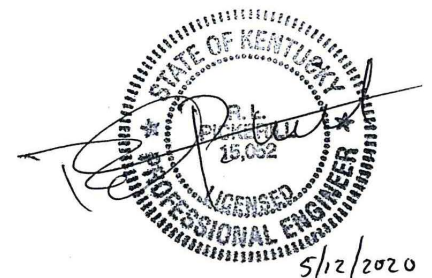


# FINAL ENGINEERING REPORT MCUPTON BOOSTER PUMP STATION (MBPS) REPLACEMENT AND WATERLINE UPGRADES

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*BARKLEY LAKE WATER DISTRICT  
TRIGG COUNTY, KENTUCKY*

*JULY 2020*



*PREPARED BY:*

*BELL ENGINEERING  
2480 FORTUNE DRIVE, SUITE 350  
LEXINGTON, KY 40509*

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# FINAL ENGINEERING REPORT

## MCUPTON BOOSTER PUMP STATION (MBPS) REPLACEMENT AND WATERLINE UPGRADES

### I. INTRODUCTION

The Barkley Lake Water District (BLWD) desires to increase flow and improve pressure in the northern portion of their service area. The existing McUpton Booster Pump Station (MBPS), and transmission lines which serve the northern portion of the service area were constructed in the late 1970's. Although the system was adequate at the time, higher water demand due to regional growth at higher elevations is making it increasingly difficult and costly for the BLWD to adequately operate and serve the northern portion of the service area in a reliable manner. The current system is undersized, aging, and in need of upgrades and replacements. The proposed project will establish the necessary upgrades to allow BLWD to continue to provide an adequate, safe and reliable water supply for its customers in the northern portion of the service area. In addition, this project will enhance the ability of the BLWD to provide water to the Lyon County Water District near the county line.

The MBPS will be replaced as part of this project in order to increase flow and pressure. The BLWD estimates that the existing pump station was built in the 1980's. Previous projects have added storage tanks and additional booster pump stations to the service area, with few upgrades to the MBPS itself. As a result, the station is operating at near capacity. Much of the yard piping is inadequate and has to be operated in an inefficient manner in order to maintain supply. For example, when system demand is met, the pump(s) constantly cycle with excess flow bypassed back to the suction side of the pumps. This situation creates an energy drain and accelerates degradation of the pumps themselves.

The MBPS is an integral part of the BLWD system and any issue with this station has the potential to negatively affect service to the northern geographic regions that could be negatively impacted by outages include but are not limited to Trigg County, southern portions of Caldwell county, western portions of Christian County, and southern portions of Lyon County.

The design of the new MBPS will incorporate an efficient, tri-plex pump design with variable frequency drives (VFDs) motors to save on energy costs and enhance the reliability of the pump station.



Increased pressure from the new MBPS will require that portions of the existing distribution system to be replaced specifically lines located at lower elevations, higher pressure class lines in order to help minimize potential rupture problems arising out of increased operating pressure. The majority of existing lines were constructed with Class 160 (160 psi) Polyvinyl chloride (PVC) lines. This project will replace the existing Class 160 PVC with Class 250 PVC at specific points identified by BLWD. As funds become available, the BLWD plans to replace the remainder of the Class 160 Pipe serviced by the MBPS.

These proposed improvements will benefit customers in the northern portion of the service area through increased supply, increased pressure, and reliability of the system. The proposed improvements will also reduce the number of service interruptions and reduce operational maintenance (O & M) cost to BLWD.

## **II. PLANNING AREA**

The BLWD service area encompasses most of Trigg County, Kentucky with some water provided to the adjoining counties of Caldwell, Christian, and Lyon. In addition, the BLWD also provides water to Stewart County, Tennessee. As previously discussed, this project will affect the northern portions of the service area specifically two geographic regions north of Interstate 24. Maps of the service area and location of the MBSP have been attached.

## **III. EXISTING FACILITIES**

The Barkley Lake Water District owns and operates water treatment facilities on the shores of Lake Barkley near the community of Canton. These facilities were recently upgraded resulting in the plant capacity being increased from 2 mgd to 3.75 mgd. Transmission piping upgrades near the plant will allow efficient distribution of the treated water to meet rising demands. The BLWD distribution system is comprised of approximately 531 total miles of water mains averaging in size and composition along with 6 water storage tanks. A breakdown of the components of the distribution system are as follows:



**TABLE 1--PVC PIPE**

MILES	SIZE
30.5	2"
102.5	3"
170	4"
68	6"
17	8"
12	12"
2	14"
2	16"
<b>404</b>	<b>TOTAL</b>

**TABLE 2--ASBESTOS-CEMENT PIPE**

MILES	SIZE
63	4"
41	6"
17	8"
3	10"
3	12"
<b>127</b>	<b>TOTAL</b>

**TABLE 3--WATER STORAGE TANKS**

NAME	TYPE	CAPACITY (GAL.)	OVERFLOW EL	GROUND EL.
Plant Tank	Standpipe	500,000	620.00	493.00
Rogers Tank	Standpipe	450,000	704.00	594.00
Pete Light Tank	Elevated	1,000,000	735.50	625.50
South Road Tank	Elevated	300,000	815.00	727.00
Siloam Tank	Elevated	300,000	704.00	614.00
Cerulean (New)	Standpipe	300,000	712.50	670.50
<b>Storage Capacity Total:</b>		<b>2,850,000</b>	<b>Gallons</b>	

**TABLE 4--PUMPS (ALL ELECTRIC)**

LOCATION	TYPE	GPM	HP	NO.
Plant (Intake)	Raw Water	1,400	50	2
Plant	Low Service	1,400	100	2
Plant	High Service	1,400	60	2
Pete Light	Booster	800	40	2
Rogers	Booster	300	25	2
McUpton	Booster	600	30	2
Cerulean (New)	Booster	250	30	2
South Road	Booster	300	25	2

Additional components include approximately eighty (80) large hydrants and five hundred and forty nine (549) flush hydrants. The BLWD also has three (3) disinfection units with a combined maximum chlorine feed rate of 240 pounds per day (lbs/d).

According to the Kentucky Infrastructure Authority (KIA) “Drinking Water System Information” page, the BLWD operational statistics are as follows:

Total Annual Volume Produced (mg)		555,836
Total Annual Volume Purchased (mg)		0.0
Total Annual Volume Provided (mg)		555,836
Estimated Annual Water Loss		27%
Wholesale Customers	4	Usage (mg): 84.041
Residential Customers	5,287	Usage (mg): 240.620
Commercial Customers	66	Usage (mg): 39.230
Industrial Customers	5	Usage (mg): 5.231
<b>TOTAL CUSTOMERS</b>	<b>5,367</b>	

Flushing, Maintenance and Fire Protection Usage (mg):	82.000
Total Water Usage (mg):	413,631

The BLWD system is generally in good repair; however, some components are aging, undersized, and are in need of upgrading or replacement.

The BLWD is currently in compliance with all federal and state regulations regarding the sanitary features of the distribution system. In addition, the BLWD is governed by the Public Service Commission, and they have no current violations of PSC regulations.

#### **IV. NEED FOR THE PROJECT**

The MBPS located is near the old McUpton School in North Cadiz, just off Highway 139, and is an integral part of the BLWD distribution system. This station supplies all of the northern portion of Trigg County including another booster pump station (Cerulean), and two water storage tanks, Siloam and Cerulean.

Currently, when system demand is met in the pressure zone of the Siloam tank, the pumps must continue to operate to supply the Cerulean booster pump station and tank. Excess flow is bypassed into the supply (suction) side of the pumps creating a continual loop. This condition is inefficient, costly, and creates unnecessary wear on the pump station.

Growth in this area of the county has increased by 10 percent since the year 2000 according to the Kentucky State Data Center. The majority of growth has occurred at high elevations near hilltops and ridgelines. Because of the existing supply conflicts, homes and businesses at these locations experience low water pressures frequently.

#### **V. PROJECT BIDDING**

Bids for the Highway 139 North Waterline Upgrades and McUpton Booster Pump Station Replacement for Barkley Lake Water District were opened on July 14, 2020. A total of 3 bids were received for the contract. Copies of the bid tabulation and a recommendation for award letter are included in Appendices D and E respectively, of this document. Barkley Lake Water District has accepted Bell Engineering's Recommendation for Award and is ready to move to construction.

The bidding documents advised contractors that the low bidder would be determined based on the lowest responsive and responsible total bid. The low total bid received for contract 586-19-01 was received from Scott and Ritter, Incorporated of Bowling Green, Kentucky and is summarized as follows:

Total Bid Contract \$634,920.60



#### **Final Engineering Report**

*McUpton Booster Pump Station (MBPS) Replacement and Waterline Upgrade  
Barkley Lake Water District*

Available Project funds are summarized below:

USDA RD Loan:	\$854,890
Increase in Loan	<u>\$38,100</u>
	\$892,990

## VI. PROJECT BUDGET

The As-Bid Project Budget is as follows:

Development	\$635,000
Land and Rights	25,000
Planning and Administration	10,000
Legal	15,000
Engineering	118,588
Interest	30,000
Contingencies	<u>59,402</u>
TOTAL	\$892,990

## VII. PROJECT SCHEDULE

The proposed project schedule is as follows:

Finish Design	Complete
Advertise for Construction Bids	Complete
Bid Opening	Complete
Begin Construction	September 1, 2020
End Construction	March 1, 2021
Finish Project Close-out	April 1, 2021



### Final Engineering Report

McUpton Booster Pump Station (MBPS) Replacement and Waterline Upgrade  
Barkley Lake Water District

**APPENDIX A**  
**MAP NO. 1--**  
**BLWD SERVICE AREA AND PROJECT AREA**

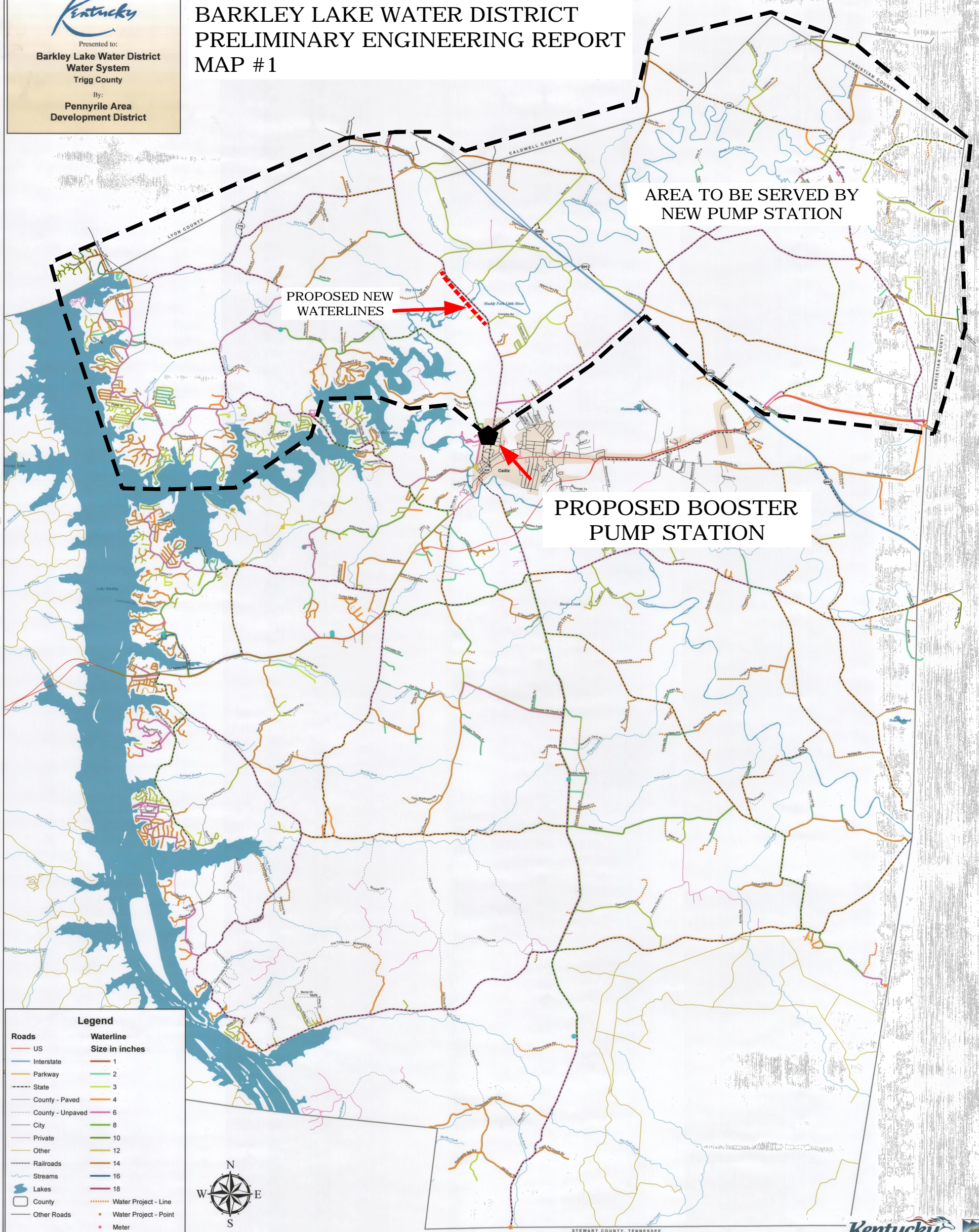




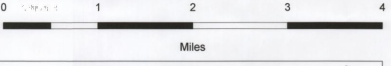
Presented to:  
**Barkley Lake Water District**  
 Water System  
 Trigg County

By:  
**Pennyriple Area**  
 Development District

# BARKLEY LAKE WATER DISTRICT PRELIMINARY ENGINEERING REPORT MAP #1



Legend	
<b>Roads</b>	<b>Waterline</b>
— US	— 1
— Interstate	— 2
— Parkway	— 3
— State	— 4
— County - Paved	— 6
— County - Unpaved	— 8
— City	— 10
— Private	— 12
— Other	— 14
— Railroads	— 16
— Streams	— 18
— Lakes	— Water Project - Line
— County	— Water Project - Point
— Other Roads	— Meter
	— Surface Source
	— Pump Station
	— Purchase Source
	— Water Treatment Plant
	— Public Well Source
	— Water Tank
	— Water Pump



NADCON 1983 Datum based on Kentucky State Plane Coordinate System, Single Zone 1600.  
 Road Centerlines collected using GPS technology and KYTC (Kentucky Transportation Cabinet) standards.



To the best of my knowledge, this planning map and associated reports are an accurate and current representation of the Barkley Lake Water District water system.

Authorized Representative \_\_\_\_\_ Date \_\_\_\_\_  
 System Name: Barkley Lake Water District

Limitation of Liability: The information contained on this map is to be used for planning purposes only. The Pennyriple Area Development District provides no warranties of any kind for the accuracy or use of this information outside the context of use for planning purposes.

Date: December, 2011  
 Illustrated by: GIS Department  
 Sheet Number: 1  
 Project: Kentucky Infrastructure Authority (KIA)



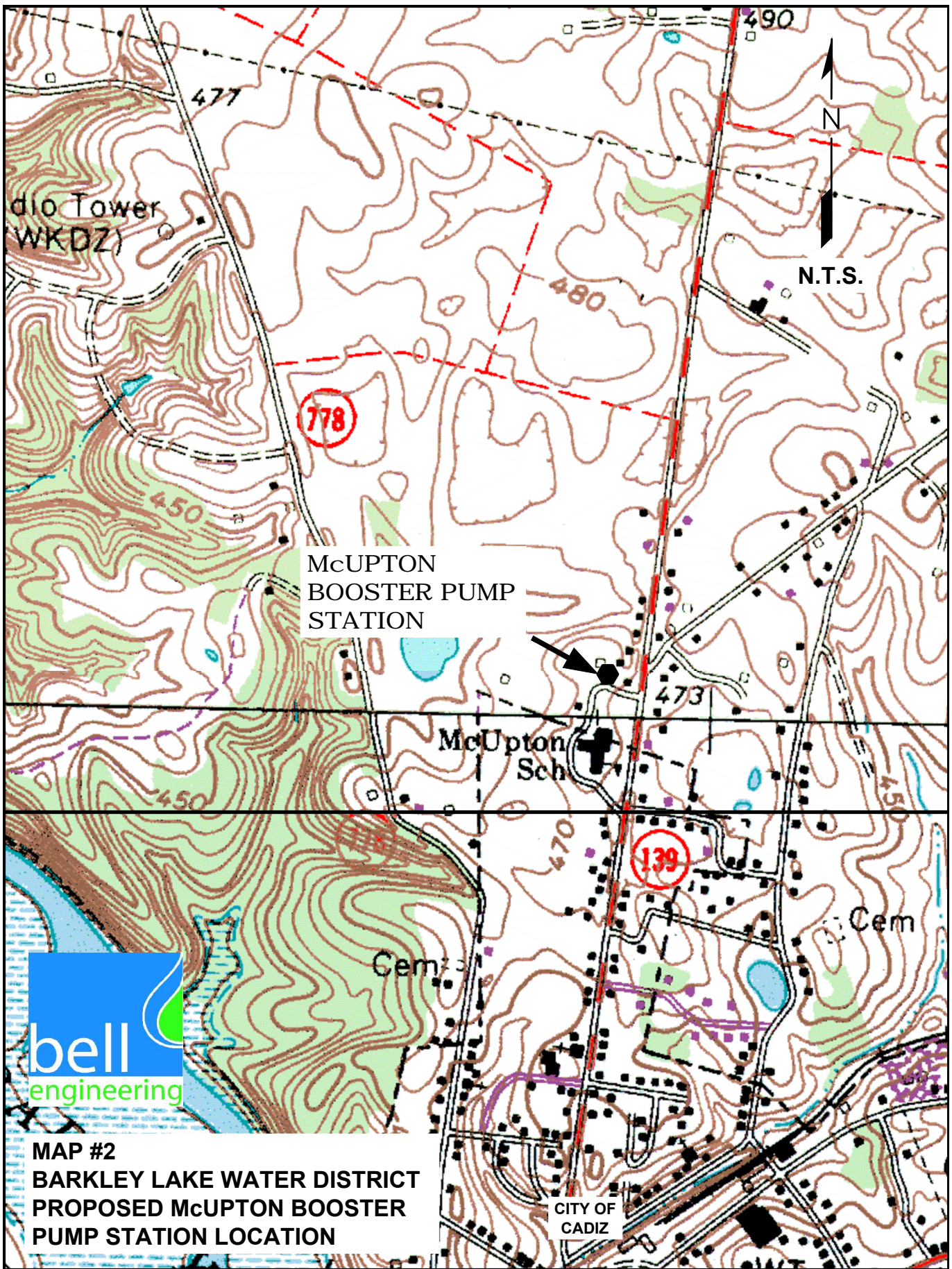
**PADD** a regional planning and development agency

GIS Department  
 300 Hammond Drive  
 Hopkinsville, Kentucky 42240

Fax: 270-886-3211  
 Phone: 270-886-9484  
 www.padd.org



**APPENDIX B**  
**MAP NO. 2--**  
**PROPOSED BOOSTER PUMP STATION LOCATION**



Radio Tower  
WKDZ

N.T.S.

778

McUPTON  
BOOSTER PUMP  
STATION

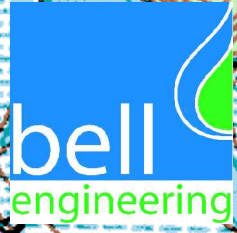
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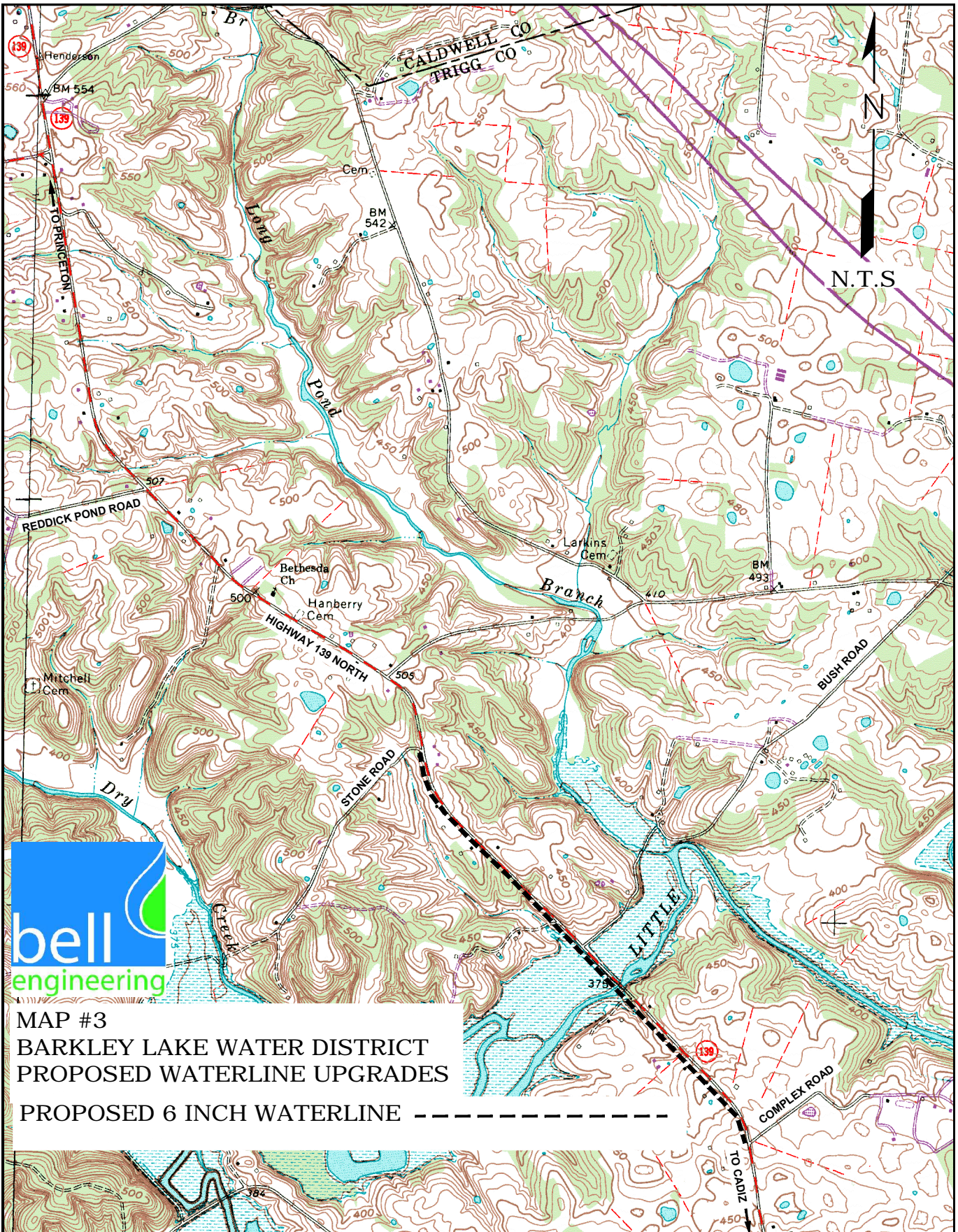
CITY OF  
CADIZ



MAP #2  
BARKLEY LAKE WATER DISTRICT  
PROPOSED McUPTON BOOSTER  
PUMP STATION LOCATION



**APPENDIX C**  
**MAP NO. 3--**  
**WATERLINE LOCATIONS**



MAP #3  
BARKLEY LAKE WATER DISTRICT  
PROPOSED WATERLINE UPGRADES  
PROPOSED 6 INCH WATERLINE - - - - -

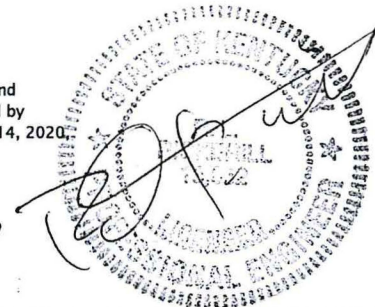
**APPENDIX D**  
**BID TABULATIONS**



**CONTRACT 586-19-01 HIGHWAY 139 NORTH WATERLINE UPGRADES AND McUPTON BOOSTER PUMP STATION REPLACEMENT BARKLEY LAKE WATER DISTRICT TRIGG COUNTY, KENTUCKY**

We certify that the following is a true and complete tabulation of all bids received by the Barkley Lake Water District on July 14, 2020, for the titled project.

BELL ENGINEERING



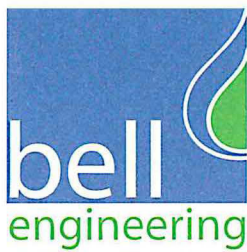
Scott and Ritter, Inc. P.O. Box 749 Bowling Green, Kentucky 42102	Cumberland Pipeline, LLC 2909 Cane Valley Mill Road Columbia, Kentucky 42728	Cleary Construction, Inc. 2006 Edmonton Road Tompkinsville, Kentucky 42167
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Item No.	Item	Quantity	Unit	Unit Price	Total	Unit Price	Total	Unit Price	Total
responsive, responsible Base Bidder whose evaluation by the OWNER indicates to the OWNER that the award will be in the best interest of the Project.									
<b>DIVISION "A"-WATER LINES</b>									
1.	6-Inch Class 250 (SDR 17) PVC Pipe, Furnishing, Trenching, Bedding, Laying and Backfilling, Including Compact Ductile Iron, Mechanical Joint Fittings, Detectable Wire, Unclassified Excavation, Complete	7,329	L.F.	\$21.60	\$158,306.40	\$22.50	\$164,902.50	\$43.60	\$319,544.40
2.	6-Inch Ductile Iron Restrained Joint Pipe for Bridge Crossing. Includes Pipe, Supports, Insulation, Coring of Bridge End Bents, Connections to PVC Pipes, Expansion Joint, and Installation on Bridge, Complete	348	L.F.	\$188.90	\$65,737.20	\$270.00	\$93,960.00	\$511.00	\$177,828.00
3.	6-Inch Ductile Iron, Mechanical Joint Gate Valve, Valve Box, and Collar, Complete	4	Each	\$1,295.00	\$5,180.00	\$1,500.00	\$6,000.00	\$1,330.00	\$5,320.00
4.	Fire Hydrant Assembly, Furnish and Install, Per Detail on Plans, Complete	1	Each	\$4,810.00	\$4,810.00	\$4,919.00	\$4,919.00	\$4,788.00	\$4,788.00
5.	Flush Hydrant Assembly, Furnish and Install, Per Detail on Plans, Complete	1	Each	\$3,940.00	\$3,940.00	\$4,131.00	\$4,131.00	\$3,724.00	\$3,724.00
6.	Locate and Reconnect Existing Water Service, Per Detail on Plans, Includes up to 12 Linear Feet of 3/4" Poly Service Tubing, and All Fittings Necessary for Reconnection	13	Each	\$265.00	\$3,445.00	\$365.00	\$4,745.00	\$1,437.00	\$18,681.00
7.	3/4" Corp Stop and Saddle for 6" PVC Pipe, Complete	13	Each	\$240.00	\$3,120.00	\$292.00	\$3,796.00	\$320.00	\$4,160.00
8.	3/4" Polyethylene Service Tubing, Where Reconnection Distance Required Exceeds 12' in Length	100	L.F.	\$9.00	\$900.00	\$7.00	\$700.00	\$10.70	\$1,070.00
9.	Reconnect Existing 2" Water Main, Including DIMJ Tee, Bronze Full-Port Ball Valve, Standard Valve Box and Collar, Complete	1	Each	\$1,465.00	\$1,465.00	\$1,507.00	\$1,507.00	\$2,660.00	\$2,660.00
10.	Reconnect Existing 1" Water Main, Including Bronze Saddle, Corp Stop, Bronze Full-Port Ball Valve, Copper Tubing, Standard Valve Box, and Collar, Complete	1	Each	\$1,560.00	\$1,560.00	\$1,406.00	\$1,406.00	\$1,596.00	\$1,596.00
11.	Cut/Tie-in To Existing 6-Inch Line, Including All Necessary Fittings, Complete	2	Each	\$1,580.00	\$3,160.00	\$2,360.00	\$4,720.00	\$1,064.00	\$2,128.00
12.	Supply and Install 6" SDR 17 PVC Carrier Pipe under Driveways or Obstacles by Drilling/Boring Method, No Casing Pipe Required (Freebore),	105	L.F.	\$98.00	\$10,290.00	\$49.00	\$5,145.00	\$107.00	\$11,235.00
13.	Remove Existing Hydrant, Reset on New Line, Including New Gate Valve, Box And Collar, DIMJ Tee, Complete	2	Each	\$2,700.00	\$5,400.00	\$3,245.00	\$6,490.00	\$1,596.00	\$3,192.00
14.	Supply and Install Cap on End of Abandoned Water Mains, Complete	2	Each	\$100.00	\$200.00	\$2,315.00	\$4,630.00	\$1,809.00	\$3,618.00
15.	Test Meter Assembly, Furnish and Install, Including Inline Gate Valve, as Detailed on Plans, Complete	1	Each	\$3,195.00	\$3,195.00	\$3,700.00	\$3,700.00	\$4,256.00	\$4,256.00
16.	Crushed Rock on Trench Surface (_____ L.F. x 225/2000 lbs = _____ Tons)	165	Ton	\$22.00	\$3,630.00	\$25.00	\$4,125.00	\$58.60	\$9,669.00

Scott and Ritter, Inc. P.O. Box 749 Bowling Green, Kentucky 42102	Cumberland Pipeline, LLC 2909 Cane Valley Mill Road Columbia, Kentucky 42728	Cleary Construction, Inc. 2006 Edmonton Road Tompkinsville, Kentucky 42167
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Item No.	Item	Quantity	Unit	Scott and Ritter, Inc.		Cumberland Pipeline, LLC		Cleary Construction, Inc.	
				Unit Price	Total	Unit Price	Total	Unit Price	Total
17.	Fiberglass Line Marker, Furnish, and Install, Complete	6	Each	\$55.00	\$330.00	\$150.00	\$900.00	\$63.90	\$383.40
18.	2-Inch Thickness Bituminous Surface Replacement, Trench Width, on Streets, Drives, and Roads,	60	L.F.	\$37.00	\$2,220.00	\$50.00	\$3,000.00	\$74.50	\$4,470.00
19.	Remove Existing Flush Hydrant, Return To Owner	1	Each	\$210.00	\$210.00	\$450.00	\$450.00	\$1,596.00	\$1,596.00
20.	Search And Extra Depth Trench Excavation, Only on Order of the Engineer	10	C.Y.	\$10.00	\$100.00	\$110.00	\$1,100.00	\$10.70	\$107.00
21.	Extra for Riprap Stone, Only on Order of the Engineer	10	Ton	\$26.40	\$264.00	\$50.00	\$500.00	\$53.20	\$532.00
22.	Extra for Crushed Rock for Trench Stabilization, Only on Order of the Engineer	10	Ton	\$24.30	\$243.00	\$50.00	\$500.00	\$53.20	\$532.00
SUBTOTAL DIVISION "A"					\$277,705.60		\$321,326.50		\$581,089.80
<b>DIVISION "B" - BOOSTER PUMPING STATION</b>									
For the complete construction as shown on plan sheets and specifications of a water booster pumping station, complete, as specified and/or shown on the Drawings, including excavation, regrade, valves, piping, conduits, pumps, site work, flushing hydrants, line markers, concrete work, crushed stone, security fence, gate, access road, electrical and control work, telemetry relocation and coordination, and all other items of work necessary for a complete and functional facility;									
		1	L.S.	\$357,215.00	\$357,215.00	\$493,000.00	\$493,000.00	\$503,834.00	\$503,834.00
SUBTOTAL DIVISION "B"					\$357,215.00		\$493,000.00		\$503,834.00
<b>SUMMARY</b>									
DIVISION "A"					\$277,705.60		\$321,326.50		\$581,089.80
DIVISION "B"					\$357,215.00		\$493,000.00		\$503,834.00
<b>TOTAL BID CONTRACT 586-19-01</b>					<b>\$634,920.60</b>		<b>\$814,326.50</b>		<b>\$1,084,923.80</b>

**APPENDIX E**  
**RECOMMENDATION FOR AWARD LETTER**



July 14, 2020

Mr. Scott Bridges  
Chairman  
Barkley Lake Water District  
P.O. Box 308  
Cadiz, Kentucky 42211

Subject: **Recommendation for Award**  
**Contract 586-19-01**  
Highway 139 North Water Line Upgrades and McUpton Booster Pump Station  
Trigg County, Kentucky

Dear Mr. Bridges,

We are pleased to submit our recommendation for the subject contract. After your bid opening on July 14, 2020, Bell Engineering reviewed and tabulated all bids received. We enclose one copy of the Bid Tabulation for your review and acceptance as desired.

Contractor interest in your project was satisfactory with three (3) bids being submitted. The project low bid totaled \$634,920.60 compared to Bell Engineering's Opinion of Probable Construction Cost of \$592,263. The low bid was \$42,657.60 (7.2%) above the Engineer's As-Designed Opinion of Probable Cost. Bids are summarized as follows:

**SUMMARY OF KEY BID RESULTS**

BIDDER RANK	BIDDER NAME	BID AMOUNT	DIFF. ABOVE LOW
1	Scott & Ritter, Inc.	\$634,920.60	Not Applicable
2	Cumberland Pipeline, LLC	\$814,326.50	\$179,405.90 (28.3%)
3	Cleary Construction	\$1,084,923.80	\$450,003.20 (70.9%)

At the time of the bid opening, the low bidder, Scott & Ritter provided a listing of past and current construction projects. Some of their more local references include the City of Cadiz and Hopkinsville Water Environment Authority (HWEA). Bell Engineering has had a long work history with Scott & Ritter and is very familiar with their work and abilities. Following the bid opening, Mr. Luke Ritter of Scott & Ritter was contacted and debriefed on his bid. They will self-perform most all of the project and are satisfied with their bid price. Bell Engineering has a favorable opinion of this contractor.

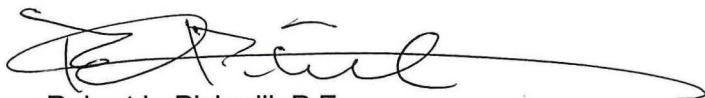
The amount of any contract award should be in accordance with available monies. Assuming sufficient funds are available for construction of the entire project, we recommend the Barkley Lake Water District award the project to **Scott & Ritter, Inc. of Bowling Green, KY.**



Mr. Scott Bridges  
July 14, 2020  
Page 2

We will be happy to meet with you and other board members to discuss bid results at your convenience, if desired. Should you have any questions about this or any other matter, please do not hesitate to call.

Sincerely,  
Bell Engineering

A handwritten signature in black ink, appearing to read "R. Pickerill", with a long horizontal flourish extending to the right.

Robert L. Pickerill, P.E.  
Vice President

Enclosure





*2480 FORTUNE DRIVE, SUITE 350  
LEXINGTON, KY 40509  
859/278-5412*

*107 FORBES DRIVE  
HOPKINSVILLE, KY 42240  
270/886-5466*

*1278 HENDERSONVILLE ROAD  
SUITE D  
ASHEVILLE, NC 28803  
828/774-5499*

*[WWW.HKBELL.COM](http://WWW.HKBELL.COM)*