parties responsible for providing the City and the designated growth areas of Albemarle County will meet to discuss how best to proceed with a review of the plan.

Analysis of the Resolution: The goal of the local Water Supply Plan is to provide sufficient storage of water to get the community through times of drought over the next 50 years. Questions regarding the local Community Water Supply Plan appear to center on three fundamental questions. Where should the storage be located? How should the storage be filled? How big should the storage be? The resolution passed by City Council touches on each of these, which will be addressed below.

CREATING THE STORAGE

According to the Rivanna Water and Sewer Authority, the community will need 2,714 million gallons of drinking water storage to see us through drought periods over the next 50 years.[1] (We have been in and out of drought conditions since 2001, with the most recent drought warnings lifted in May of this year). The existing three reservoirs (South Fork, Ragged Mountain and Sugar Hollow) are not big enough to store this volume, so we need to create 1,726 million gallons of storage in addition to what we will have in 2055.[2]

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[1] Presentation of Tom Frederick to the South Fork Rivanna Reservoir Stewardship Task Force, October 13, 2008.

[2] In 2055, Sugar Hollow useable storage: 324 million gallons; Ragged Mountain useable storage: 463 million gallons (assuming no increase in dam height); South Fork Rivanna Reservoir useable storage: 200 million gallons (assuming no maintenance). *Safe Yield Study*, Gannett Fleming (January 2004), p. 36;

Raising the Ragged Mountain dam by 45 feet creates 1,730 million gallons of additional storage. (100% of need).

Dredging South Fork of the sediment that has accumulated to date creates 360 million gallons of storage.[3] (21% of need). Dredging this amount would allow the Ragged Mountain dam to be reduced by 5 feet,[4] which would reduce by 14 acres the amount of land that would be inundated.[5]

Dredging South Fork of the sediment that has accumulated to date plus all the sediment that will accumulate over the next 50 years creates 900 million gallons of storage.[6] (53% of need). Dredging this amount would allow the Ragged Mountain dam to be reduced by 15 feet,[7] which would reduce by 48 acres the amount of land that would be inundated.[8]

According to the Permit Support Document approved by City Council on June 5, 2006, dredging was not selected as the preferred alternative for meeting the community's water supply needs because "it would not satisfy the basic project purpose on its own. To do so, it would have to be combined with one or more additional concepts."[9] The best "additional concept" to meet the need was to raise the Ragged Mountain dam, but it proved more cost-effective to raise the dam to the full height of 45 feet rather than to stop at 30 feet and be mandated to dredge the South Fork for 50 years.

In the process of designing the dam that would meet the storage needs, core samples were taken at the dam site. The results of these engineering samples indicated that the bedrock was more weathered and fractured than anticipated, thus requiring a more expensive dam foundation. These findings prompted the RWSA to halt work on the dam project until a group of experts examined the site. Hiring that panel of experts is a part of the resolution adopted by City Council:

> Ragged Mountain Dam Design Review – RWSA will retain a team of dam experts from multiple firms to review geotechnical data, preliminary design, and

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Concept Development—Dredging the South Fork Rivanna Reservoir, Gannett Fleming memo (December 1, 2004), p. 7.

[3] 2 million cubic yards of sediment removal=360 million gallons of storage

[4] Presentation of Tom Frederick to the South Fork Rivanna Reservoir Stewardship Task Force, October 13, 2008.

[5] Information generated by The Nature Conservancy using proposed pool elevations and GIS contour mapping.

[6] 5 million cubic yards of sediment removed=900 million gallons of storage capacity restored. *Concept Development—Dredging the South Fork Rivanna Reservoir*, Gannett Fleming memo (December 1, 2004), p. 7.

[7] *Impact of Dredging on Sizing of Ragged Mountain*, Hydrologics Memorandum (March 18, 2008). *Presentation at the City Council Work Session*, RWSA (May 10, 2008). RWSA should be consulted for most current bathymetric data.

[8] Information generated by The Nature Conservancy using proposed pool elevations and GIS contour mapping.

[9] *RWSA Community Water Supply Project Permit Support Document*, Gannett Fleming (May 17, 2006), p. 45.

> foundation design for proposed new dam and I-64 embankment. This review to follow draft RFP scope dated October 27, 2008. Significant focus will be on improving the value (lowest possible costs) of the project through foundation design, and will also consider revisions to dam orientation, existing Lower Dam location, and alternative core wall design. A report will be prepared listing technical decisions and providing an updated project cost estimate for a new Ragged Mountain Dam with sufficient storage to meet 50-Year demand. In addition, the team will determine the extent to which the height of this proposed dam could be lowered to reduce total storage volume by an amount equivalent to the volume restored in South Fork by an initial dredging operation, and will estimate how much of the cost of the dam is saved by the lower height (this will permit a comparison of benefits to cost when the savings are compared to the cost estimate for the initial dredging operation).

The increase in cost, of course, does not decrease the demand for additional water storage. Prudence would dictate that while the experts are examining the feasibility and cost of the dam, we should be exploring the feasibility of a "*Plan B*." Use the pause created by the dam review to revisit some of the previously studied storage options that meet the demand. We know, for example, that dredging alone does not create sufficient storage. Of the previously considered options, which could meet our storage needs? If they are found to be physically available, we can then determine whether they are financially feasible, in the event that a new Ragged Mountain dam proves to be infeasible or unaffordable. Specifically, Rivanna Water and Sewer Staff should be instructed to use available information to develop a report on the storage options that are available to meet the demand in the event the Ragged Mountain dam proves infeasible or unaffordable.

The resolution also calls for the following:

> The team, for comparison purposes, will also develop an updated cost estimate in current dollars to simply make required dam safety improvements to the existing Ragged Mountain Dams with no supply increase.

Unless the community's water storage needs can be met without raising the dam at all, it would appear that this information would not be particularly useful. While this information may prove interesting to determine how much we would have to pay even if the dam weren't expanded, it does not appear necessary.

While City Council determined that expanding capacity at South Fork by dredging was not necessary for meeting our water storage needs, Council nevertheless determined by resolution dated June 2, 2008 that we should examine "appropriate initiatives that could maintain and enhance the aquatic health and water quality of the South Fork Rivanna Reservoir, as a valuable water resource for the long term future benefit of the community."

The South Fork Rivanna Reservoir Stewardship Task Force was asked to explore with the community the benefits of this valuable water resource beyond its purpose as a water storage facility. As Mayor Norris and Chairman Boyd told the task force, "measures to sustain the long-term health of the South Fork Reservoir (potentially to include dredging) were not envisioned as replacing, but rather supplementing, the other components of the water supply plan approved by the City and County." Specifically, the task force was instructed to "focus its efforts on building a well-rounded case as to how the Reservoir benefits our community, what measures would be most effective in maintaining those benefits, what is likely to happen to the Reservoir if no such measures are undertaken, and what the next steps would be in order to move those measures forward." In light of that charge, the feasibility study portion of the resolution seems reasonable:

> Dredging Feasibility Study – If the South Fork Rivanna Reservoir Stewardship Task Force recommends dredging as a means of maintaining the reservoir, RWSA will retain an engineering firm with specialization and proven experience in dredging operations to evaluate dredging of the South Fork Reservoir. The objective and scope of desired dredging will be based upon the local agencies' approval of recommendations from the task force. This may include reviewing background data, updating a bathymetric survey, updating sediment sampling and evaluation of basic characteristics, identifying wetland and other areas that would be restricted by regulatory agencies, calculating probable volume of sediment that would be removed, identifying goals of neighboring property owners, recommending acceptable dredging method(s), identifying and evaluating disposal sites (including Airport site and quarry site), interviewing local firms in construction dirt hauling and quarrying businesses to include DDR and Blue Ridge Sand. Determine feasibility of development of "in-reservoir" forebay area to more efficiently capture future sediment after initial operation. Develop estimated project cost for initial dredging operation that includes RWSA administration and quality control, and order-of-magnitude cost estimates in current dollars for future dredging to remove additional sediment that settles in the reservoir after the initial dredging operation.

Such a feasibility study is likely to cost $275,000.[10] Since dredging is not necessary to meet the community's water supply needs, a question raised by this provision is whether it should be ratepayers or taxpayers (or perhaps a combination of both) who fund the study.

FILLING THE STORAGE

Regardless of the ultimate height of the Ragged Mountain dam, the Ragged Mountain reservoir needs supplemental water via a pipeline in order to fill. The approved water supply plan would replace the existing 81-year-old pipeline that currently fills the reservoir from Sugar Hollow with one linking the South Fork and Ragged Mountain reservoirs. Considered have been:

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[10] *Dredging Consultants Recommend a Feasibility Study*, Charlottesville Tomorrow (May 7, 2008).

South Fork to Ragged Mountain pipeline: 9 mile, 36 inch pipe that will link the two reservoirs and thus the two water treatment plants, allowing the plants to share capacity and avoiding a costly expansion.

Sugar Hollow to Ragged Mountain pipeline: 13 mile, 24 inch pipe (to replace the existing 18 inch pipe).

The resolution calls for a reexamination of this connecting pipeline. Specifically, it provides the following:

> Pipeline to Ragged Mountain – RWSA will retain a firm to review the conceptual design for a pipeline from the South Fork Reservoir to fill the Ragged Mountain Reservoir, and will develop a separate alternative to replace the Sugar Hollow Pipeline. This will include a review of Gannett Fleming's determination of pipe size and required water storage to meet the 18.7 mgd safe yield in an attempt to identify if the storage in the proposed expanded Ragged Mountain Reservoir can be reduced. This will also include field reconnaissance of both alternative pipeline routes. A project cost estimate will be prepared for each alternative, based upon an equivalent water rate transfer capacity at each location, and include recommended pipe sizes and necessary modifications at each location to provide an intake capable of providing the transfer capacity. The study also includes a review of water plant data for each source (South Fork Rivanna and Sugar Hollow) and consideration of economical measures for addressing the sediment in the water transferred to Ragged Mountain.

This expenditure seems unnecessary at this time. In an effort to spread out the costs of the water supply plan, it is unlikely this pipeline will be built for another ten years. It is clear that regardless of the size of the Ragged Mountain dam, a new pipeline must be built to fill it—whether it is a new one following the same route as the current one or a new one connecting to the South Fork Rivanna Reservoir. There are thus at least two alternatives for filling Ragged Mountain, one of which has already been permitted. With other pressing needs, and with an actual decision regarding the pipeline still ten years away, this expenditure appears designed more to satisfy curiosity than to lead to a necessary management decision.

Note that to determine the actual cost of either pipeline, the pipeline would need to be designed and engineered. Remember, the increase in the cost of the Ragged Mountain dam was determined only after core samples were taken at the dam site, and the weathered and fractured rock discovered. Clearly it would not be a wise use of scarce funds to design two pipelines, only one of which the community intends to build.

SIZING THE STORAGE

Finally, the resolution passed by City Council seeks to revisit the issue of how much drinking water the community will need over time. The review of conservation measures follows directly from the resolution Council passed on June 2, 2008 when it reaffirmed

the water supply plan. That resolution included a commitment on the part of the City "to develop stronger incentives and more effective measures for the conservation of water throughout the region."[11]

Specifically, the resolution provides:

> Water Conservation – RWSA to retain a firm to define how water is being used by customers of City and ACSA, review conservation programs and incentives, and review rate structure, to include more aggressive conservation/efficiency measures. Firm to develop and evaluate multiple alternatives for structural measures that can firmly assure additional water conservation and achieve a significant water use reduction per capita. Alternatives will be summarized in technical memorandum for review by the Board of Consultants, and then presented to public in a community meeting with public input.

With or without the water supply plan, the community should do more to conserve water. Thus, this technical study should prove quite helpful in guiding the community to achieve that goal. To have a tangible effect on the water supply plan, however, conservation measures must be enforceable. We will have to do more than hope for greater conservation—we will have to require it. If the localities, however, enact greater conservation measures as the result of the study, it may be possible to lower the height of the dam. Note that a ten percent increase in the amount of conservation would (roughly) reduce our storage need by 271 million gallons, which would be a reduction in the height of the dam by about 3.5 feet.[12]

In addition to determining whether the community can reduce its per capita consumption of water, the resolution calls for a reexamination of the growth projections. Together, per capita use and number of people equals demand. Specifically, the resolution states:

> Future 50-Yr Water Demand Calculations – Board of Consultants to review demand projections for Community Water Supply Plan and make judgment on reasonableness of approach. RWSA will supply historical demand data updated to 2008. Methodology will be long-term trending and other parameters defined by regulatory agencies, and AWWA standard practices. Review will also consider decisions from a Water Conservation study. Demand needs of County and City will be determined independently and then combined.

Unless there is a belief that the City (which was recently upzoned) and the designated growth areas of Albemarle will not grow as much as anticipated over the next 50 years, this study also appears unnecessary.

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[11] A Resolution Approving a Local Water Supply Plan for the City of Charlottesville. Adopted by the Charlottesville City Council, June 2, 2008, p. 5.

[12] RWSA identified a useable storage need of 2,714 million gallons. Ten percent of that is 271 million gallons. If 400 million gallons are stored in the upper 5 feet of the reservoir, then 271 million would be stored in roughly the top 3.5 feet.

DELAYING THE WATER SUPPLY PLAN

At the conclusion of the resolution, Council adopted the following limitation:

> Council in adopting this Scope of Work on November 3, 2008 requested that construction work on the dam will not proceed until the other studies are complete.

The community has until 2011 to address the dam safety issues at the Ragged Mountain dam, according to the Virginia Department of Conservation and Recreation.[13] In addition, the community has experienced a severe drought and numerous drought warnings since 2001, necessitating the expansion of our water supply. The Scope of Work should require the expert panel to finish all studies by the time the dam review panel has concluded its work. In the alternative, dam design and construction should be permitted to move forward even without concluding the other studies, given that they are unlikely to change the height of the dam substantially (initial dredge, 5 feet; conservation, 3.5 feet).

CHOOSING THE RAGGED MOUNTAIN RESERVOIR

The community ultimately chose the Ragged Mountain alternative for many reasons: unlike the dredging option it will meet the community's long-term needs, it expands an existing reservoir that (unlike the South Fork) won't require perpetual costly maintenance because it doesn't fill with sediment, it will replace an unsafe dam we are required to address whether we expand that reservoir or not, it will provide greater operational flexibility by joining our two main water treatment plants, it will be cheaper, and it will restore and protect the health of two major rivers in our watershed.

[13] *RWSA Community Water Supply Project Permit Support Document*, Gannett Fleming (May 17, 2006), p. 45.This date should be confirmed with RWSA.