



January 29, 2018

Hon. Kevin Neal, Judge Executive
Marshall County Fiscal Court
1101 Main Street
Benton, KY 42025

**Re: Summary/Status Report
Oak Level Water System Field Evaluation Services
Benton, Marshall County, KY**

Judge Neal:

The following has been prepared for your review and use in discussions with the Fiscal Court in regards to the field evaluations and findings from our study of the existing water system in the Oak Level area. During the fall/winter of 2017, Rivercrest coordinated with the City of Benton and their water operations staff to perform field evaluations on the existing water system west of the Marshall County Hospital. The purpose and scope of this field study was to locate and operate all system valves, check and monitor pressures at system hydrants, check and monitor pressures at the Oak Level tank location, and locate/exercise air relief valves within the system. These operations were recommended to obtain field verified information on the existing Benton water system, which could then be compared to 2016-17 City of Benton supplied historical pressure information and Rivercrest modeling results, and subsequently used to more accurately evaluate the requirements necessary to place the Oak Level Tank into operation.

APPROACH

Beginning in October 2017, Rivercrest field staff coordinated with Benton's operations staff to verify/update valve mapping, valve operation, and pressure recordings at each known valve and hydrant location between the Marshall County Hospital and the Oak Level Tank site. The following corridors were evaluated,

- a) Symsonia Hwy (KY 348)
- b) Oak Level Road (KY 408)
- c) Lynn Nelson Road
- d) Ivey Road
- e) Wadesboro Road
- f) Arant Road
- g) Breezeel School Road
- h) Jackson School Road.

****The results of these evaluations are presented as an attachment to this report.***

Rivercrest Engineering Incorporated, 7020 U.S. Highway 68 W, Paducah, Kentucky 42003

Our field approach to this study generally followed this order,

- A) RIVERCREST field staff teamed with a member(s) of City of Benton water staff to check the static water pressures (using City supplied pressure gauges) at each known hydrant location (including the new tank location) to establish a baseline for system pressures and to check for noticeable pressure drops, which may indicate water line restrictions (i.e. air pockets, main breaks, partially closed valves, etc.)
- B) RIVERCREST field staff teamed with City of Benton water staff to review/inspect the former water booster pump station location and old West Marshall Meter pit location (near Lynn Nelson Road). The purpose of these inspections was to evaluate water flow and pressures thru these areas to check for line restrictions (primarily from line size changes associated with line bypasses and typical meter installation practices).
- C) RIVERCREST field staff coordinated with City of Benton water staff to locate and map system isolation valves and operated them to ensure these were in the fully open position – noting all findings. City of Benton staff operated all valves.
 - As potential irregularities were noted, in “A” thru “C”, follow up pressure tests were performed at the adjacent hydrant locations to check for system impacts resulting from the opening of valves or removal of line restrictions.
- D) RIVERCREST field staff coordinated with City of Benton water staff in an effort to locate and map system air relief valves based upon available record drawing information. BUD calls were made by RIVERCREST staff, and excavations were performed by Benton staff to physically locate and inspect these valves. Excavations were performed at four (4) locations where air release valves were shown to exist on the record drawings.

During these initial evaluations, Rivercrest obtained static pressure readings indicating that suitable pressures may currently exist at the Oak Level Tank site for filling the tank. To further evaluate this condition, Rivercrest coordinated with Paducah Water & City of Benton staff to install a pressure recorder at the Oak Level Tank site hydrant to monitor the pressures on 5-minute intervals over a 2-week period. This period was selected during a dry-weather stretch to obtain more conservative (lower) pressures typically experienced during dry weather (and higher system water usage).

RESULTS

The information collected during our field evaluations was very beneficial on multiple fronts. The following list highlights the significant findings:

1. Throughout the study area, system pressures were measured to be higher than information previously presented to Rivercrest, which more closely matched our modeled results.
2. Recorded pressures at the Oak Level Tank site averaged between 41 and 46 psi, with peak readings above 50 psi, as compared to data previously supplied to Rivercrest indicating pressures in the range of 33-38 psi.
3. Although several valves and a few hydrants were inoperable,
 - a. Pressures recorded at the available hydrants were more consistent with RIVERCREST's previously performed hydraulically modeled runs, which are indicative of an "open" or "mildly" restricted distribution system.
 - b. Only 1 mainline valve was viewed as being partially closed – following operation of this valve, adjacent system pressures were measured to increase by approximately 4 psi.
4. Field reviews indicated that the old Booster pump station, located near Lynn Nelson Road, appears to have been properly isolated from the distribution system, with valves shut and piping removed.
5. A review of the old West Marshall metering pit indicates a restriction in the distribution system, as the line size is reduced from 6" to 4" through the metering device. The line size then returns to 6" prior to exiting the meter pit. Pressure gauges are not installed on either side of the active metering device. However, RIVERCREST would anticipate pressure losses on the order of <5 psi at this location.
6. Following attempts at 4 different locations, our team was unable to locate and operate an existing air release valve. At each location, the existing water main was located and exposed, by Benton Water staff, across a distance of approximately 50 feet. Based on these findings, we would conclude that many or all of these valves were eliminated from the design during construction of the existing water main as no repair clamps or material changes were noted by the field crew.
7. Based on the as-built plans for the Oak Level Tank, the low water level elevation at the site is 74.25 ft, with a high water (overflow) elevation of 102.75 ft. Monitored pressures at the site indicate that water elevations of 95 to 106 ft could potentially be achieved (based on the 41-46 psi average recorded pressures).

CONCLUSIONS & RECOMMENDATIONS FOR NEXT STEPS

The information gathered from this study is very promising. The data recorded indicates that favorable pressures exist at the Oak Level site for the potential filling of the tank and placing it into operation. RIVERCREST strongly recommends that additional follow up discussions with City of Benton management and operations staff be conducted, along with the completion of additional field testing:

1. A detailed discussion of the standard operating procedures of the City's water system pumps and tanks needs to be completed to obtain a clear understanding of critical system set points.
2. City of Benton operational procedures may need to be modified to allow for longer high service pump run times in an effort to fill the 3 elevated tanks.
3. Additional water system valving and controls may be necessary to control the filling of the City's tanks to prevent tank overflows.
4. With the implementation or changing of any operations, system pressures will need to be monitored to assess impacts on the water distribution system.
5. Prior to sending any water to the Oak Level Tank, a third-party contractor will need to be secured to inspect the water tank and perform all necessary cleaning and disinfection procedures to protect the City's water system from contamination.

At your request, RIVERCREST can be available to meet with the Fiscal Court and City of Benton staff for discussions of our findings, and in performance or coordination of the recommended next steps. We appreciate the Fiscal Court's and City's cooperation and efforts on this project, and we are optimistic that water service will be available to the Oak Level area in the short term.

Sincerely,

RIVERCREST ENGINEERING, INC.



Charles D. McCann II, P.E.
Project Manager

ATTACHMENT

cc: Rita Dotson, Mayor

OAK LEVEL WATER SYSTEM FIELD EVALUATION - BENTON, KY.

HYDRANT No.	HYDRANT LOCATION	DATE	TIME	MEASURED STATIC PRESSURE (PSI)	DATE	TIME	MEASURED STATIC PRESSURE (PSI)	COMMENTS	INSPECTED BY
EX. 1	KY 348 WEST SIDE OF DRIVEWAY	10/3/2017	9:42 AM	87 PSI				HYDRANT APPEARS TO BE IN GOOD WORKING CONDITION. HYDRANT WAS DIFFICULT TO OPERATE. HYDRANT DID NOT FUNCTION PROPERLY. HYDRANT NEEDS TO BE REPLACED.	CW / TH
1	673 Old symsonia Rd.	10/3/2017	10:20	100 +				Hydrant appears to be in good working condition. hydrant was leaking and was washed out at hydrant.	CW / TH
2	Across the road from 922 KY 348 W.	10/3/2017	10:30	98				Hydrant appears to be in good working condition. hydrant was leaking.	CW / TH
3	966 KY 348 W.	10/3/2017	10:37	89				Hydrant appears to be in good working condition.	CW / TH
4	Ivey Rd. & KY 348 W.	10/3/2017	10:45					Unable to open valve on hydrant, froze up.	CW / TH
5	1075 KY 348 W.	10/3/2017	10:52	100 +				Hydrant needs rebuilding or replaced, hard to open/close, leaking bad out of top.	CW / TH
6	Across from 106 Lynn Nelson rd.	10/3/2017	11:27	95				Hydrant needs rebuilding or replaced, hard to open/close, leaking bad out of top. Washed out around hydrant.	CW / TH
7	115 Lynn Nelson Rd.	10/3/2017	11:30	86				Hydrant appears to be in good working condition.	CW / TH
8	Across from 140 Lynn Nelson Rd.	10/3/2017	11:35	84				Hydrant opened easily but was unable to shut hydrant off, had to shut off Water valve at hydrant.	CW / TH
9	124 Ivey Rd.	10/3/2017	11:52	81				Hydrant appears to be in good working condition. Erosion at hydrant.	CW / TH
10	KY 348 W. @ Trailer Park	10/3/2017	1:20	100 +				Hydrant appears to be in good working condition.	CW / TH
11	4754 KY 348 W. East of Church.	10/3/2017	1:30	51				Hydrant appears to be in good working condition.	CW / TH
12	Kent Rudd Residence KY 408 W.	10/3/2017	2:01	84				Hydrant appears to be in good working condition.	CW / TH
13	1623 KY 408 W.	10/3/2017	2:05	77				Hydrant appears to be in good working condition.	CW / TH
14	1733 KY 408 W.	10/3/2017	2:11	83				Hydrant appears to be in good working condition.	CW / TH
15	1861 KY 408 W.	10/3/2017	2:17	-				Unable to open valve on hydrant, froze up.	CW / TH
16	Across the road from 926 KY 408 W.	10/3/2017	2:25	97				Hydrant appears to be in good working condition.	CW / TH
17	2025 KY 408 W.	10/3/2017	2:30	98				Hydrant appears to be in poor condition, leaking at caps.	CW / TH
18	KY 408 W. and Lynn Nelson Rd.	10/3/2017	2:36	89				Hydrant was very hard to open and close, needs rebuilt or replaced.	CW / TH
19	KY 2606 and KY 408 W.	10/3/2017	2:44	66				Hydrant appears to be in good working condition.	CW / TH
20	2799 KY 408 W.	10/3/2017	2:49	62				Hydrant appears to be in good working condition.	CW / TH
21	KY 408 W. & KY 2606	10/3/2017	2:54	-				Hydrant has been hit as was laying on ground by isolation Valve.	CW / TH

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22	Gibson Lane & KY 408 W.	10/3/2017	3:03	68						Hydrant appears to be in good working condition.	CW / TH
23	PHELPS Rd. & KY 408 W.	10/3/2017	3:15	100 +						Hydrant appears to be in good working condition.	CW / TH
24	KY 1949 & KY 408 W.	10/3/2017	3:21	77	10/4/2017	9:05	77			Hydrant appears to be in good working condition.	CW / TH
25	4592 Wadesboro Rd.	10/3/2017	3:30	54	10/4/2017	9:25	55			Hydrant appears to be in good working condition.	CW / TH
26	5204 Wadesboro Rd.	10/3/2017	3:35	58	10/4/2017	9:31	62			Hydrant appears to be in good working condition.	CW / TH
27	Arant Rd. & Wadesboro Rd.	10/3/2017	3:40	56	10/4/2017	9:40	60			Hydrant appears to be in good working condition.	CW / TH
28	Freeman Ln. & Wadesboro Rd.	10/3/2017	3:45	50	10/4/2017	9:45	54			Hydrant appears to be in good working condition.	CW / TH
29	Breezeel Sch. Rd. & Wadesboro Rd.	10/3/2017	3:55	43	10/4/2017	9:52	45			Hydrant appears to be in good working condition.	CW / TH
30	At Oak Level Water Tank.	10/3/2017	4:00	48	10/4/2017	10:00	51			Hydrant appears to be in good working condition.	CW / TH
31	158 Jackson School Rd.	10/6/2017	9:12	80						Performed pressure test at residence hydrant on the front of home.	CW / TH
32	266 Jackson School Rd.	10/6/2017	9:20	40						Performed pressure test at residence hydrant on the front of home. We could hear water leaking from back side of hydrant.	CW / TH
33	236 Jackson School Rd.	10/6/2017	9:30	75						Performed pressure test on hydrant on the back backside of home.	CW / TH
34	279 Breezeel Sch. Rd	10/6/2017	9:45	68						Performed pressure test on hydrant on the backside of home.	CW / TH
35	794 Breezeel Sch. Rd	10/6/2017	9:50	90						Performed pressure test on hydrant at garage.	CW / TH
36	1720 Breezeel Sch. Rd	10/6/2017	9:55	42						Performed pressure test at residence hydrant on the front of home.	CW / TH
AA	976 Breezeel Sch. Rd.	10/6/2017	10:00	90						Flush hydrant appears to be in good working condition. Weep hole may be clogged?	CW / TH
BB	1720 Breezeel Sch. Rd	10/6/2017	10:15	100						Flush hydrant appears to be in good working condition. Hydrant leaking.	CW / TH
CC	KY 348 W. and Jackson Sch. Rd	10/6/2017	10:50	88						Flush hydrant appears to be in fair working condition. Hydrant was hard to open/close.	CW / TH
DD	2331 KY 348 W.	10/6/2017	11:28	-						Unable to open flush hydrant, froze up? Need to repair or replace.	CW / TH
FF	3163 KY 348 W.	10/6/2017	11:40	-						Unable to open flush hydrant, stem broken. Need to repair or replace.	CW / TH

OAK LEVEL WATER SYSTEM FIELD EVALUATION - BENTON, KY.

VALVE LETTER	VALVE LOCATION	DATE	TIME	SIZE OF WATER MAIN (IN)	NO. OF VALVE TURNS	Comments	INSPECTED BY
EL.A	KY 348 WEST SIDE OF DRIVEWAY NEAR HYDRANT	10/3/2017	9:45 AM	6 IN		VALVE CHECKED FOR OPEN/CLOSE POSITION. VALVE DETERMINED TO BE FULLY OPEN. VALVE DETERMINED TO BE PARTIALLY CLOSED - FOLLOW UP HYDRANT PRESSURE CHECKS NEED TO BE PERFORMED. VALVE NEEDS MAINTENANCE. VALVE WAS HARD TO TURN. VALVE IS SEIZED UP. VALVE NEEDS TO BE REPLACED. VALVE OPERATION NORMAL.	JS / TH
A	#673 Old Symsonia Rd.	10/4/2017	10:20	12"		Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
B	Int. of Ivey Rd & KY 348 W.	14/4/2017	10:30	6"		Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
C	# 1075 KY 348 W.	10/4/2017	10:46	6"		Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
D	Lynn Nelson Rd & KY 348 W.	10/4/2017	10:55	6"		Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
E	Jackson Sch. Rd & ky 348 W.	10/4/2017	11:05	6"		Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
F	Jackson Sch. Rd & ky 348 W.	10/4/2017	11:10	3"		Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
G	Jackson Sch. Rd & ky 348 W.	10/4/2017	11:12	4"		Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
H	New Harmony & KY 348 W.	10/4/2017	11:15	6"		Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
I	New Harmony & KY 348 W.	10/4/2017	11:20	6"		Valve box was pushed over so far we were unable to get tool on valve to operate.	JS / TH
J	Phelps Rd. & KY 348 W.	10/4/2017	11:30	6"		Unable to open/close valve, metal pole locating valve needs to be relocated.	JS / TH
K	Hamlett Rd. & KY 348 W.	10/4/2017	11:37	6"		Valve box is broken, unable to get tool on valve to operate. VB needs replacing.	JS / TH
L	4757 KY 348 W.	10/4/2017	11:45	6"		Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
M	4757 KY 348 W.	10/4/2017	1:15	6"		Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
N	KY 348 W. West of Walters Rd.	10/4/2017	1:30	4"		Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
O	115 Lynn Nelson Rd.	10/5/2017	9:55	6"	20	Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
P	124 Ivey Rd.	10/5/2017	10:15	6"	20	Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
Q	Across street from 1926 KY 408	10/5/2017	10:25	6"	?	Valve Box was completely full of mud, need to replace valve box.	JS / TH
R	Lynn Nelson Rd & KY 348 W.	10/5/2017	10:30	4"	?	Valve was closed, Old existing 4" WM still in service. WM was hit by electric Co some time back and has never been repaired. Needs repairing or capped.	JS / TH
S	Lynn Nelson Rd & KY 408 W.	10/5/2017	10:35	6"	20	Checked valve for open/close position. Valve was fully open, valve operation normal. Cap is broken and ring on valve box is broken, needs replacing.	JS / TH
T	Lynn Nelson Rd & KY 408 W.	10/5/2017	10:50	8"	26	Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
U	Jackson Sch. Rd & KY 408 W.	10/5/2017	11:00	8"	26	Checked valve for open/close position, valve was completely shut off. Valve operation normal, we left valve completely closed after operating valve.	JS / TH
V	Jackson Sch. Rd & KY 408 W.	10/5/2017	11:25	8"	26	Checked valve for open/close position. Valve was fully open, valve operation normal. Valve box had a lot of dirt and mud in it.	JS / TH
W	Jackson Sch. Rd & KY 408 W.	10/5/2017	11:50	8"	?	Valve Box was completely full of mud, need to replace valve box.	JS / TH
X	Gibson & KY 408	10/5/2017	1:15	8"	?	Valve Box was completely full of mud, need to replace valve box.	JS / TH
Y	Gibson & KY 408	10/5/2017	1:17	8"	?	Valve Box was completely full of mud, need to replace valve box.	JS / TH
Z	Gibson & KY 408	10/5/2017	1:18	?	?	Valve Box was completely full of mud, need to replace valve box.	JS / TH
AA	Gibson & KY 408	10/5/2017	1:20	8"	26	Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
BB	East side of Middle fork bridge.	10/5/2017	1:50	8"	26	Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
CC	Phelps Rd. & KY 408 W.	10/5/2017	2:18	?	?	Valve Box was completely full of mud, need to replace valve box.	JS / TH

OAK LEVEL WATER SYSTEM FIELD EVALUATION - BENTON, KY.

VALVE LETTER	VALVE LOCATION	DATE	TIME	SIZE OF WATER MAIN (IN)	NO. OF VALVE TURNS	Comments	INSPECTED BY
DD	Wadesboro Rd. & KY 408 w.	10/5/2017	2:30	8"	26	Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
EE	Wadesboro Rd. & KY 408 w.	10/5/2017	2:35	8"	26	Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
FF	Arant RD. & Wadesboro Rd.	10/5/2017	2:40	8"	26	Valve was closed/off, for future WM expansion on KY 408 W. to the west.	JS / TH
GG	Arant RD. & Wadesboro Rd.	10/5/2017	2:45	8"	24	Checked valve for open/close position. Valve was not fully open, valve operation normal. Retested hydrant #27 and got 60 PSI.	JS / TH
HH	Arant RD. & Wadesboro Rd.	10/5/2017	2:50	8"	26	Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
II	Arant RD. & Wadesboro Rd.	10/5/2017	3:00	8"	26	Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
JJ	Arant RD. & Freeman	10/5/2017	3:06	8"	26	Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
KK	Arant & Breezell Sch. Rd.	10/5/2017	3:16	8"	26	Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
LL	Breezell Sch. Rd @ Water Tank	10/5/2017	3:25	8"	26	Valve was closed, valve operation normal. Left valve closed.	JS / TH
MM	Breezell Sch. Rd @ Water Tank	10/5/2017	3:27	8"	26	Checked valve for open/close position. Valve was fully open, valve operation normal.	JS / TH
NN	Breezell Sch. Rd @ Water Tank	10/5/2017	3:30	8"	26	Valve was closed, valve operation normal. Left valve closed.	JS / TH