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ACTION ITEM
BOARD OF SUPERVISORS

DATE December 16, 2008

TO Board of Supervisors

FROM Harry Critzer
Director of Utilities

ISSUE Rocky Pen Run Reservoir Status Report

STAFF RECOMMENDATION N/A

BUDGET IMPACT N/A

ATTACHMENTS (3)

[1] Memo dated 12/09/08 [ ] **Reso/Ord/Proc #**

[2] Map [ ] **Reso/Ord/Proc #**

[3] Road Study Report April, 2005 [ ] **Reso/Ord/Proc #**

REVIEW [X] County Administrator's Office

[ ] Legal

[ ] **Consent Agenda** [ ] **Other Business** [ ] **Public Hearing**
[X] **Discussion Item** [ ] **Presentation** [ ] **Unfinished Business**
[ ] **New Business**

PRESENTATION BY Keith Dayton

ELECTION DISTRICT N/A

MEMO

Utilities Administration Office

To: Michael P Neuhard
Deputy County Administrator

From Harry Critzer
Director of Utilities

From: Keith Dayton
Director of Code Administration

Date December 9, 2008

Subject: **Rocky Pen Run Reservoir**
Alternative Road Alignments & Reduced Reservoir Analysis

This will respond to the questions asked at the November 5, 2008 Board Meeting regarding the effect of reducing the water elevation of Rocky Pen Run Reservoir by 10' and the construction of an alternate road connection for the residents in the Rocky Pen Run Reservoir area who will be affected when the reservoir is filled and a portion of Rocky Run Road is closed

Alternative Road Alignments

Rocky Run Road is currently used as a preferred means of accessing I-95 and retail locations along Route 17 for an estimated 50 properties This route serves a far greater number of properties when Holly Corner Road is blocked and when there are traffic situations along Route 17 between Holly Corner Road and I-95

When the dam construction project is completed and the county begins filling the reservoir, a portion of Rocky Run Road will be flooded immediately, cutting off this route The current schedule for the initiation of filling operations is early 2012 At that time, the sole means of accessing Route 17 for those residents west of Rocky Pen Run along Rocky Run Road and Holly Corner Road will be Holly Corner Road

In 2005, the Utilities Department commissioned a Road Study Report (attached) to examine various alternatives to provide a second means of egress to Route 17 and I-95 for when Rocky Run Road was flooded Four alternative road alignments were studied, two of which involved constructing a bridge over the reservoir, one that traversed the top of the dam, and one that extended below the dam Cost estimates for these alternatives (in 2005 dollars) ranged from $9 7 million to $13 million Due to the high cost for each of the road construction options, and the limited benefit in reduced trip time for a relatively small number of residents, the draft study recommended that the county not construct an alternative route

The current analysis focused on lower cost road options that would provide an alternative means of egress should Holly Corner Road become blocked due to an accident or natural event Road options that connected to Stafford Lakes subdivision from either Rocky Run Road or Holly Corner Road by extending around the northern tip of the western finger of the reservoir meet these criteria

In selecting a proposed alignment for further evaluation, several factors were considered as follows

- The proposed route should take advantage of all existing and proposed roads to reduce cost and facilitate approval
- The proposed route should cross as few properties as practical to avoid a protracted acquisition process
- The proposed route should avoid environmentally sensitive areas to the maximum extent practical to expedite permitting and reduce cost
- The proposed route would connect to Village Parkway in Stafford Lakes to access the most direct route to Route 17 with sufficient capacity for additional traffic count

Following review of the area, staff has determined that a route (see Attachment A) beginning at Rocky Run Road where it crosses Parcel 43-69A and extending across Parcel 43-70 and a portion of Parcel 43-72 will meet the evaluation criteria listed above The road will extend approximately 4,300 feet with one stream crossing Approximately 1,800 feet of this proposed route would follow a proposed road shown on the Generalized Development Plan for the approved re-zoning for Rocky Run Village that would abut Stafford Lakes

The conceptual cost estimate for this road is $5,700,000, including a 30% contingency

Should the Board wish to pursue this option, staff recommends the necessary steps be taken to have this road included in the Transportation Plan This will provide additional authority to staff when exploring the option with other outside agencies and other involved parties

Reduced Reservoir Analysis

Lowering the height of the dam and the associated reservoir elevation will reduce the storage volume from approximately 5 3 billion gallons to 3 8 billion gallons The 28% reduction in water storage capacity lowers the safe yield of the reservoir from about 13 2 million gallons per day (mgd) to 9 6 mgd, or about 27% of the permitted safe yield capacity

Should the dam be constructed to a lower height to reduce construction costs, any future expansion of the reservoir will result in a much larger total project cost due to the difficulty of raising an existing dam At the present time, water supply development costs range from between $5 and $8 million per mgd It is estimated that lowering the dam by 10' will result in the loss of safe yield valued between $18 and $28 8 million The value of this lost safe yield will be much higher in the future It should also be noted that any provisions to facilitate raising the

dam in the future (e g making the dam wider at the base to make it easier to increase the height later) will significantly erode the potential savings listed below

The county actively pursued the environmental permits for this project from 1994 to 2005 We were constantly faced with evolving agency requirements that required additional study and project concessions and resulted in delaying the start of construction, increasing the project cost, and reducing the safe yield Reducing the scope of the project without a plan to construct the full permitted reservoir in the future will very likely result in requiring us to amend the permits issued by the various regulatory agencies Should the county later wish to raise the reservoir, we will be required to comply with much stricter permitting regulations then in effect

As requested, staff examined projected safe yield requirements in light of the recently adopted Urban Service Area (USA) boundaries While the removal of the Widewater area from the USA results in a significant decrease in total dwelling units (DU) in the county, there is no effect on the safe yield requirements since that area was planned to be served from a local public water supply system using wells as the source of supply Planning staff has determined that other proposed changes to the USA boundaries represent approximately a 0 7% increase (22,395 vs 22,549) to the DU total This increase could become greater if areas are added back into the USA (e g Westlake) before the plan is adopted Future re-zonings or USA additions by this or other Boards could also increase the DU total as well

Reducing the height of the dam by 10' will result in reducing the quantity of work in many areas of the project by as much as 10%, although the effect upon other areas of the project would be negligible The saddle dike proposed along Rocky Run Road on the west side of the reservoir would be eliminated

The major impacts and estimated savings are detailed below Construction cost reduction values have been adjusted to reflect the rise in construction costs of 8% per year and include a 15% contingency

Dam, spillway & outlet works	$3,387,900
Saddle Dike	$ 667,400
Land Acquisition	$ 918,300
Land Clearing	$ 693,000
Total Savings	**$5,666,600**

The estimated savings presented herein were prepared using information currently available and do not reflect detailed engineering analysis Should the Board wish to pursue this option further, more investigation would be required to determine the actual savings from land acquisition and the construction of the dam

Based upon the analysis of water supply requirements with the proposed Comprehensive Plan revision, staff believes that Stafford County will ultimately need the entire 13 2 mgd of safe

yield provided by the Rocky Pen Run Reservoir constructed to a full pool elevation of 230' Staff also believes that a plan which permanently lowers the reservoir elevation to 220' by lowering the crest of the dam will result in a future water supply deficit similar to the one the county currently faces Furthermore, if a decision is later made to raise the dam and reservoir elevation to 230', proceeding with the project in this manner will result in greatly escalating the overall project complexity and cost, and could create impacts to our environmental permits For these reasons, staff does not recommend this approach

Recent discussions with the design team of URS and Schnabel have raised the possibility of an alternative approach to constructing the dam that may result in significant initial savings without adding substantially to the total project cost or creating permitting difficulties when developing the reservoir to the full extent in the future The basic concept is outlined below

- Construct the dam and outlet works to the full height necessary to support a reservoir with an elevation of 230' (the current proposed elevation)
- Construct the spillway to operate with a full reservoir elevation of 220' The initial spillway would be constructed in a manner that facilitates modifications to raise the spillway elevation to 230' in the future
- Acquire property and clear the reservoir to the 232' elevation as is the current plan
- Construct the saddle dike along Rocky Run Road during the initial stage of construction

Under this scenario, the reservoir would operate with a full pool elevation of 220' and have a safe yield of 9 6 mgd In the event of a significant precipitation event, reservoir storage between 220' and 230' will replace spillway capacity and allow us to construct a much smaller spillway and stilling basin This concept has the potential to save between $5 and $10 million in initial construction costs, without adding significantly to the total future construction cost of the project The lower financed cost for the project has the potential to reduce availability fees by between $375 and $750 per DU Furthermore, the designed phasing plan for construction should allow us to avoid amending our environmental permits

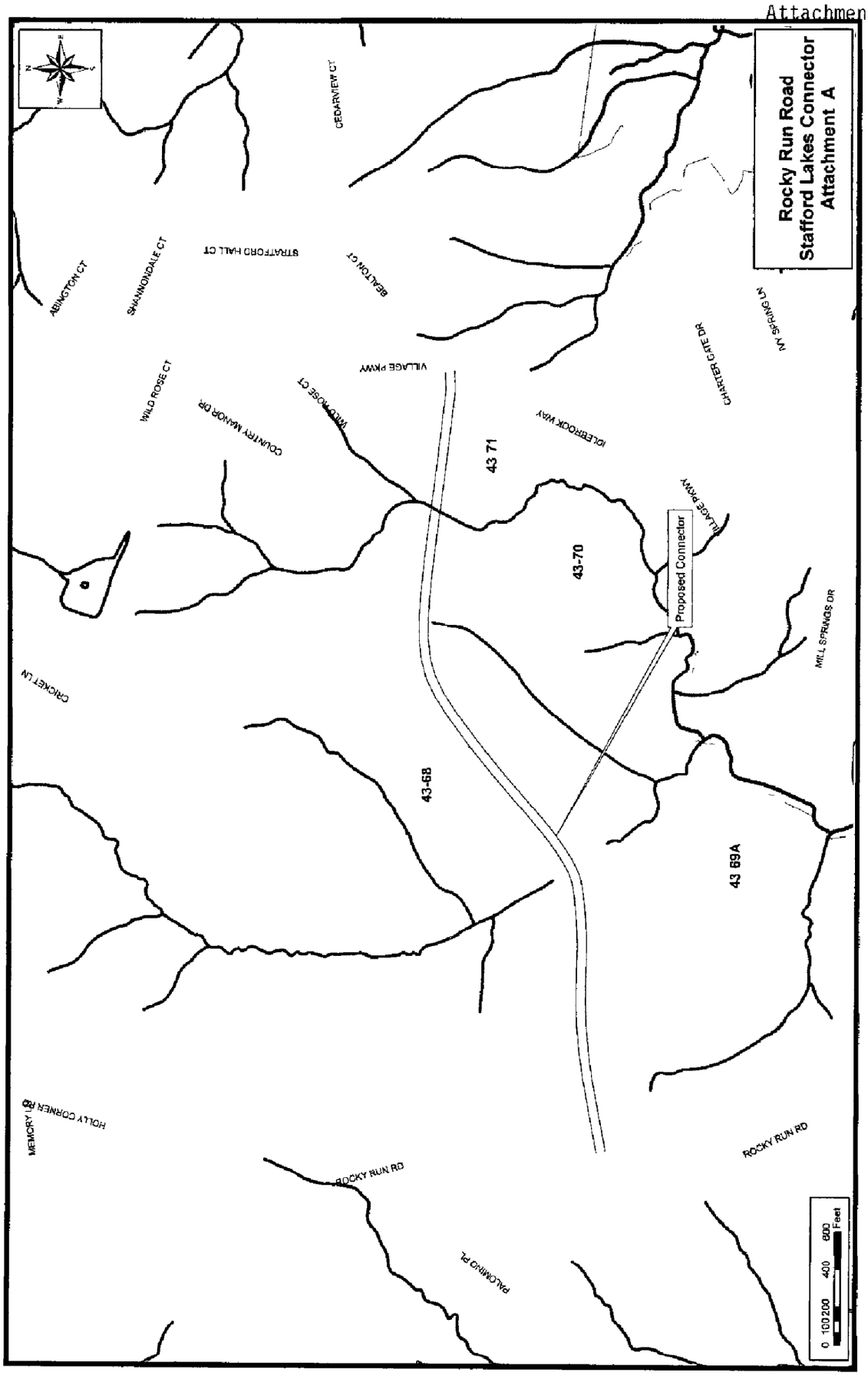
The safe yield of 9 6 mgd for the initial phase is adequate to support the treatment facility being designed with a capacity of 10 mgd Based upon historical patterns of water use in the county, this should be sufficient to meet water supply and treatment demands for approximately 20 years

The design team is currently evaluating this option in greater detail

Should you have any additional questions, please contact me

MPN KCD HLC kd

Attachments (2)


Rocky Run Road
Stafford Lakes Connector
Attachment A
Proposed Connector
43 71
43-70
43-68
43 69A
CEDARVIEW CT
ABINGTON CT
SHANNONDALE CT
STRATFORD HALL CT
BEALTON CT
VILLAGE PKWY
WILD ROSE CT
COUNTRY MANOR DR
WILDROSE CT
IDLEBROOK WAY
CHATTERGATE DR
MT SPRING LN
MILL SPRINGS DR
CRICKET LN
HOLLY CORNER RD
MEMORY LN
ROCKY RUN RD
PALOMINO PL
0 100 200 400 800 Feet

Road Study Report for Proposed Rocky Pen Run Reservoir

Stafford County
Virginia
Department of Utilities

April 26, 2005

Prepared for
Stafford County
Department of Utilities
by
Dewberry

Dewberry

Table of Contents

1.0 Introduction

1.1 Rocky Pen Run Reservoir Background

Stafford County is one of the fastest growing counties in the state of Virginia In order to provide water for previously approved and future projects, the County must plan to provide a safe and sufficient water supply system A key component of the County's planned water supply system is the Rocky Pen Run Reservoir, which has been identified as the future water supply source for the last 15 years

Rocky Pen Run Reservoir will be impounded by construction of a dam approximately 2,000 feet upstream of the mouth of Rocky Pen Run, north of the Rappahannock River in Stafford County, Virginia (see Appendix C) At a normal pool elevation of 230 feet mean sea level (msl), the reservoir surface area will be 503 acres and its total volume will be 5 29 billion gallons Roller compacted concrete (RCC) construction has been proposed for the dam, which is planned to be 130 feet in height and 1,200 feet in length

The Rocky Pen Run Reservoir will be operated as an off-stream water storage reservoir from water pumped from the Rappahannock River during periods of high instream flow Because of its small drainage area (5 18 sq miles), the water yield from this reservoir will come primarily from water pumped from the Rappahannock River River withdrawals will be restricted by permitted minimum instream flow levels Raw water will be withdrawn from the reservoir and treated as required to meet the County's water demands The reservoir will be continually refilled with water withdrawn from the Rappahannock River and pumped into the reservoir

A 40 million gallon per day (mgd) Rappahannock River Pump Station will be located on the north shore of the river, approximately 4,500 feet downstream of the mouth of Horsepen Run and 10,000 feet upstream of the mouth of Rocky Pen Run This pump station will draw water from the river, and pump it to an outfall on the reservoir shoreline through a 48-inch diameter, 2,600 foot long raw water pipeline

A 30 mgd capacity raw water pump station would be located on the east side of the Rocky Pen Run valley below the dam site A 36-inch diameter raw water pipeline approximately 2,000 feet long would run from the pump station to the water treatment plant site The water treatment plant site would be located east of the dam site, on an approximate 20-acre site at

the south end of Route 656 The ultimate capacity of the treatment plant would be approximately 25 mgd, in order to treat projected maximum day demand From the treatment plant site, a 42-inch diameter finished water pipeline would follow Routes 656 and 654 north for approximately 13,000 feet to U S Route 17, where it would connect to the County's existing water distribution system

1.2 Purpose of Road Study

The reservoir drainage area of 5 18 square miles is generally bounded by State Route 655 to the northwest, U S Route 17 to the northeast, State Routes 654 and 656 to the east and State Route 654 also to the west (see Appendix C) Route 654 crosses the reservoir pool area approximately 3,000 feet upstream of the dam site, and will be flooded to a maximum depth of approximately 116 feet by the reservoir when filled

Currently, Route 654 is being used as a shortcut to Warrenton Road (U S Route 17) and its interchange with I-95 via Sanford Drive (Route 670) by approximately 50 residential properties in and around Old Banks and Rivergate communities, located west of the proposed reservoir (see Appendix B) The direct access for the residents of these homes would be eliminated when the proposed reservoir is filled with water

Therefore, this report focuses on the immediate impact on travel along Route 654 based on the elimination of this shortcut Other potential impacts will be discussed in section 1 3 of this report It is important to note that the dual purposes of this study are

1 Quantify the travel time impacts on the residents of the approximately 50 properties whose preferred route would be eliminated by the closing of Route 654
2 Identify and evaluate other alternative routes of access from and to U S Route 17 and its interchange with I-95

1.3 Potential Impacts

While the main focus of this study is to assess the impacts to residents due to the proposed closure of a section of Route 654 due to filling Rocky Pen Run Reservoir, other impacts have been considered and are briefly discussed below

1 **Permanent Impacts** – The closure of Route 654 (heading towards Route 656) will require any residents within Old Banks and Rivergate communities to use an alternative route to access U S Route 17 and its interchange with I-95 In addition, it was noted that the current

roadway network is sometimes used as a reliever for U S Route 17 during major incidences However, the frequency of such events was considered to be minimal It is also important to note that the primary function of the existing roads is the connectivity of the local residential traffic The function as a reliever would be eliminated with the proposed reservoir As stated above, the permanent impacts to residents are the primary focus of this report and are addressed in greater detail elsewhere in this report

2 **Temporary Construction Impacts** – Overland access to both the east and west dam abutments will be required for construction and long-term inspection and maintenance of the dam From the east, a new private all weather access road will be constructed from the end of Route 656 to the abutment From the west, access could be provided either across the top of the dam or by a second road constructed from Route 654, although it is likely that access will be provided across the top of the dam During construction, additional temporary construction access roads are likely to be required between staging, storage, quarry, rock crushing and material stockpile areas The number and location of these temporary roads will be determined as the dam design nears completion The County will examine ways to reduce these temporary construction impacts by imposing time of year, weight limit, and route restrictions on the contractor If necessary, improvements to the existing roadways will be included in the dam design as well Specific details on ways to reduce temporary construction impacts will be included in the dam design and provided to state and local authorities for review

3 **Long-Term Development Impacts** – Currently, only the area north of the reservoir (around Stafford Lakes Village) has been zoned for suburban residential This area where the main peninsula will be created by the proposed reservoir will be served by Village Parkway and will not be impacted by closing Route 654 The remaining surrounding areas are zoned for agricultural use, severely restricting their development potential (see Appendix B) Should any future rezoning of these areas take place, they would be accompanied by road proffers to offset impacts on the existing road networks The current roadway network in addition to several proposed roads such as Celebrate Virginia Parkway and Village Parkway can handle minimal amount of weekend recreational traffic attracted by the proposed reservoir

4 **Water Treatment Plant Impacts** – The water treatment plant site would be located east of the dam site, on an approximate 20-acre site at the south end of Greenbank Road (Route 656) There will be increased traffic from operations, maintenance and delivery traffic to this site, however, as the total number of employees assigned to the facility will be less than ten, the total increase in trips per day is estimated to be less than fifty The current road network has enough capacity to accommodate the added trips

5 **Emergency Response** – The primary fire and rescue responder for the area affected by the proposed reservoir was identified as the Hartwood Fire Company (Company 6) located at 67 Hartwood Church Road This emergency response center is located approximately 2 75 miles north of the intersection of Holly Corner Road (Route 655) and U S Route 17 (identified as Node 5 in Appendix C) The shortest route from this center to the intersection of Rocky Run Road and River Acres Lane (Node 1) was determined to be approximately 6 4 miles via southbound U S Route 17 to Route 655 and eventually to Route 654 In conversations with the emergency response team, they stated that the proposed reservoir would not affect response times or route selection Response via Greenbank Road (Route 656) depends on how far east the address is located on Route 654 past Brookview Lane Addresses further east of Brookview Lane are nearly always responded to via Route 656 Due to the area's current low population density, the response team indicated that there was minimal likelihood that a second call for emergency assistance would occur on the opposite side of the reservoir while responding to another call The Company 6 staff did not feel the lost connectivity of Route 654 would impair their ability to respond to an emergency situation should U S Route 17 be blocked between Routes 655 and 656

1.4 Alternatives

As stated in the introduction, the dual purposes of this study are to determine the travel time impacts on the residents along Route 654 and to identify and evaluate alternative routes of access to U S Route 17 and its interchange with I-95 Two alternatives were identified as the most feasible options in providing access to the interchange when Rocky Run Road is closed by the proposed reservoir

1 **Existing Road Network Option** – Evaluation of the existing optional route for access to Warrenton Road (U S Route 17) and I-95 Interchange via westbound Rocky Run Road (Route 654) to northbound Holly Corner Road (Route 655) and eventually to Warrenton Road (U S Route 17) This option involves no significant construction and its analysis focuses on the study of both the current travel time and the proposed optional route travel time utilizing the existing road network

2 **New Road Network Option** – Identification and evaluation of alternative routes providing access to the U S Route 17 and I-95 interchange via new road alternatives around or over the proposed reservoir including bridge crossing options

2.0 Existing Network Option

2.1 Introduction

The existing network option involves evaluating the existing optional route for access to Warrenton Road (U S Route 17) and I-95 Interchange via west bound Rocky Run Road (Route 654) to north bound Holly Corner Road (Route 655) to U S Route 17

A travel time study was conducted for both the morning and evening peak rush-hours to determine the current as well as the proposed optional route travel times Generally, a travel time study determines the amount of time required to travel from one point to another on a given route See Appendix A for definition of terms related to travel time studies

In order to define the existing study points, 6 nodes were defined for the existing roadway intersections as follows and as shown in the Road Study Exhibit (Appendix C)

- **Node 1** – Intersection of Rocky Run Road (Route 654) and River Acres Lane
- **Node 2** – Intersection of Rocky Run Road (Route 654) and Greenbank Road (Route 656)
- **Node 3** – Intersection of Warrenton Road (U S Route 17) and Sanford Drive (Route 670)
- **Node 4** – Intersection of Warrenton Road (U S Route 17) and Greenbank Road (Route 656)
- **Node 5** – Intersection of Warrenton Road (U S Route 17) and Holly Corner Road (Route 655)

- **Node 6** – Intersection of Rocky Run Road (Route 654) and Holly Corner Road (Route 655)

To obtain travel times between nodes, 3 segments were defined as follows

- **Segment 1** – Node 1 to Node 2 and Node 2 to Node 3 (existing "shortcut")
- **Segment 2** – Node 1 to Node 2, Node 2 to Node 4 and Node 4 to Node 3
- **Segment 3** – Node 1 to Node 6, Node 6 to Node 5, Node 5 to Node 4 and Node 4 to Node 3 (alternative route option)

The segment sections were further defined as either **Depart** (concentrating on the departing morning rush-hour travel time) or **Return** (concentrating on the returning afternoon rush-hour travel time)

In addition to the travel time study, a node-split study was conducted at Node 6 (see Appendix C) to determine the approximate distribution of vehicles that continue north through Node 6 on Holly Corner Road and those that proceed south on Rocky Run Road This node study was performed to gain a sense of the amount of traffic that might access the U S Route 17 and I-95 interchange via each of these routes The purpose of this simple node split study was generally to assess driving behaviors of residents regarding traffic distribution at this intersection

2.2 Methodology

The **"Average-Speed Technique"** was utilized in obtaining the travel time for this study as outlined in the Garber & Hoel "Traffic & Highway Engineering" book This technique involves driving the test car along the length of the test section at a speed that, in the opinion of the driver, is the average speed of the traffic stream
The speed includes all delays including signal delays and stops at intersections The total time required to traverse the test section is noted The test run is repeated a number of times for the different peak rush-hour travel times and an average time is recorded as the final travel time Generally, the travel time is obtained by the observer's use of a stop watch The travel time is recorded and the process is repeated as needed

The travel sections for this study were divided into nodes and the different nodes formed the three study segments Travel times were recorded on Monday, Wednesday and Friday for both the morning and evening rush-hour periods during the week of October 18, 2004, the goal being to take measurements in which typical work and school traffic

patterns exist Weekend studies were not conducted based upon the assumption that the weekday peak traffic volume exceeded the weekend volume

2.3 Results

Average travel times were obtained for the three segments as defined in the methodology portion of this report and is outlined below in Table 2 3-1 The AM peak travel time was based on traffic originating from Node 1 to access the U S Route 17 and I-95 Interchange while the PM peak travel time was based on traffic returning back to Node 1 from the interchange (see Appendix C for node locations) The actual travel time data is shown on Table 2 3-1 below

Segment	Peak Hour	Monday Travel Time Min Sec	Wednesday Travel Time Min Sec	Friday Travel Time Min Sec	Average Travel Time Min Sec	Total[1] Time Increase Min Sec
1 Depart	AM	9 30	10 30	10 05	**10 02**	**N/A**
2 Depart	AM	11 16	9 48	13 07	**11 24**	**1:22**
3 Depart	AM	13 32	14 19	14 56	**14 16**	**4 14**
1 Return	PM	10 00	10 16	9 40	**9 59**	**N/A**
2 Return	PM	11 52	11 17	12 43	**11:57**	**1 58**
3 Return	PM	14 16	14 01	13 55	**14.04**	**4 05**

Table 2 3-1 Average Travel Time

- **Segment 1** – Rocky Run Road (Route 654) to Greenbank Road (Route 656) via Sanford Drive (Route 670) to I-95 (existing "shortcut")
- **Segment 2** – Rocky Run Road (Route 654) to Greenbank Road (Route 656) via Warrenton Road (U S Route 17) to I-95
- **Segment 3** – Rocky Run Road (Route 654) to Holly Corner Road (Route 655) via Warrenton Road (U S Route 17) to I-95 (alternative route option)

1 Increase in travel time due to closing of Route 654 through the reservoir area assuming no other road improvements

In addition to the travel time study, a node split study was conducted at the intersection of Routes 655 and 654 (Node 6) The Node 6 traffic distribution study was conducted to identify the approximate distribution of vehicles that use Rocky Run Road (Route 654) to access the Warrenton Road (U S Route 17) and I-95 Interchange from Holly Corner Road (Route 655) Table 2 3-2 shows the actual number of vehicles observed during the study The right turn movement was the actual turn onto southbound Rocky Run Road from Holly Corner Road The traffic split study was conducted in the early morning to assess the behavior of commuters traveling to I-95

Node	Day and Peak Hour	Through movement continuing north on Holly Corner Road from Node 6. Total Number of Vehicles	Right Turn Movement from Node 6 on Holly Corner Road onto Rocky Run Road Total Number of Vehicles
6	Monday AM	15	1
6	Wednesday AM	12	0
6	Friday AM	13	0

Table 2 3-2 Node 6 Traffic Distribution Study

The field data confirmed that, virtually almost all of the vehicles during the peak observation period continued north on Holly Corner Road (Route 655) to access the U S Route 17 and I-95 Interchange In addition, the data confirmed the travel preferences on route selections by the current residents in relation to the Decision Impact Area (DIA) discussed in the next section

2.4 Decision Impact Area

The DIA is an approximate location along Rocky Run Road where the travel time would be the same regardless which route was selected either northbound Route 655 or southbound 654 (segment 1 or 3) to access the Warrenton Road (U S Route 17) and I-95 Interchange (see Appendix C for DIA location) This location was determined to be approximately 1300-feet north of Ballard Lane (along Route 654) and 4650-feet north of Node 1 along Route 654 heading towards Route 655 The setting of this location is reinforced by the node split study which confirms that virtually all vehicles continue north on Route 655 to access the I-95 interchange

2.5 Conclusions

Based on the travel time data outlined in Table 2 3-1, the greatest increase in additional travel time required to use the alternate existing routes from any location along any segment was 4 minutes and 14 seconds for the morning rush hour traffic, and 4 minutes and 5 seconds in the afternoon rush hour This increase in travel time was obtained by subtracting the lowest current peak hour travel time of segment 1 from the highest existing optional route travel time of segment 3

3.0 New Network Option

3.1 Introduction

The elimination of the Route 654 connectivity will result in additional average travel time of just over 4 minutes over the alternative of traveling on the existing road network to Holly Corner Road and U S Route 17 as determined in the travel time study The new network option examines build-alternatives that alleviate the additional travel This option involves identification and evaluation of alternatives which provide access to U S Route 17 and I-95 Interchange via new roadway alternatives around and over the proposed reservoir including bridge crossings

3.2 Proposed Alternatives

The alternatives were selected based on constructability, cost, minimal impacts to current residents and their connectivity to the existing roadway network Four options were identified (see Appendix C) that met the selection criteria In addition to the four options, the option of replacing the flooded portion of Route 654 with a bridge along a generally similar alignment was also considered This option would require a 3,500-foot two-lane bridge and the approximate construction cost would be about $20 million It was determined that Option 1 (see below) would function very much like this option, but at about one third less cost Consequently, this similar alignment option was dropped from further consideration

Existing Network Option – Although not under the new network option, this option as previously discussed involves utilizing the existing optional route to access U S Route 17

and I-95 Interchange via westbound Route 654 to northbound Route 655 onto U S Route 17 There is no significant construction involved other than basic construction of two cul-de-sacs at both ends of Route 654 east and west of the proposed reservoir (see Appendix D for approximate cost of implementation) In addition to the existing network option, four alternatives were identified and are discussed below

Option 1 – This alternative involves connecting Hassle Lane to Rocky Run Road (east of the reservoir) with a bridge crossing and new approach roadways Improvements would be needed on Hassle Lane to convert it to a collector road

Option 2 – Involves connecting Hassle Lane to Greenbank Road with a new roadway alignment south of the proposed reservoir with a bridge across the crest of the proposed dam This would require modifications to the design of the roller compacted concrete dam estimated to add $2 2 million in cost to that project In addition to the first bridge, a second bridge may be required over the dam spillway

Option 3 – Involves connecting Hassle Lane to Greenbank Road with a new roadway alignment south of the proposed reservoir with a bridge across Rocky Pen Run Due to the proximity to the Rappahannock River, there are major concerns regarding the environmental impacts of this option In addition, the rugged terrain would require a substantial amount of earthwork and would be considerably difficult to construct

Option 4 – This alternative involves connecting Rocky Run Road (west side of the reservoir) to Village Parkway with a bridge and new roadway alignment west of the proposed reservoir Proposed Village Parkway will traverse through the Stafford Lakes Village and would provide direct access to the I-95 interchange The travel time for this option is comparable to the existing network option which involves no major construction

Appendix D provides new travel times and data on gained travel times for the proposed alternatives compared to the existing network option travel time In addition, approximate lengths of the various options and a general construction cost estimate is provided in this section Qualitative advantages and disadvantages for the proposed alternatives are also listed for each option See Table D-1 in Appendix D for a detailed summary

4.0 Conclusion and Summary

Rocky Pen Run Reservoir is a key component of the County's planned water supply system, which has been identified as the County's preferred water supply option for the last 15 years It is a vital project necessary for the County to keep pace with the commercial and residential growth currently approved and under consideration Consultation on the project has taken place between the Virginia Department of Transportation (VDOT) and Stafford County VDOT comments have been addressed both in the report and directly to the Fredericksburg VDOT residency office The dual purposes of this study have been discussed in determining both the travel times and evaluating alternative routes The greatest increase in travel time required to use the alternate existing route as a result of flooding Route 654 was determined as 4 minutes and 14 seconds

In addition, after consultations with the emergency response team, it was concluded that the proposed reservoir does not affect response times or route selection to reach residents The lowest cost option was identified as the existing road network option which would involve minimal construction as previously discussed In addition, four alternatives have been discussed and their respective implementation costs provided

5.0 Recommendation

The existing road network option is the recommended option of this report based on the fact that the average increase in commuter travel time required to use this alternative as a result of flooding Route 654 is just over 4 minutes The negative aspects of this additional travel time associated with the existing network option are minimal The four new road construction options do not provide significant reduction in total travel time compared to the current travel time of the shortest route (Route 654 to I-95 interchange via Route 670) The cost to implement these options would be significant considering the maximum net gain of 3 minutes 21 seconds compared to using Holly Corner Road to U S Route 17 If the County chooses to construct a new road, the road over the dam (Option 2) would the most cost effective and feasible option with the travel time most comparable to the existing time

Appendix A

Definition of Terms Related to Travel Time Studies

1 **Travel Time** – is the time taken by a vehicle to traverse a given section of a highway

2 **Peak-Hour Traffic** – traffic volumes for an interval of time shorter than a day

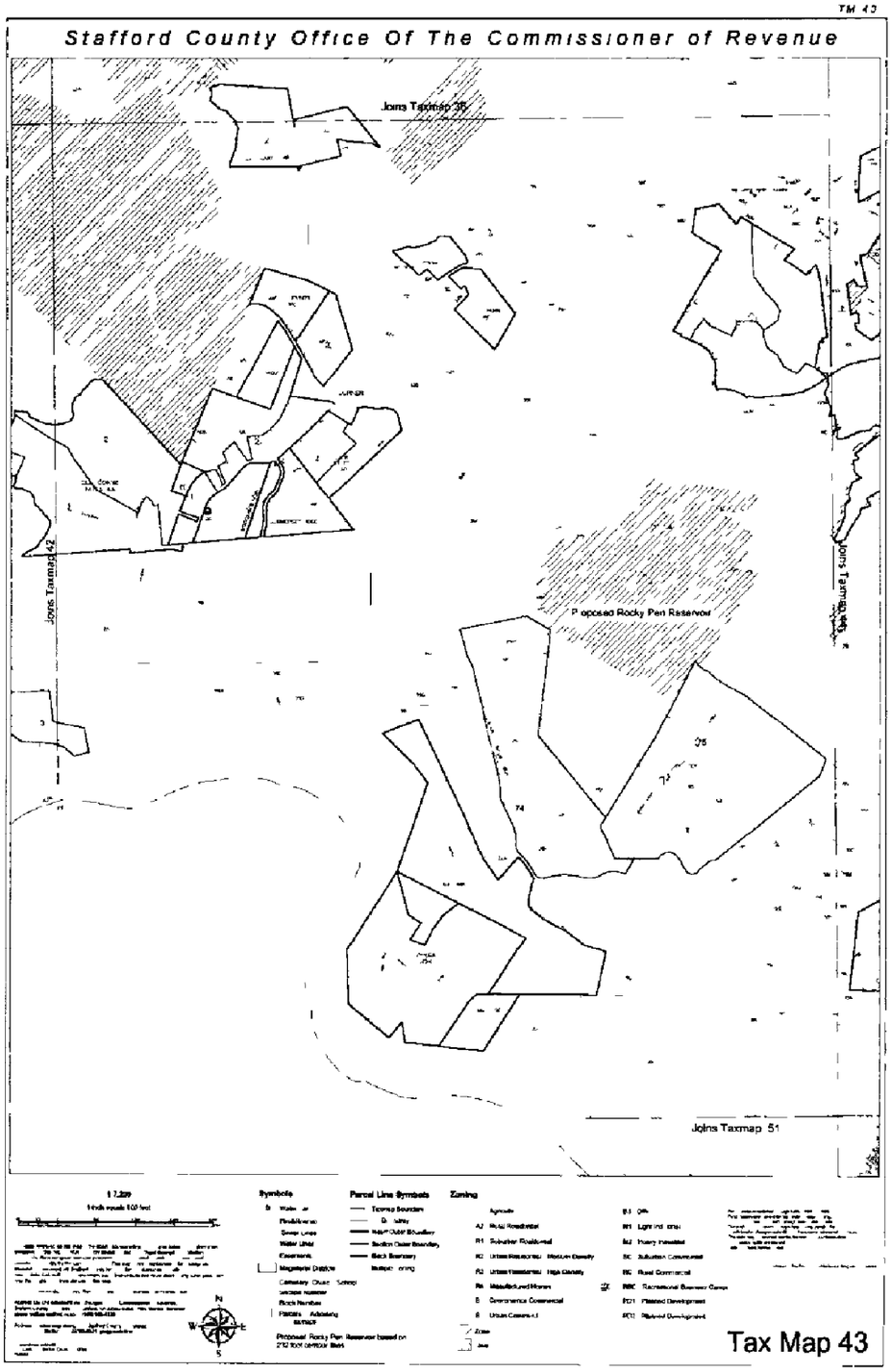
3 **Average Travel Speed** – is the speed including all delays and travel time over a given roadway section

4 **Running Time** – is the time a vehicle is actually in motion while traversing a given section of a highway

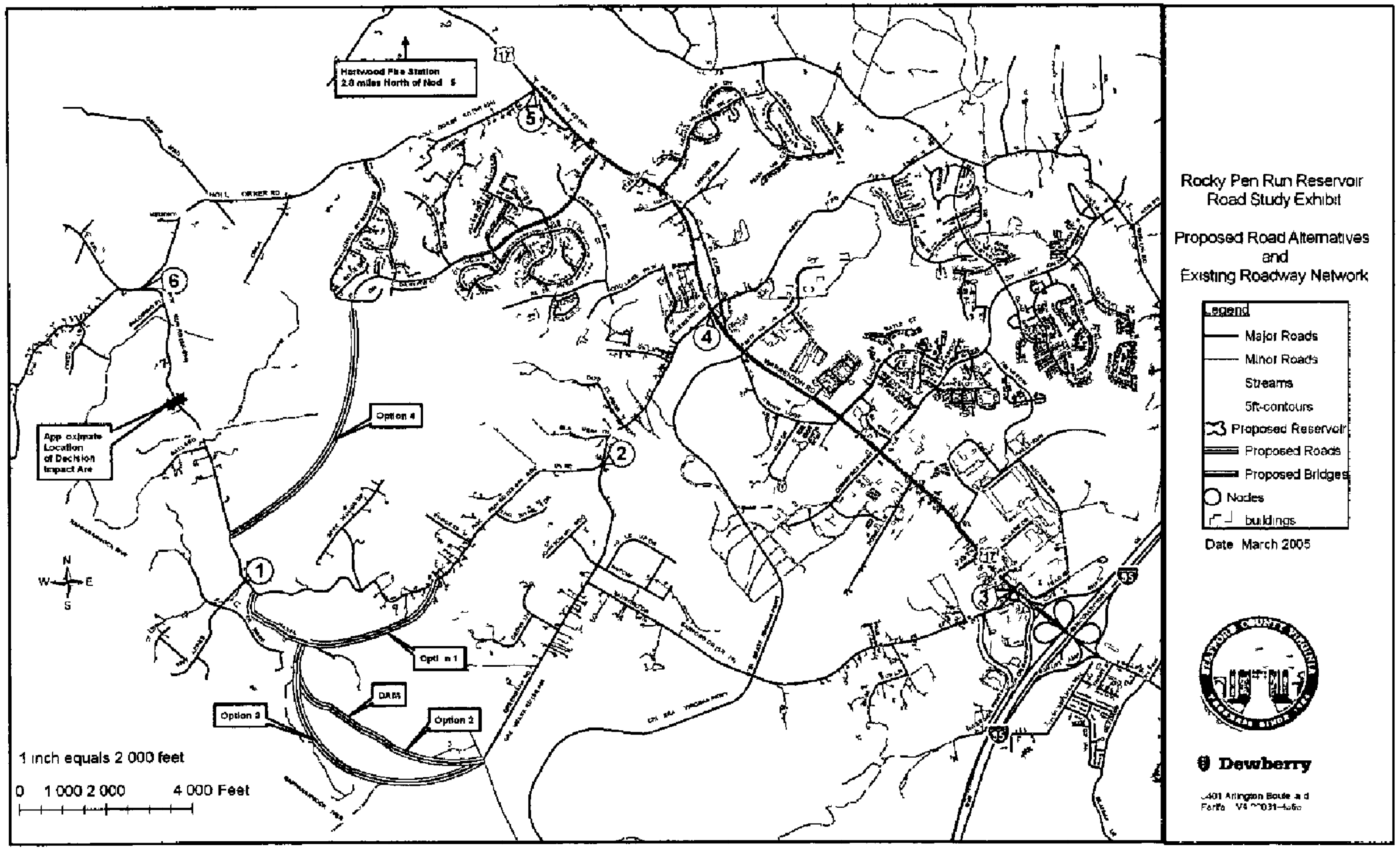
5 **Delay** – is the time lost by a vehicle due to causes beyond the control of the driver

6 **Stopped-time delay** – is the part of the delay during which the vehicle is at rest

7 **Operational delay** – is the part of the delay caused by the impedance of other traffic


TM 43
Stafford County Office Of The Commissioner of Revenue
Joins Taxmap 35
Joins Taxmap 42
Proposed Rocky Pen Reservoir
Joins Taxmap 51
Tax Map 43

Appendix C


Hartwood Fire Station
2.8 miles North of Nod 5
App oximate
Location
of Decision
Impact Are
Option 4
Opti n 1
DAM
Option 3
Option 2
1 inch equals 2 000 feet
0 1 000 2 000 4 000 Feet
N
W
E
S
Rocky Pen Run Reservoir
Road Study Exhibit
Proposed Road Alternatives
and
Existing Roadway Network
Legend
Major Roads
Minor Roads
Streams
5ft-contours
Proposed Reservoir
Proposed Roads
Proposed Bridges
Nodes
buildings
Date March 2005
Dewberry

Appendix D

Proposed Alternatives and Approximate Cost Estimates

Option	Alternative Description	Qualitative Disadvantages	Qualitative Advantages	Total[i] Travel Time Min Sec	Gained[ii] Travel Time Min Sec	Roadway Length (ft)	Bridge Length (ft)	Total[iii] Length (ft)	Roadway Cost (Millions)	Bridge Cost (Millions)	Total Cost (Millions)
-	Existing network option Utilize existing road network without major construction	Minimal increased travel time	Least expensive option	14 16	0	-	-	-	$0 3	$0 0	**$0 3**
1	Connect Hassle Lane to Rocky Run Road with a bridge and approach roadways	Existing properties impacted along Route 654	Least length of new roadway	11 03	3 13	3700	1900	5600	$2 0	$11 0	**$13 0**
2	Connect Hassle Lane to Greenbank Road with a bridge across the crest of the proposed dam and approach roadways	Impacts design of dam in addition to security issues for dam and treatment facility	Maintains the closest travel time compared to the existing time	10 55	3 21	7450	400	7850	$4 5	$3 0	**$9 7[iv]**
3	Connect Hassle Lane to Greenbank Road with a new roadway alignment south of the proposed reservoir with a bridge across Rocky Pen Run	Difficult terrain to construct new roadway Environmental concerns may make this option difficult to permit	No major impact to existing properties	11 36	2 40	8600	600	9200	$6 5	$3 5	**$10 0**
4	Connect Rocky Run Road to Village Parkway with a bridge and new roadway alignment west of the proposed reservoir	Improvements needed on Village Parkway which may not be feasible subdivision plans in final stage of review Minimal benefit in travel time saved	Potential future access for new development	13 25	0 51	5650	1150	6800	$3 5	$7 0	**$10 5**

Table D-1

[i] The "Total Travel Time" is the amount of time it takes to travel the entire length of the defined option For options 1-4, the time is computed from the new travel lengths at an assumed average speed of 25 miles per hour

[ii] The "Gained Travel Time" is the time savings of these new alternatives in comparison to the existing network option travel time (Example if option 4 was selected, the benefit compared to utilizing the existing network option would be a gain of only 51 seconds in travel time)

[iii] Roadway and bridge lengths used are approximate Actual lengths may vary based on existing topography

[iv] Option 2 includes an additional $2 2 million cost impact for dam construction to include roadway across the dam crest