KENVIRONS

PRELIMINARY ENGINEERING REPORT

FOR

SOUTHEASTERN WATER ASSOCIATION

KY 192/KY 1003 WATERLINE REPLACEMENT
&
SANDY GAP/DIXIE BEND P.S. REPLACEMENTS

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TABLE OF CONTENTS

TABLE OF CONTENTS CONT.

LIST OF TABLES

APPENDIX

LIST OF FIGURES

INTRODUCTION

The potable water supply for the eastern half of Pulaski County was initially provided by four water utilities beginning in the latter part of the 1960s. The water providers were Nelson Valley, Elihu-Rush Branch, Tateville and Barnesburg Water Associations. Customer growth and system expansion has been significant over the years for all four utilities. The Public Service Commission, in recognition of the advantages of consolidated operation, sought a merger of these four entities into one water association. The merger was accomplished in 1997, combining the four utilities into the Southeastern Water Association (SWA). The service rates were revised and consolidated to one system-wide rate. SWA now operates from an office location at 147 East Somerset Church Road, Somerset, KY in Pulaski County, KY.

The City of Somerset is the regional provider of treated water in Pulaski County. The raw water is sourced from Lake Cumberland which has essentially unlimited quantity along with excellent quality. SWA purchases all of its treated water from the City of Somerset at a wholesale rate for distribution in their system through eight (8) separate interconnects around the eastern border of the City. Southeastern Water Association serves a majority of eastern Pulaski County, along with a small portion of southeastern Lincoln County. Many of the existing waterlines and pump stations throughout the system are outdated, undersized for the demand needed, and have reached the end of their usable lives. Collectively, the Association is aiming to replace 40,500 Linear Feet (L.F.) of existing 4" PVC, SDR-26 line with 6" and 8" D.I., CL350, and 8" PVC, SDR-17, install 4,000 L.F. of new 4" PVC, SDR-17 waterline, replace three booster pump stations and rehabilitate one booster pump station in this project. The project will focus on the existing line and pump station replacement stated above, but two alternatives have been discussed that would replace an additional 17,000 L.F. of waterline if funds remain at the completion of the original project. This project will be an essential step in supporting the growth of the SWA system.

1.0 PROJECT PLANNING

1.1 Location

Founded in 1798, Pulaski County is one of the oldest counties in the Commonwealth. It is situated in the south central region of Kentucky. Somerset serves as the County Seat for Pulaski County, and is near the geographic center of the County. As stated previously, Southeastern Water Association is a rural water utility system. The purpose of the SWA is to establish, develop, and operate a distribution system for its customers in eastern Pulaski County as well as a small portion of southeastern Lincoln County. Since the inception of the SWA, there has been a steady rise in demand for clean, potable drinking water. This project will help Southeastern Water Association support this increase in demand. A location map of the system with proposed project sites and additive alternates is shown in Figure 1 in the Appendix.

1.2 Environmental Resources Present

The proposed project is located across the eastern portion of Pulaski County. According to the Soil Survey of Pulaski County, Kentucky, prepared by the USDA Soil Conservation Service, the major natural resources in the area are soil, water, and timber. The largest and most important of these resources is the soil, as it is the main resource used for the area's largest industries, farming and raising livestock. Pulaski County has an approximate land area of 653 square miles. Of that, 13 square miles is covered by Lake Cumberland, and approximately 372 square miles is designated as farmland. The farms are primarily family owned, and the primary crops consist of tobacco, beans, cucumbers, and bell peppers. Approximately 50 percent of farm income is derived from the sale of crops, principally tobacco, while the remaining 50 percent is obtained from livestock and livestock products. Cattle and dairy products account for 94 percent of the livestock income in the county. This project will replace many of the old and undersized water lines, so that Pulaski County farmers and residents can continue to grow and maintain their production of products that are essential to the Commonwealth of Kentucky. A more detailed Environmental Report will be completed at a later date. The Environmental Report focuses closely on many more aspects of the environment, and how each respective resource will be affected by the project.

1.3 Population Trends

The population of Pulaski County according to the 2010 Census conducted by the United States Census Bureau was 63,063. The Southeaster Water Association currently services 7,233 customers or approximately 15,000 people. This is roughly 24 percent of the Pulaski County population. Pulaski County has seen a growth in population since 1970 at a rate of approximately 1.32 percent per year. A population and water usage projection graph is attached as Figure 2 in the Appendix. Assuming the same trend will continue, the current water lines will not be able to withstand the growth. This project will allow Pulaski County to grow at its current rate and provide users with a sufficient potable water supply.

2.0 EXISTING FACILITIES

2.1 Location Map

A Location Map for the Southeastern Water Association distribution system is attached in the Appendix as Figure 1.

2.2 History

As stated previously, Pulaski County is one of the oldest counties in the Commonwealth of Kentucky. As such, clean drinking water has been supplied to both residential and commercial customers across Pulaski County for many years, with some connections dating back to the 1950's. A potable water supply for the eastern half of Pulaski County was initially provided by four water utilities beginning in the latter part of the 1960s. The four water utilities were Nelson Valley, Elihu-Rush Branch, Tateville and Barnesburg Water Associations. Due to the advantages of consolidated operation among water utilities, the Public Service Commission sought a merger of these four water associations.

The merger was accomplished in 1997, and combined these four utilities into the Southeastern Water Association. Many of the waterlines to be replaced as part of this project have been in place since prior to the merger and the demand has outgrown what the existing line can efficiently deliver. This project will upgrade these lines and booster pump stations to help SWA run a more efficient, cost effective system.

2.3 Condition of Existing Facilities

As stated in previous sections, a majority of the existing distribution system was constructed prior to the merger that created Southeastern Water Association. Since then, only a select few of the distribution system lines and components have been replaced. Several waterlines have been extended to the outskirts of eastern Pulaski County, which puts more stress on these existing lines due to the increased demand throughout the system. The existing lines that are to be replaced in this project have a lower pressure classification than what is needed to carry the demand in the system in an efficient manner. These lines need to be replaced to avoid further leaks and breaks due to high pressure. With these line and pump station replacements, Southeastern Water Association will be improving their system for future demand needs and growth.

The following description is an overview of the current system components and operating conditions:

2.3.1 Water Supply and Treatment: The City of Somerset is the regional provider of treated water in Pulaski County. The raw water is sourced from Lake Cumberland, has essentially unlimited quantity along with excellent quality. SWA purchases all of its treated water from Somerset at a wholesale rate for distribution in their system through eight (8) separate interconnects around the eastern border of the City.

The Somerset Water Treatment Plant (WTP) is located along the banks of Lake Cumberland between U.S. 27 and Old Monticello Road. The plant was originally constructed in 1957 with the first major expansion occurring in 1996 that increased the rated capacity to 10.0 Million Gallons per Day (MGD). The WTP is currently undergoing a second major expansion that will increase the rated treatment capacity to 16.0 MGD, with the ability to easily expand to 20.0 MGD in the future. The current average daily production is approximately 7.25 MGD. As an aside, the WTP also produces water for three other water utilities in the area, Eubanks Water System, Science Hill Water Works and Western Pulaski County Water District, which collectively use approximately 2.2 MGD, or about 30 percent of the daily production volumes. Using data gathered from the Southeastern Water Association's monthly operating reports for 2016, the treated water sold to SWA was:

Total Annual Volume (approx.): 512,474,000 Gallons
Daily Average Volume: 1,404,000 Gallons per Day
Daily Average during Maximum Month (July): 1,674,000 Gallons per Day
Maximum Day (05/31/16): 1,808,100 Gallons

2.3.2 Storage: Southeastern Water Association currently has eleven (11) water storage tanks that serve as finished water storage facilities. All finished water is supplied by the City of Somerset through various interconnects and is pumped to each of the water storage tanks in the system. The construction dates for these tanks range from 1970-2008 and are regularly inspected to ensure that they are up to code. The volumes of the eleven tanks across the system vary from 50,000 to 400,000 gallons and have overflow elevations ranging from 1,290'-1,420' above mean sea level.

2.3.3 Pumping Stations: The Southeastern Water Association system has eleven (11) pumping stations located in their distribution system. These pumps are located throughout the system and range in performance from 80 gallons per minute (GPM) to 550 GPM. These pumps maintain the water level in the water storage tanks, which sets the hydraulic grade line that drives the water throughout the extents of the system. While these booster pump stations have performed well over the years, they have begun to show their age and cannot efficiently meet the increased demands in the system. Based on monthly operating reports from the Association, the distributed water that passed through these pump stations are as follows:

KY 192 Pump Station:
Annual Volume: 26,260,400 Gallons
Daily Average Volume: 72,000 Gallons per Day (GPD)
Daily Average during Maximum Month (July): 85,800 GPD
Maximum Day (05/31/16): 92,700 GPD

Sandy Gap Pump Station:
Annual Volume: 50,271,000 Gallons
Daily Average Volume: 137,700 Gallons per Day (GPD)
Daily Average during Maximum Month (July): 164,200 GPD
Maximum Day (05/31/16): 177,300 GPD

Dixie Bend Pump Station:
Annual Volume: 45,812,500 Gallons
Daily Average Volume: 125,500 Gallons per Day (GPD)
Daily Average during Maximum Month (July): 149,600 GPD
Maximum Day (05/31/16): 161,600 GPD

Dahl Pump Station:
Annual Volume: 73,730,250 Gallons
Daily Average Volume: 202,000 Gallons per Day (GPD)
Daily Average during Maximum Month (July): 240,800 GPD
Maximum Day (05/31/16): 260,100 GPD

The pumps at KY 192, Sandy Gap, Dixie Bend, and Dahl Pump Stations generally run at the rate of 80, 100, 100, and 190 GPM, respectively. At these pumping rates, the approximate duration of the pumps operations at these four pump stations during 2016 was:

KY 192 Pump Station:

Annual Average Day: 15 hours (63% of capacity)
Maximum Month Average Day: 18 hours (75% of capacity)
Maximum Day: 19 hours (80% of capacity)

Sandy Gap Pump Station:

Annual Average Day: 23 hours (95% of capacity)
Maximum Month Average Day: 24 hours (100% of capacity)
Maximum Day: 24 hours (100% of capacity)

Dixie Bend Pump Station:

Annual Average Day: 21 hours (87% of capacity)
Maximum Month Average Day: 24 hours (100% of capacity)
Maximum Day: 24 hours (100% of capacity)

Dahl Pump Station:

Annual Average Day: 18 hours (74% of capacity)
Maximum Month Average Day: 21 hours (88% of capacity)
Maximum Day: 23 hours (95% of capacity)

2.3.4 Distribution System: As seen by the information shown in Section 2.3.1, the SWA water distribution system carries a large volume of water through an aging and undersized network of lines. Without the implementation of this project, these lines will continue to age and deteriorate costing the Association money for this additional maintenance. The aging, inefficient lines will lead to reduced hydraulic transmission capacity, lower system pressures, and overall poor system performance. The current distribution system network totals around 440 miles of water distribution lines with nearly 70 percent being diameters 4" and less. This project will replace more than 8 miles of these existing, undersized 4" lines so that the Association may grow and provide existing customers with safe, clean drinking water in the quantities they desire.

2.4 Financial Status of Existing Facilities

The financial status of the Southeastern Water Association is summarized in the budget sheet attached in Figure 3 in the Appendix. The sheet shows the income generated, current operation and maintenance costs, and the existing debts of the utility from 2015.

A Summary Addendum to Preliminary Engineering Report will be completed at a later date. The Summary Addendum will outline the projects feasibility, and determine the final rate increase needed based on more in-depth analysis of the utilities most recent financial statements.

3.0 NEED FOR PROJECT

3.1 Health, Sanitation, and Security

This project will replace over 43,000 L.F. of existing water lines, three booster pump stations, and rehabilitate one pump station. As mentioned in previous sections, many of the existing lines were constructed prior to the merger that created Southeastern Water Association and are undersized for the demand needed across the system at the present time. These inefficient lines can lead to breaks and leaks that can affect the customers' health throughout the SWA service area. The replacement of these aging, undersized lines will ensure that the Association will remain in compliance with federal regulations, and that end users are provided with clean, safe drinking water. After project construction, there are no other known health, sanitation, or security issues faced by the Southeastern water system.

3.2 Aging Infrastructure

The existing KY 192, Sandy Gap, and Dixie Bend booster pump stations have been in place prior to the merger that formed Southeastern Water Association. While each pump station has performed well over the years, they have reached the end of their usable lives due to the increased demand across the system in recent years. The existing Dahl Pump Station was built in 1998 along with the existing Dahl Water Storage Tank. The pump station was constructed with the foresight that the pumps would need upgrading in the future. With the Dahl Pump Station and Tank feeding the Dahl service area as well as the Sandy Gap Pump Station and its service area, Dahl Pump Station no longer has the capacity to meet these demands without rehabilitation. As with the pump stations, the lines that will be replaced along KY 192 and KY 1003 has given the Association many problems with leaks and breaks due to age and increased demand. This project will replace three pump stations and undersized, aging waterlines and rehabilitate one addition pump station to give SWA a more efficient and reliable system that can easily sustain future growth throughout Pulaski County.

3.3 Reasonable Growth

A detailed computer based hydraulic model has been developed for the Southeastern Water Association, and has been updated over several years to reflect current system conditions. The replacement of waterlines, three pump stations, and the rehabilitation of another pump station would allow for the area of eastern Pulaski County to accommodate future growth.

In order to predict potential usage in the future, past population growth rates were analyzed, and this data was expanded using linear regression to develop an estimated future demand based upon the population growth. The future forecast period and hydraulic design basis will be a 20 year period, (although the design life of PVC pipe is much greater) providing an approximation to the year 2037. The population and water usage growth pattern was graphed, and is shown in Figure 2 in the Appendix. According to the graph, the population of Pulaski County will be approximately 78,000 people by the year 2037. The Southeaster Water Association has a current customer base of approximately 7,500 with an average usage of about 1.40 MGD. Assuming the same

population growth pattern of approximately 1.32 percent per year applies, a customer base of approximately 9,500 would require roughly 1.84 MGD by the year 2037. This is an increase of approximately 31 percent over the current demand. Without this project, the Southeastern Water Association will be unable to support this increase in demand with the existing distribution system.

4.0 ALTERNATIVES CONSIDERED

4.1 Description

After consulting with the client, and discussing multiple alternatives, there were three alternatives that were ultimately to be considered. There are two technically feasible alternatives and one technically infeasible alternative to be considered. The alternatives considered to be technically feasible are (1) the proposed plan outlined in this report (waterline and pump station replacement/rehabilitation), or (2) reduce the project to include only the waterlines on KY 192 and Blaze Valley Road and the KY 192 pump station. This second alternative would involve procuring the funding to replace the pump station and waterlines mentioned above, and waiting to replace the additional line on KY 1003 and pump stations at Dixie Bend, Sandy Gap, and Dahl at a later date. The final alternative that could be chosen is not technical in nature, but is an option the client is facing. This alternative is to simply not do the project, and continue the current practice of repairing leaks when they occur (reactive maintenance). This has been a substantial cost for the client due in part to both the intense labor needed to repair lines, as well as in the physical water losses. This option also does not allow for the community to grow and maximize its potential. Since the last option is technically infeasible, only the first options of replacement will be analyzed. Following the evaluation, one of the alternatives will be recommended to the client.

4.2 Design Criteria

Both technically feasible designs must be able to supply the current customer load of approximately 7,500 with the ability to withstand the growth determined in section 3.3 of this report. The current average daily demand for water through the entire system is approximately 1.40 MGD, with a total of 0.54 MGD passing through the pump stations being replaced and upgraded in this project. With a growth rate of approximately 1.32 percent per year, the average daily demand is estimated to grow to 1.84 MGD, with approximately 0.70 MGD passing through the pump stations in this project. The design criteria for each pump station in this project is shown below:

KY 192 Pump Station: 0.30 MGD or 200 GPM
Sandy Gap Pump Station: 0.22 MGD or 150 GPM
Dixie Bend Pump Station: 0.50 MGD or 350 GPM
Dahl Pump Station: 0.36 MGD or 250 GPM

The KY 192 and Dixie Bend Pump Station capacities will be able to handle over two times the estimated maximum daily usage in 2037, while the Sandy Gap and Dahl Pump Stations will be sized based on existing hydraulic capabilities and a future project to be constructed.

By the year 2037, Sandy Gap and Dahl Pump Stations are estimated to need capacities of 400 and 500 GPM, respectively, based on current usage data and population trends. At the present time, the Dahl service area feeds the Sandy Gap service area through a 6" waterline along Dahl-Elrod Road, Coal Pit Road, and KY 1675. Due to the increase in elevation along Coal Pit Road, the capacity of the Sandy Gap Pump Station cannot be increased to 400 GPM for future growth because customers along Coal Pit Road will drop below the required 30 pounds per square inch (psi). The maximum amount of water that can feed Sandy Gap Pump Station and keep Coal Pit Road customers above 30 psi is 150 GPM, the design capacity for this project.

To handle the future growth, a new project has been discussed that will increase the level of service to the Sandy Gap and Dahl service areas. A new transmission main would be built along KY 461, KY 80, and KY 1675 to feed the new Sandy Gap Pump Station and service area and take the burden off of the Dahl Pump Station and service area. More importantly, the elevation change along Coal Pit Road would no longer be an obstacle. In this new project along with the transmission main, a new elevated tank will be constructed and the pumps at the new Sandy Gap Pump Station would be upgraded to allow for 400 GPM. The new pump station at Sandy Gap will be designed to allow these pump upgrades for higher capacity needed at a future date. Therefore, a new structure and piping will not be needed during the later project.

With the future project planned, the Dahl Pump Station will be sized based off feeding only its own service area. After both projects are complete, the Dahl service area will have an estimated maximum daily demand of 0.15 MGD. To account for two times the maximum daily demand, the design capacity for the Dahl Pump Station will be 250 GPM.

The waterlines will be designed to at least the standards of the 2007 edition Recommended Standards for Water Works (10 State Standards). No matter which alternative is chosen, the project will need to fulfill the needs of the client by providing clean drinking water in the quantity required to sustain growth, all while remaining within the budget of the client.

4.3 Map

Figure 4 in the Appendix shows the layout of the waterlines and pump station sites that will be replaced if Alternative 1 (waterline and pump station replacement) is implemented. Figure 5 in the Appendix depicts the layout of lines and pump station that will be replaced if Alternative 2 (reduced project) is chosen.

4.4 Environmental Impacts

The environmental impacts of this project are minimal, as the area has been previously disturbed and the right-of-way for the lines have been previously cleared. However, there are differences in impacts between the two alternatives. Alternative 1 will replace all the lines and pump stations in a single construction period. In this way, the impacts to the environment will be limited to the time of construction. Alternative 2 will require environmental disturbance at two separate time periods. The environmental impact of

Alternative 2 would be greater, due to the necessity of two separate construction periods. Both alternatives were assessed, and the resources that may be potentially affected are streams and local waterways, and the soils surrounding the pipeline right-of-way.

4.5 Land Requirements

The land where the line replacement will be executed is on an existing right-of-way from the Kentucky Department of Transportation and residential land owners. In order to proceed with the project, an encroachment permit from the County and Kentucky Department of Highways will need to be obtained. Locations for each of the pump station sites are to be on easements that will be acquired by the Association prior to construction.

4.6 Potential Construction Problems

Both alternatives would face similar construction issues. The lines that are to be replaced may cause minimal traffic concerns depending on work space in the right-of-way. Utilizing traditional open trench and backfill construction, there could be daily lane closures until the new sections of line were in place, but are not likely. Another concern that was considered while evaluating potential construction problems that each alternative might face is the severity of tree removal. The land area where new lines are to be constructed will be minimal and due to the construction on existing right-of-way, tree removal is not a likely concern. Both alternatives have been analyzed and there are no other foreseeable construction issues beyond these which have been addressed.

4.7 Sustainability Considerations

For sustainability considerations, both alternatives would utilize PVC pipe in their design, when feasible. PVC pipe has many advantages over similar specification metal pipe. Some of these advantages include energy efficiency (both in manufacturing effort as well as pumping costs for owner), NSF sustainability certification, lower purchase and construction costs per liner foot, as well as widely and readily available. PVC pipe is also formed with inert materials, which makes it less susceptible to corrosion. Also, AWWA, an industry leader in water treatment and distribution, has performed and analyzed the results of a recent study concerning the longevity of PVC pipe. The study results showed that PVC pipe has a useful life of well over 100 years. With this product's performance, advantages, and useful design life of at least 50 years, SWA and its potable water customers will be well served for many years to come.

4.8 Cost Estimates

Table 1 on the following page shows the following breakdown of costs associated with the project if Alternative 1 (waterline and pump station replacements) is chosen. The primary costs considered were legal and administrative fees, engineering fees, project construction, contingency, environmental, as well as other miscellaneous costs. Figure 6 in the Appendix shows a detailed Engineer's Opinion of Probable Cost & Estimated User Rate Impact for Alternative 1.

Table 1: Cost Estimate of Alternative 1	
Category	**Cost**
Construction	$2,133,870
Contingency	213,330
Engineering Design Fee	192,500
Construction Observation	96,300
Preliminary Engineering Report	12,000
Legal & Administrative	20,000
Environmental	25,000
Lands & Rights	20,000
Interim Interest	35,000
Total Project Cost	**$2,748,000**

Table 2 below shows the following breakdown of costs associated with the project if Alternative 2 (reduced project) is chosen. The primary costs considered were legal fees, engineering fees, project construction, contingency, environmental, as well as other miscellaneous costs. Figure 7 in the Appendix shows a detailed Engineer's Opinion of Probable Cost & Estimated User Rate Impact for Alternative 2.

Table 2: Cost Estimate of Alternative 2	
Category	**Cost**
Construction	$1,482,490
Contingency	148,110
Engineering Design Fee	192,500
Construction Observation	75,900
Preliminary Engineering Report	12,000
Legal & Administrative	20,000
Environmental	25,000
Lands & Rights	10,000
Interim Interest	25,000
Total Project Cost	**$1,991,000**

5.0 SELECTION OF AN ALTERNATIVE

5.1 Life Cycle Cost Analysis

Tables 3 and 4 show the Life Cycle Cost Analysis for the project alternatives, as well as the values for planning period and discount rate that were used when performing the calculations. To interpret the results of the Life Cycle Cost Analysis, it is important to understand the contextual situation of the analysis. Since both of the alternatives aim to complete the same task, this is considered to be a fixed output analysis. Whichever alternative has the lowest net present value (NPV) is the alternative that should be chosen.

The Annual Operation and Maintenance (O&M) values used in the analysis were obtained by increasing the 2015 O&M values by 2 percent per year for 4 years due to inflation. The same formula was used for the maintenance category with a slight change. For Alternative 1, the maintenance was reduced by 20 percent in 2019 due to the full project completion. For Alternative 2, the maintenance was not reduced at all due to more maintenance needed to run the aging pump stations and increases in materials costs for replacements at the same pump stations. Tables 3 and 4 are the expected values for the first year of operation (2019) for Alternative 1 and 2, respectively.

Table 3: Alternative 1 Life Cycle Cost Analysis

Capital Expense		$2,748,000
Annual O&M		
Wages	$373,200	
Maintenance	98,000	
Insurance	206,700	
Other General & Administrative	98,200	
Customer Billing	109,700	
Directors' Fees	40,100	
Office Expenses	72,200	
Bad Debts	32,500	
Professional Services	75,300	
Tax & License	49,600	
Total O & M Cost	$1,155,500	
USPW Factor	x 18.99	
Present Worth; Annual O&M		$21,942,945
Salvage Value		
Existing Facilities	$21,002,867	
Proposed Improvements	1,280,322	
Total Salvage Value	$22,283,189	
SPPW Factor	x 0.91	
Present Worth; Salvage		$20,277,702
Net Present Value:		**$4,413,243**

Table 4: Alternative 2 Life Cycle Cost Analysis		
Capital Expense		$1,991,000
Annual O&M		
Wages	$373,200	
Maintenance	122,500	
Insurance	206,700	
Other General & Administrative	98,200	
Customer Billing	109,700	
Directors' Fees	40,100	
Office Expenses	72,200	
Bad Debts	32,500	
Professional Services	75,300	
Tax & License	49,600	
Total O & M Cost	$1,180,000	
USPW Factor	x 18.99	
Present Worth; Annual O&M		$22,408,200
Salvage Value		
Existing Facilities	$21,002,867	
Proposed Improvements	889,494	
Total Salvage Value	$21,892,361	
SPPW Factor	x 0.91	
Present Worth; Salvage		$19,922,048
Net Present Value:		**$4,477,152**

Notes and Equations Used in Life Cycle Cost Analysis:

Interest Rate (i) = 0.5%
Planning Period (n) = 20 years
Estimated Maintenance for Alternative 1 = (Existing Maintenance x 1.02^4) x 0.80
Estimated Maintenance for Alternative 2 = Existing Maintenance x 1.02^4
Salvage Value; Existing Facilities = Straight Line Depreciation value from utility's financial statement
Salvage Value; Proposed Improvements = Straight Line Depreciation of construction cost from PER. Assumed life of 50 years, depreciated over 20 years.

$$Net\ Present\ Value = \text{Capital} + (\text{USPW} * \text{Total O\&M}) - (\text{SPPW} * \text{Total Salvage Value})$$

$$Uniform\ Series\ Present\ Worth\ Factor\ (USPW) = \frac{(1+\mathrm{i})^{\mathrm{n}} - 1}{\mathrm{i}(1+\mathrm{i})^{\mathrm{n}}}$$

$$Example\ USPW = \frac{((1+.005)^{20} - 1)}{(.005(1+.005)^{20})} = 18.99$$

$$Single\ Payment\ Present\ Worth\ Factor\ (SPPW) = (1+\mathrm{i})^{-\mathrm{n}}$$

$$Example\ SPPW = (1+.005)^{-20} = 0.91$$

5.2 Non-Monetary Factors

There were two technically feasible alternatives being considered, and there were no foreseeable non-monetary factors that would play a role in this project if either of the project alternatives were chosen.

6.0 PROPOSED PROJECT

6.1 Preliminary Project Design

It is upon recommendation of the project engineer that Alternative 1 (waterline and pump station replacement) be constructed. Based upon current conditions, client budget, environmental impacts, and future forecasting, Alternative 1 will be most effective in meeting the needs of the client. As this project is a drinking water project, the following items need to be addressed:

6.1.1 Project Layout: The primary focus of this project is to replace existing water lines and booster pump stations with new lines and pump stations. Waterlines along KY 192 and KY 1003 have given the Association problems over the years with leaks and breaks due to the lines being undersized and the increased demand in the system. These lines will be replaced and upgraded from 4" PVC, SDR-26 pipe to 8" PVC, SDR-17 and 8" D.I., CL350 pipe along KY 192 and to 6" D.I., CL350 along KY 1003. These lines will be far less susceptible to breaks and leaks due to the upgrade in pressure classification, which currently plague the existing PVC, SDR-26 lines. The new line will also provide increased hydraulic capacity to serve the extents of SWA's system for many years to come. A regulating station and new 4" PVC, SDR-17 waterline on Blaze Valley Road will also be constructed in this project. The connector will let SWA abandon a creek crossing that has caused problems for many years, and allow for all of Blaze Valley Road to be fed by the same water storage tank.

Along with the line replacements and installations, the KY 192, Sandy Gap, and Dixie Bend Pump Stations will be replaced, and the pumps at the existing Dahl Pump Station will be upgraded. The three pump stations have performed well, but have reached the end of their usable lives due to increased demands in these areas of the system. During the original construction of Dahl Pump Station, it was known that the pumps would need to be upgraded at some point in the future and the building was designed for that scenario. New, more efficient pumps will be installed in the Dahl Pump Station, and all pump stations will be equipped with telemetry communications to allow for the Association to save on operational costs of these pump stations. With these new and upgraded stations, Southeastern Water Association will now be able to reliably and efficiently provide water across the system for the foreseeable future without issue.

6.2 Project Schedule

Table 5 shown on the following page contains the proposed completion dates for the major project components. This list is not exhaustive of all project tasks, and the dates shown are tentative.

Table 5: Estimated Project Schedule	
Task	**Estimated Date**
Environmental Review Submittal	October 1, 2017
Bid Opening	March 1, 2018
Construction Start	June 1, 2018
Construction Completion	November 15, 2018

6.3 Permit Requirements

Table 6 shown below is a tentative list of permits and approvals that will need to be obtained before project construction can begin. This list is preliminary and is subject to change following the review process of the required agencies.

Table 6: Permits & Approvals Needed	
Agency	**Permit or Approval**
KY Division of Water	Approval of Plans & Specifications
KY Division of Water	KPDES Permit
KY Division of Water	Stream Construction Permit
KY Department of Transportation	Encroachment Permit

6.4 Total Project Cost Estimate

Table 7 shown below is a summarized version of the Engineer's Opinion of Probable Cost for the recommended alternative as described above. A detailed Opinion of Probable Cost is included in the Appendix as Figure 6.

Table 7: Total Project Cost Estimate	
Category	**Cost**
Construction	$2,133,870
Contingency	213,330
Engineering Design Fee	192,500
Construction Observation	96,300
Preliminary Engineering Report	12,000
Legal Fees	20,000
Environmental	25,000
Lands & Rights	20,000
Interim Interest	35,000
Total Project Cost	**$2,748,000**

6.5 Excess Funding Disbursement

Any remaining funds leftover after the project has been substantially completed will be used to fund any or all of the following items as needed or deemed most appropriate by the Southeastern Water Association: waterline replacement along KY 692 and Piney Grove Rd., waterline replacement along Elihu Rush Branch Rd. to Commerce Lane, or

for purchase of Radio Read Water Meters. Site maps of the two additive waterline replacements are attached as Figure 8 in the Appendix.

6.6 Annual Operating Budget

Table 8 shown below is a summarized version of the Existing Operating Budget for Year Ending 2015 and proposed operation and maintenance costs upon project completion. The full Existing Operating Budget for Year Ending 2015 is included in the Appendix as Figure 3.

Table 8: Annual Operation & Maintenance Cost

Category	Existing	Proposed
Wages	$ 344,818	$373,200
Maintenance	113,133	98,000
Insurance	190,866	206,700
Other General & Administrative	90,711	98,200
Customer Billing	101,317	109,700
Directors' Fees	37,000	40,100
Office Expenses	66,664	72,200
Bad Debts	30,087	32,500
Professional Services	69,572	75,300
Tax & License	45,804	49,600
Total Operation & Maintenance Cost	**$ 1,089,972**	**$ 1,155,500**

7.0 CONCLUSIONS AND RECOMMENDATIONS

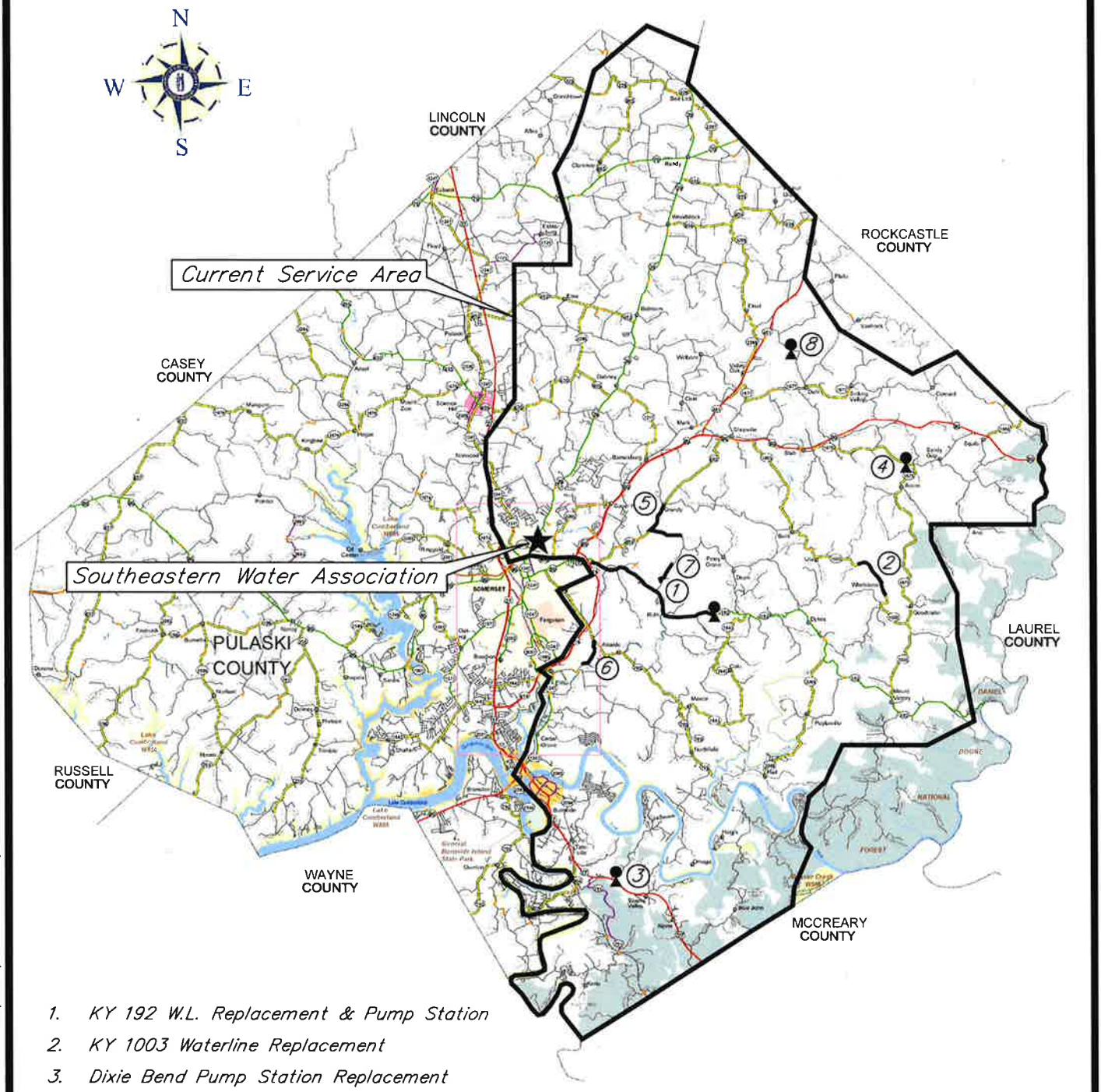
It is the conclusion and recommendation of this report that the Southeastern Water Association implement the project as described in the Proposed Project section of this report. It is further recommended that SWA proceed with its applications for project funding assistance.

An evaluation of the revenue needed for the proposed project was conducted to determine the project's impact on the water rates. The evaluation of estimated user rate impact can be found in Figure 9 of the Appendix. Based on the evaluation of the revenue needed for debt repayment from the proposed project, the user rates will need to be increased 2.99% to finance the proposed project.

As mentioned in a previous section of this Report, a Summary Addendum to Preliminary Engineering Report will be completed at a later date. This document will outline the project feasibility, and determine the final rate increase needed based on more in-depth analysis of the utility's most recent financial statements.

APPENDIX

FIGURE 1



KENVIRONS, INC.
FRANKFORT, KENTUCKY

FIGURE 1
SOUTHEASTERN WATER ASSOCIATION
LOCATION MAP

N:\P\2016173\misc\Location Map.dwg, 8/8/2017 3:26:15 PM, PTH, iR-ADV C5535, 1:1

FIGURE 2

Figure 2

Pulaski County, KY - Projections for Population & Water Usage

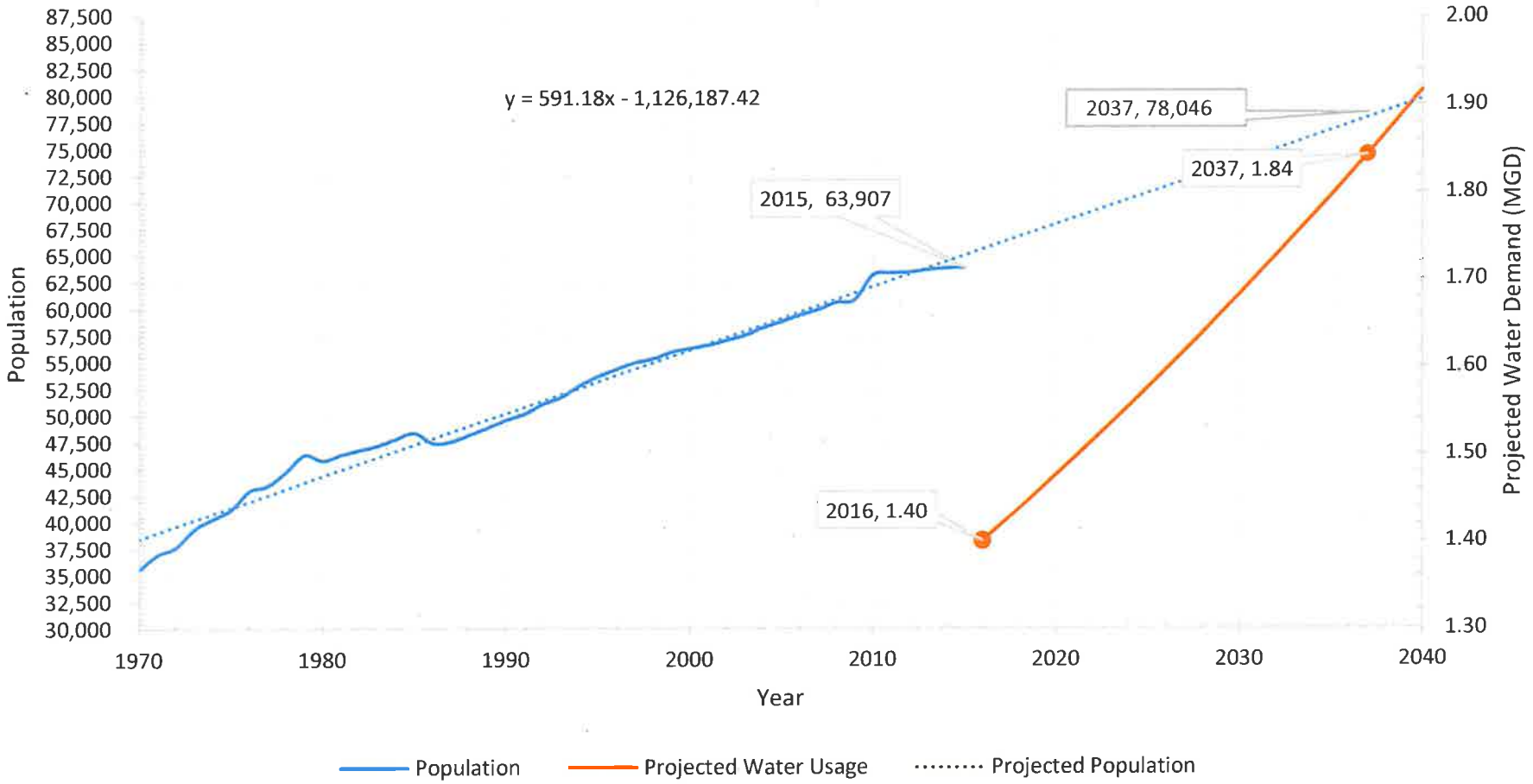


FIGURE 3

SOUTHEASTERN WATER ASSOCIATION
Existing Operating Budget
For Year Ending 2015

REVENUE REQUIREMENTS		
Operation & Maintenance Expenses		
Wages	$ 344,818.00	
Maintenance	$ 113,133.00	
Insurance	$ 190,866.00	
Other General and Administrative	$ 90,711.00	
Customer Billing	$ 101,317.00	
Directors' Fees	$ 37,000.00	
Office Expense	$ 66,664.00	
Bad Debt	$ 30,087.00	
Professional Services	$ 69,572.00	
Tax and License	$ 45,804.00	
		$ 1,089,972.00
Debt Service		
Annual Principal & Interest	$ 441,841.74	
		$ 441,841.74
Debt Service Coverage, Reserve, & Service Fees		
RD	$ 44,184.17	
		$ 44,184.17
TOTAL REVENUE REQUIREMENTS		**$ 1,575,997.91**
UTILITY INCOME		
Operating Revenues		
Water Sales	$ 4,085,799.00	
Cost of Water Sold	$ (1,445,734.00)	
		$ 2,640,065.00
Non-Operating Revenues		
Capital Contributions - Federal Grants	$ 74,142.00	
Capital Contributions - Other Grants	$ 6,953.00	
Membership Fees Collected	$ 4,890.00	
Tap-on Fees Collected, Net of Amounts Refunded	$ 37,595.00	
Interest Income	$ 16,962.00	
Interest Expense	$ (404,307.00)	
		$ (263,765.00)
TOTAL UTILITY INCOME		**$ 2,376,300.00**

FIGURE 4

Blaze Valley Road Connection
Lat. 37° 05' 29"
Long. −84° 31' 20"

KY 192 Pump Station
Lat. 37° 04' 17"
Long. −84° 30' 46"

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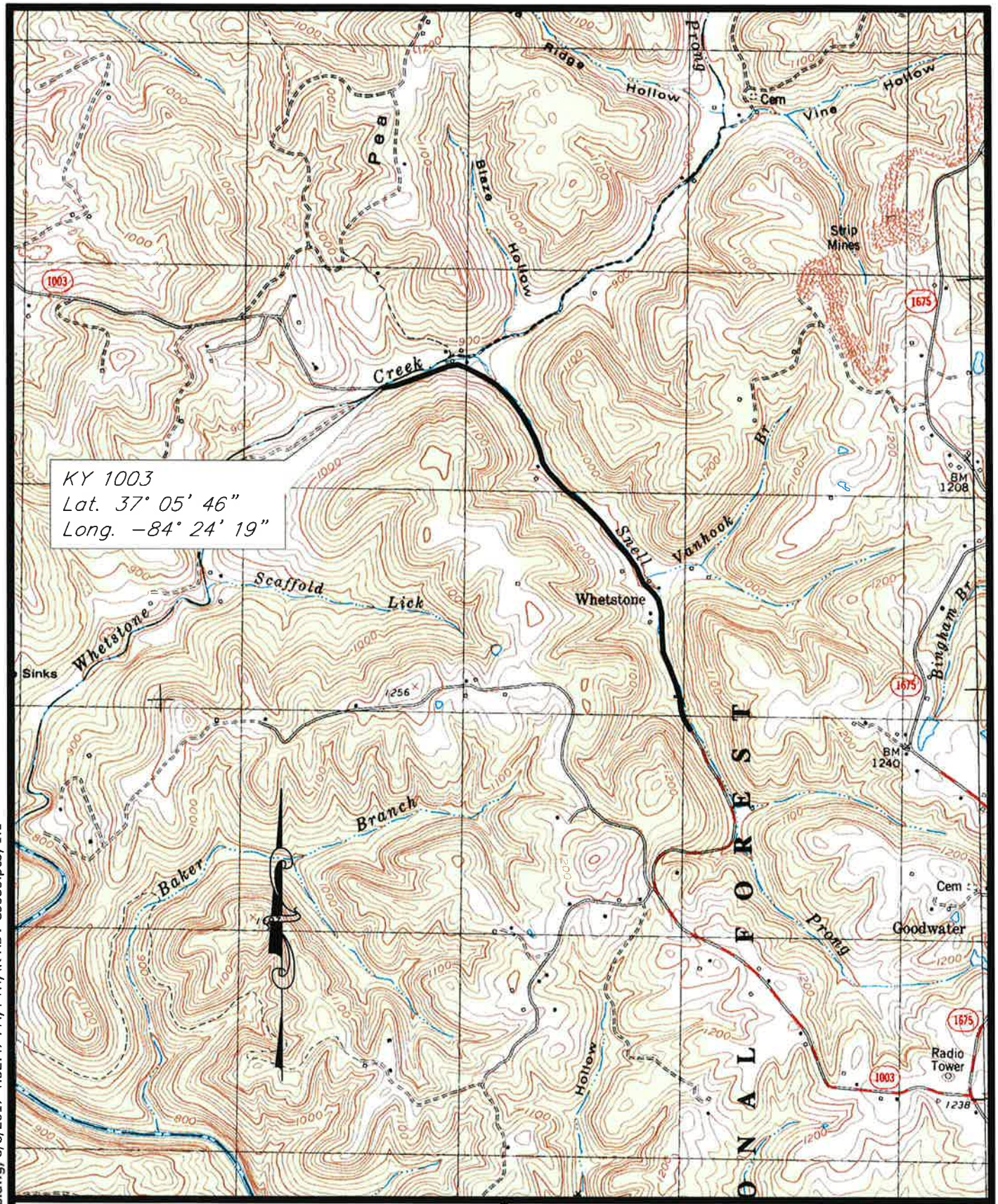
(502) 695-4357

SCALE IN MILES
0 1/2 1
SCALE: 1"=2,000'

SOUTHEASTERN WATER ASSOCIATION
BLAZE VALLEY ROAD CONNECTION, KY 192
WATERLINE & PUMP STATION REPLACEMENT
SOMERSET, KY. QUADRANGLE



DYKES, KY. QUADRANGLE

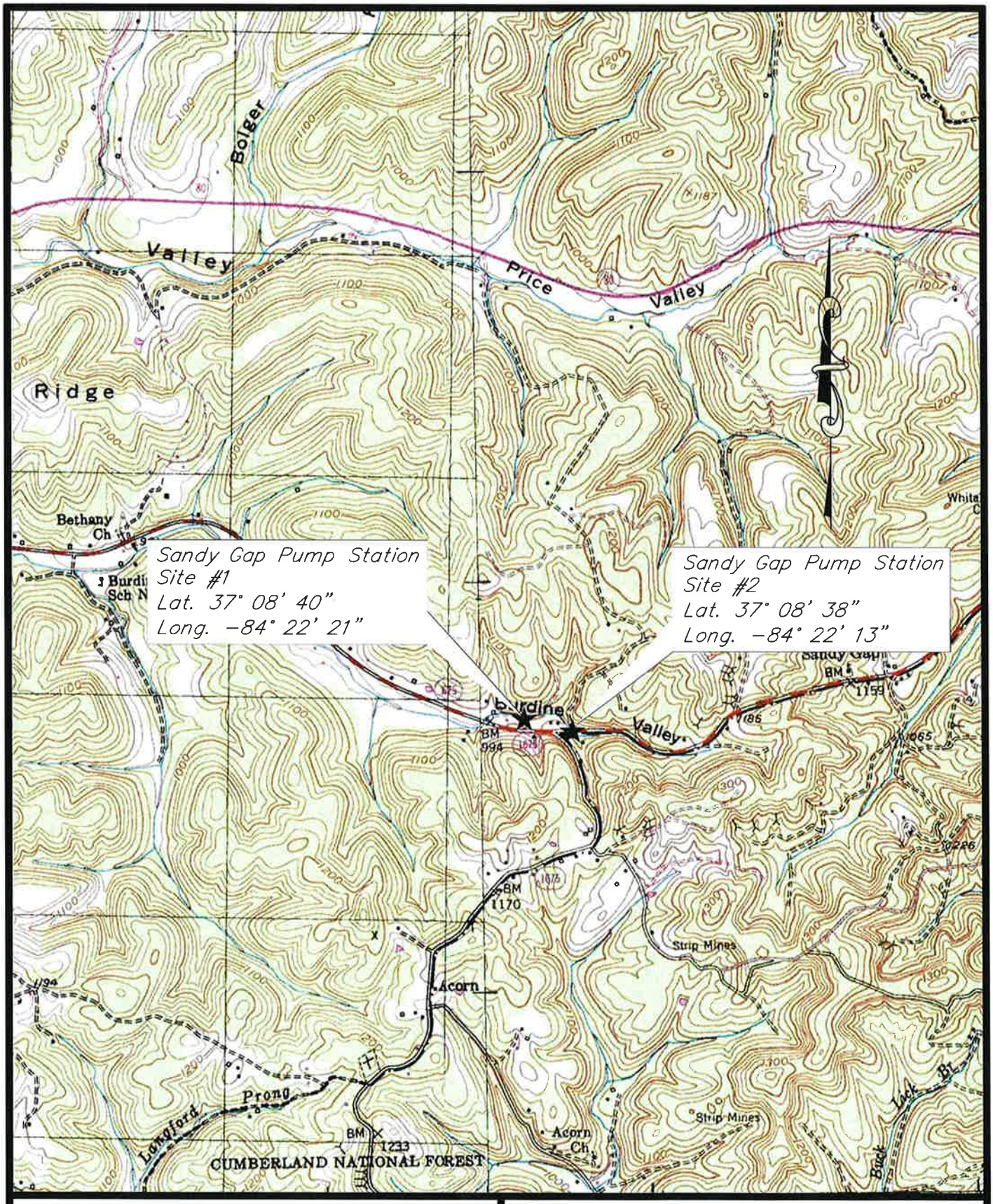
SCALE IN MILES

0 1/2 1

SCALE: 1"=2,000'

SOUTHEASTERN WATER ASSOCIATION
KY 1003 WATERLINE REPLACEMENT
PULASKI COUNTY, KENTUCKY

KENVIRONS, INC.
452 VERSAILLES ROAD, FRANKFORT, KENTUCKY
(502) 695-4357



BURNSIDE, KY. QUADRANGLE

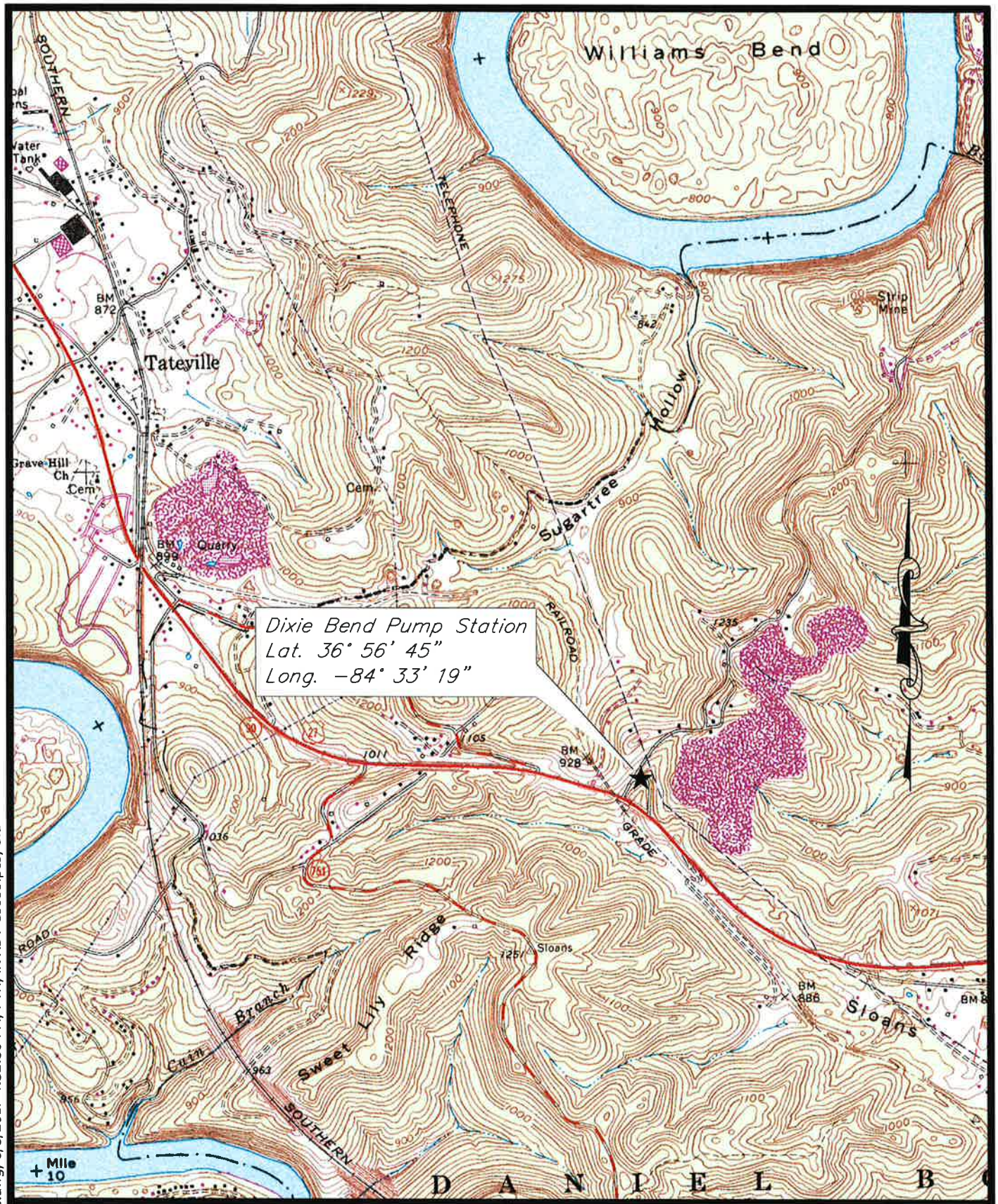
SCALE IN MILES

0 1/2 1

SCALE: 1"=2,000'

SOUTHEASTERN WATER ASSOCIATION
SANDY GAP PUMP STATION REPLACEMENT
PULASKI COUNTY, KENTUCKY

KENVIRONS, INC.
452 VERSAILLES ROAD, FRANKFORT, KENTUCKY
(502) 695-4357



BURNSIDE, KY. QUADRANGLE

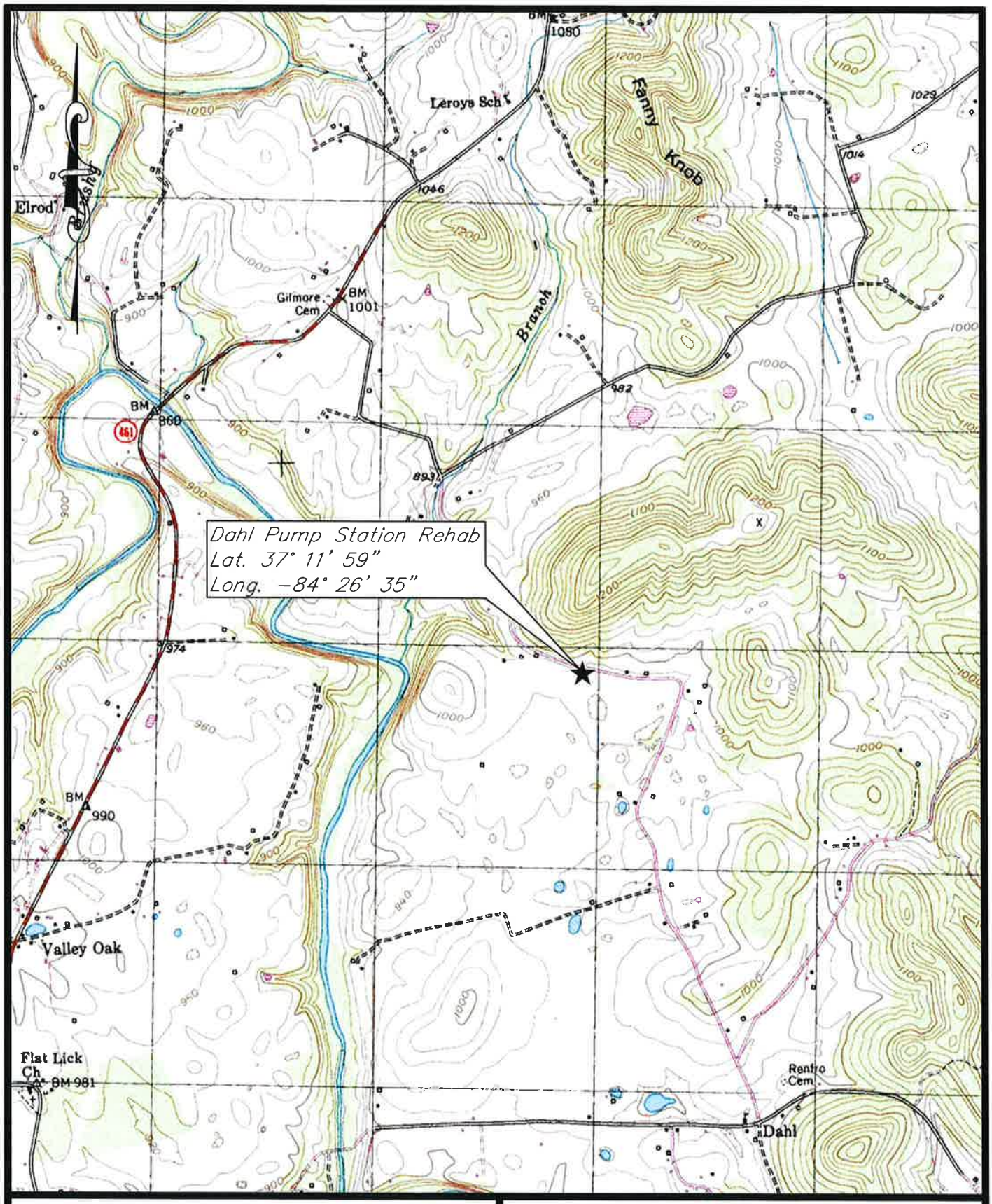
SCALE IN MILES

0 1/2 1

SCALE: 1"=2,000'

SOUTHEASTERN WATER ASSOCIATION
DIXIE BEND PUMP STATION REPLACEMENT
PULASKI COUNTY, KENTUCKY

KENVIRONS, INC.
452 VERSAILLES ROAD, FRANKFORT, KENTUCKY
(502) 695-4357



SHOPVILLE, KY. QUADRANGLE

SCALE IN MILES

0 1/2 1

SCALE: 1"=2,000'

SOUTHEASTERN WATER ASSOCIATION
DAHL PUMP STATION REHAB
PULASKI COUNTY, KENTUCKY

KENVIRONS, INC.
452 VERSAILLES ROAD, FRANKFORT, KENTUCKY
(502) 695-4357

FIGURE 5

Blaze Valley Road Connection
Lat. 37° 05' 29"
Long. −84° 31' 20"

KY 192 Pump Station
Lat. 37° 04' 17"
Long. −84° 30' 46"

KENVIRONS, INC.
452 VERSAILLES ROAD, FRANKFORT, KENTUCKY
(502) 695-4357

SCALE IN MILES
0 1/2 1
SCALE: 1"=2,000'

SOUTHEASTERN WATER ASSOCIATION
BLAZE VALLEY ROAD CONNECTION, KY 192 WATERLINE & PUMP STATION REPLACEMENT SOMERSET, KY. QUADRANGLE

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FIGURE 6

SOUTHEASTERN WATER ASSOCIATION
Alternative #1 (KY 192/KY 1003/Blaze Valley & All P.S. Replacements)
Opinion of Probable Cost

August 8, 2017

No.	Item	Unit	Quantity	Unit Price	Item Price
1	8" PVC Pipe, SDR-17	LF	27,050	$ 25.00	$ 676,250.00
2	8" D.I.,CL 350 Pipe	LF	4,550	$ 30.00	$ 136,500.00
3	6" D.I., CL 350 Pipe	LF	7,780	$ 24.00	$ 186,720.00
4	4" PVC, SDR-17	LF	4,130	$ 15.00	$ 61,950.00
5	3" PVC, SDR-17	LF	655	$ 12.00	$ 7,860.00
6	3" D.I., CL 350 Pipe	LF	250	$ 18.00	$ 4,500.00
7	2" PVC, SDR-17	LF	20	$ 10.00	$ 200.00
8	1" PVC, SDR-17	LF	55	$ 8.00	$ 440.00
9	Bored Encasement for 8" Pipe	LF	260	$ 150.00	$ 39,000.00
10	Bored Encasement for 4" Pipe	LF	80	$ 120.00	$ 9,600.00
11	Bored Encasement for 3" Pipe	LF	40	$ 110.00	$ 4,400.00
12	8" Gate Valve	EA	13	$ 1,500.00	$ 19,500.00
13	6" Gate Valve	EA	2	$ 1,200.00	$ 2,400.00
14	4" Gate Valve	EA	1	$ 1,000.00	$ 1,000.00
15	6" X 6" Tapping Sleeve & Valve	EA	2	$ 4,000.00	$ 8,000.00
16	4" X 4" Tapping Sleeve & Valve	EA	6	$ 3,500.00	$ 21,000.00
17	3" X 3" Tapping Sleeve & Valve	EA	7	$ 3,000.00	$ 21,000.00
18	4" Tie-in w/ Gate Valve	EA	2	$ 3,000.00	$ 6,000.00
19	3" Tie-in w/ Gate Valve	EA	1	$ 2,400.00	$ 2,400.00
20	2" Tie-in w/ Gate Valve	EA	1	$ 1,800.00	$ 1,800.00
21	1" Tie-in w/ Gate Valve	EA	3	$ 1,500.00	$ 4,500.00
22	Air Release Valve	EA	3	$ 2,000.00	$ 6,000.00
23	Fire Hydrant	EA	1	$ 4,500.00	$ 4,500.00
24	6" Blowoff Assembly	EA	2	$ 2,000.00	$ 4,000.00
25	4" Blowoff Assembly	EA	3	$ 1,800.00	$ 5,400.00
26	3" Blowoff Assembly	EA	1	$ 1,500.00	$ 1,500.00
27	Cut & Cap Existing Line	EA	15	$ 1,200.00	$ 18,000.00
28	Free Bore	LF	840	$ 30.00	$ 25,200.00
29	Leak Detection Meter	EA	2	$ 1,000.00	$ 2,000.00
30	Blaze Valley Rd. Regulating Station	LS	1	$ 15,000.00	$ 15,000.00
31	KY 192 Directional Bore	LS	1	$ 150,000.00	$ 150,000.00
32	KY 1003 Directional Bore	LS	1	$ 40,000.00	$ 40,000.00
33	Reconnect Meter	EA	135	$ 150.00	$ 20,250.00
34	3/4" Service Line	LF	8,100	$ 6.00	$ 48,600.00
35	Crushed Stone	LF	700	$ 12.00	$ 8,400.00
36	KY 192 Pump Station	LS	1	$ 170,000.00	$ 170,000.00
37	Dixie Bend Booster Pump Station	LS	1	$ 170,000.00	$ 170,000.00
38	Sandy Gap Booster Pump Station	LS	1	$ 170,000.00	$ 170,000.00
39	Dahl Pump Station Rehabilitation	LS	1	$ 60,000.00	$ 60,000.00
	Total Construction Cost				$ 2,133,870.00

Contingency	$213,330
Legal Fees	$20,000
Lands & Rights	$20,000
Engineering Design	$192,500
Resident Inspection	$96,300
Interest	$35,000
Environmental	$25,000
Preliminary Engineering Report	$12,000
TOTAL PROJECT COST	**$2,748,000**

SOUTHEASTERN WATER ASSOCIATION
Alternative #1 (KY 192/KY 1003/Blaze Valley & All P.S. Replacements)

Estimated User Rate Impact

August 8, 2017

FINANCING:

Rural Development Loan	$1,923,600
Rural Development Grant	$824,400
TOTAL PROJECT FUNDING	**$2,748,000**

REVENUE REQUIREMENT:

RD Annual Principal & Interest Payment	$77,414
Loan Coverage @ 10%	$7,741
Depreciation/Short Lived Assets	$38,472
Total Annual Expense	$123,628

Number of Existing Customers	7,345
Additional Revenue Per Bill	$1.40

	Current Rates	Proposed Rates
First 2,000 Gallons	$25.15	$26.55
All Over 2,000 Gals	$10.90	$10.90
Cost for 4,000 gallons	$46.95	$48.35
	Percent Increase	**2.99%**

FIGURE 7

SOUTHEASTERN WATER ASSOCIATION
Alternative #2 (KY 192/Blaze Valley & KY 192 P.S. Replacement)
Opinion of Probable Cost

Revised: June 20, 2017

No.	Item	Unit	Quantity	Unit Price	Item Price
1	8" PVC Pipe, SDR-17	LF	27,050	$ 25.00	$ 676,250.00
2	8" D.I.,CL 350 Pipe	LF	4,550	$ 30.00	$ 136,500.00
3	4" PVC, SDR-17	LF	4,130	$ 15.00	$ 61,950.00
4	3" PVC, SDR-17	LF	655	$ 12.00	$ 7,860.00
5	3" D.I., CL 350 Pipe	LF	250	$ 18.00	$ 4,500.00
6	2" PVC, SDR-17	LF	20	$ 10.00	$ 200.00
7	1" PVC, SDR-17	LF	55	$ 8.00	$ 440.00
8	Bored Encasement for 8" Pipe	LF	260	$ 150.00	$ 39,000.00
9	Bored Encasement for 4" Pipe	LF	80	$ 120.00	$ 9,600.00
10	Bored Encasement for 3" Pipe	LF	40	$ 110.00	$ 4,400.00
11	8" Gate Valve	EA	13	$ 1,500.00	$ 19,500.00
12	4" Gate Valve	EA	1	$ 1,000.00	$ 1,000.00
13	6" X 6" Tapping Sleeve & Valve	EA	2	$ 4,000.00	$ 8,000.00
14	4" X 4" Tapping Sleeve & Valve	EA	5	$ 3,500.00	$ 17,500.00
15	3" X 3" Tapping Sleeve & Valve	EA	7	$ 3,000.00	$ 21,000.00
16	4" Tie-in w/ Gate Valve	EA	1	$ 3,000.00	$ 3,000.00
17	3" Tie-in w/ Gate Valve	EA	1	$ 2,400.00	$ 2,400.00
18	2" Tie-in w/ Gate Valve	EA	1	$ 1,800.00	$ 1,800.00
19	1" Tie-in w/Gate Valve	EA	3	$ 1,500.00	$ 4,500.00
20	Air Release Valve	EA	3	$ 2,000.00	$ 6,000.00
21	6" Blowoff Assembly	EA	2	$ 2,000.00	$ 4,000.00
22	4" Blowoff Assembly	EA	2	$ 1,800.00	$ 3,600.00
23	3" Blowoff Assembly	EA	1	$ 1,500.00	$ 1,500.00
24	Cut & Cap Existing Line	EA	14	$ 1,200.00	$ 16,800.00
25	Free Bore	LF	840	$ 30.00	$ 25,200.00
26	Leak Detection Meter	EA	1	$ 1,000.00	$ 1,000.00
27	Blaze Valley Rd. Regulating Station	LS	1	$ 15,000.00	$ 15,000.00
28	Pitman Creek Directional Bore	LS	1	$ 150,000.00	$ 150,000.00
29	Reconnect Meter	EA	125	$ 150.00	$ 18,750.00
30	3/4" Service Line	LF	7,500	$ 6.00	$ 45,000.00
31	KY 192 Pump Station	LS	1	$ 170,000.00	$ 170,000.00
32	Crushed Stone	LF	520	$ 12.00	$ 6,240.00
	Total Construction Cost				$1,482,490.00

Contingency	$148,110.00
Legal Fees	$20,000.00
Lands & Rights	$10,000.00
Engineering Design	$192,500.00
Resident Inspection	$75,900.00
Interest	$25,000.00
Environmental	$25,000.00
Preliminary Engineering Report	$12,000.00
TOTAL PROJECT COST	**$1,991,000.00**

SOUTHEASTERN WATER ASSOCIATION
Alternative #2 (KY 192/Blaze Valley & KY 192 P.S. Replacement)

Estimated User Rate Impact

Revised: June 20, 2017

FINANCING:

Rural Development Loan	$1,393,700
Rural Development Grant	$597,300
TOTAL PROJECT FUNDING	**$1,991,000**

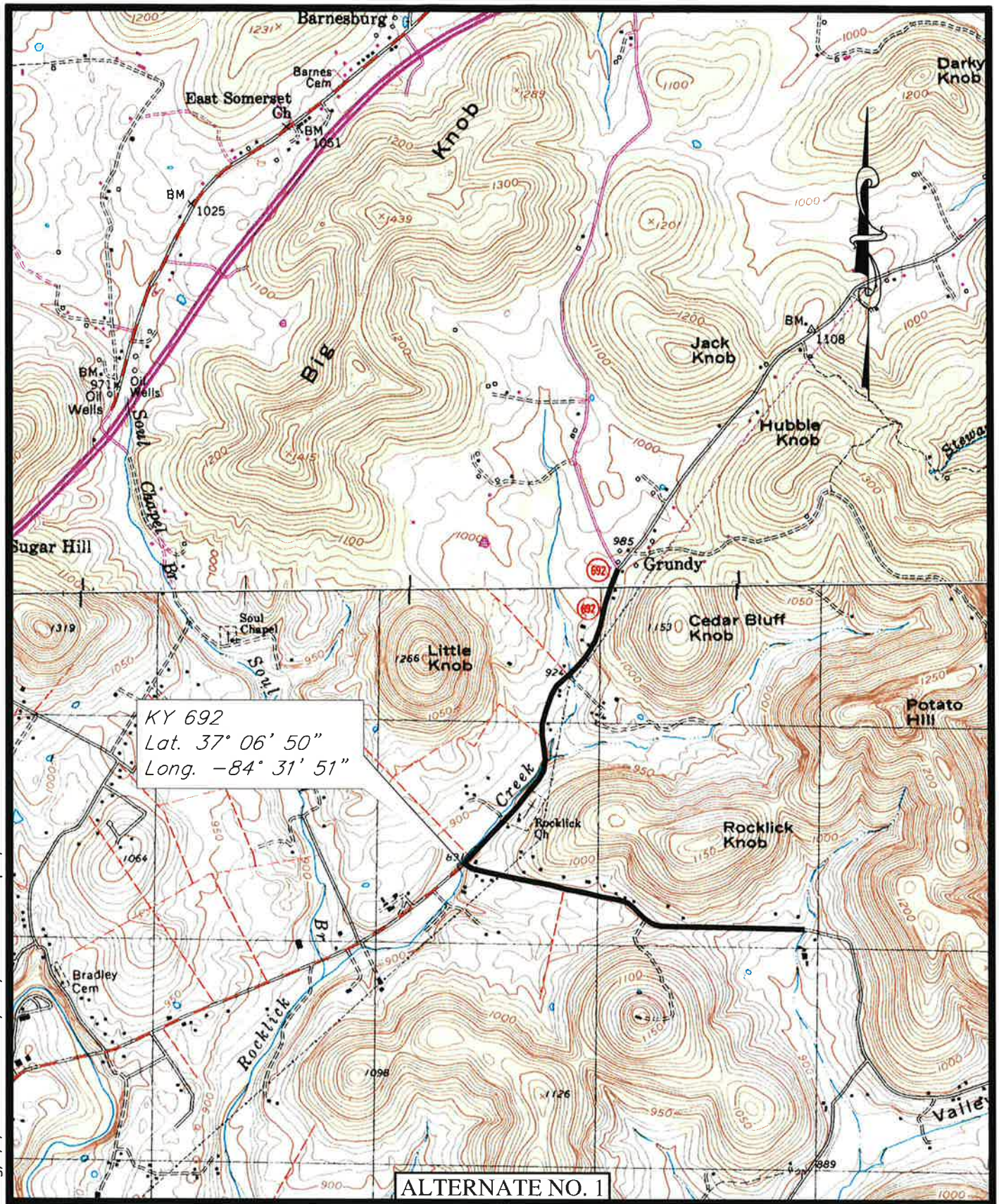
REVENUE REQUIREMENT:

RD Annual Principal & Interest Payment	$56,089
Loan Coverage @ 10%	$5,609
Depreciation/Short Lived Assets	$27,874
Total Annual Expense	$89,571

Number of Existing Customers	7,345
Additional Revenue Per Bill	$1.02

	Current Rates	**Proposed Rates**
First 2,000 Gallons	$25.15	$26.17
All Over 2,000 Gals	$10.90	$10.90
Cost for 4,000 gallons	$46.95	$47.97
	Percent Increase	**2.16%**

FIGURE 8



ALTERNATE NO. 1

SOMERSET, KY. QUADRANGLE

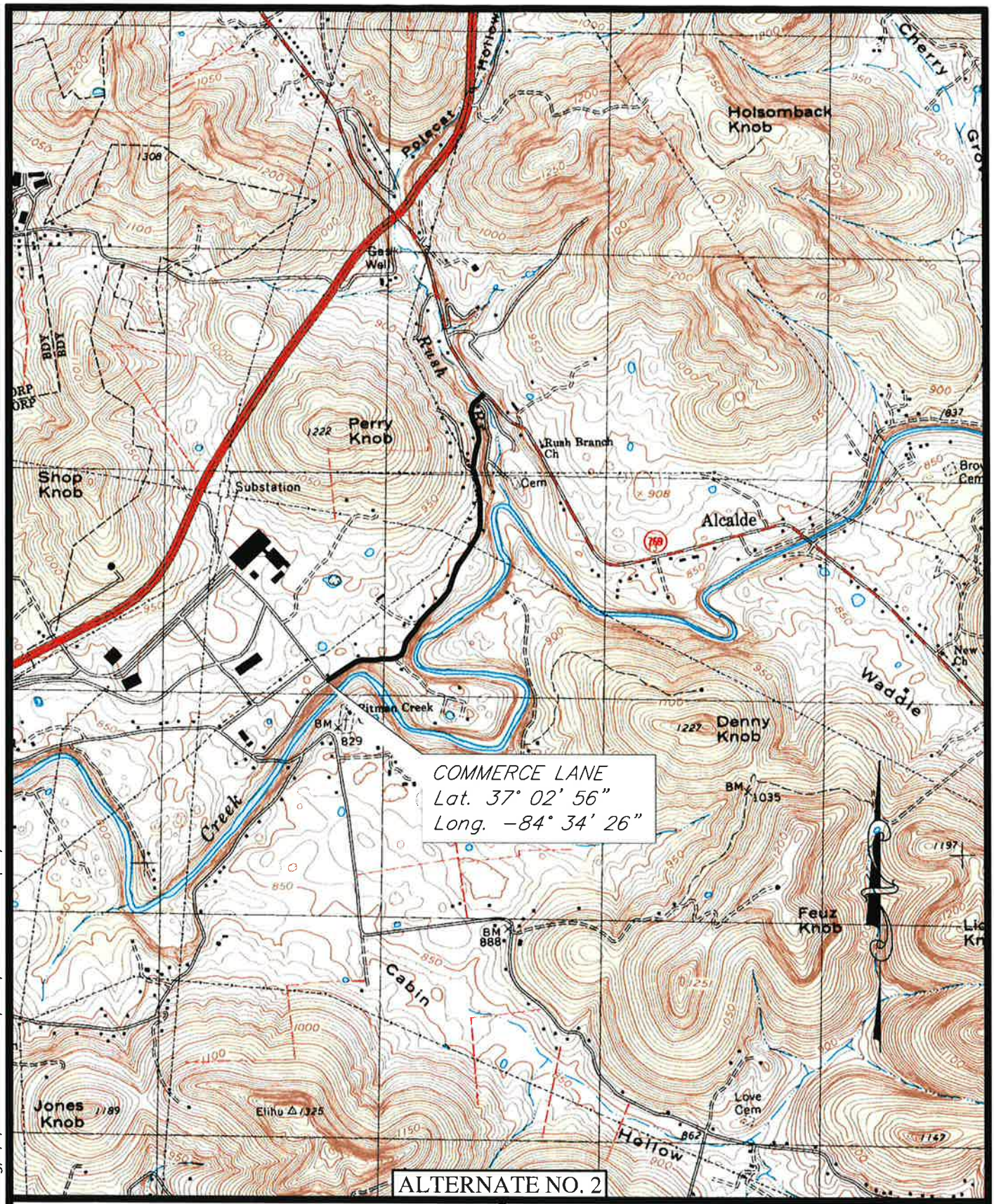
SCALE IN MILES

0 1/2 1

SCALE: 1"=2,000'

SOUTHEASTERN WATER ASSOCIATION
KY 692 WATERLINE REPLACEMENT
PULASKI COUNTY, KENTUCKY

KENVIRONS, INC.
452 VERSAILLES ROAD, FRANKFORT, KENTUCKY
(502) 695-4357



SOMERSET, KY. QUADRANGLE

SCALE IN MILES

0 1/2 1

SCALE: 1"=2,000'

SOUTHEASTERN WATER ASSOCIATION
COMMERCE LANE WATERLINE REPLACEMENT
PULASKI COUNTY, KENTUCKY

KENVIRONS, INC.
452 VERSAILLES ROAD, FRANKFORT, KENTUCKY
(502) 695-4357