

RECEIVED

COMMONWEALTH OF KENTUCKY

SEP 15 2020

BEFORE THE PUBLIC SERVICE COMMISSION

PUBLIC SERVICE COMMISSION

In the Matter of:

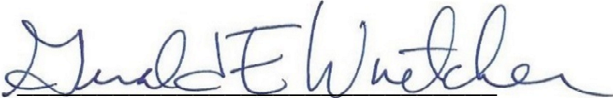
STUART I. GROSS, SR.	)	
	)	
COMPLAINANT	)	
	)	
v.	)	CASE NO. 2019-00258
	)	
GREEN RIVER VALLEY WATER DISTRICT	)	
	)	
DEFENDANT	)	

RESPONSE OF GREEN RIVER VALLEY WATER DISTRICT TO COMMISSION STAFF'S FIRST REQUEST FOR INFORMATION

Green River Valley Water District submits its Response to Commission Staff's First Request for Information.

Dated: September 15, 2020

Respectfully submitted,



Patrick A. Ross  
hrh@scrtc.com  
Hensley & Ross Attorneys  
P.O. Box 350  
Horse Cave, Kentucky 42749  
Telephone: (270) 786-2155  
Fax: (270) 786-2118

Gerald E. Wuetcher  
gerald.wuetcher@skofirm.com  
Stoll Keenon Ogden PLLC  
300 West Vine St. Suite 2100  
Lexington, Kentucky 40507-1801  
Telephone: (859) 231-3000  
Fax: (859) 259-3517

Counsel for Green River Valley Water District

**CERTIFICATE OF SERVICE**

In accordance with 807 KAR 5:001, Section 6, I certify that a true and accurate copy of this Response (without Attachment 2G) was served by U.S. Mail, postage prepaid, on Stuart I. Gross, Sr., 3013 Leitchfield Road, Cecilia, Kentucky 42724 on September 15, 2020.

  
*Counsel for Green River Valley Water District*

**COMMONWEALTH OF KENTUCKY**  
**BEFORE THE PUBLIC SERVICE COMMISSION**

**In the Matter of:**

<b>STUART I. GROSS, SR.</b>	)	
	)	
<b>COMPLAINANT</b>	)	
	)	
<b>v.</b>	)	<b>CASE NO. 2019-00258</b>
	)	
<b>GREEN RIVER VALLEY WATER DISTRICT</b>	)	
	)	
<b>DEFENDANT</b>	)	


**RESPONSE OF**  
**GREEN RIVER VALLEY WATER DISTRICT**  
**TO**  
**COMMISSION STAFF'S FIRST REQUEST FOR INFORMATION**

**FILED: September 15, 2020**

**VERIFICATION**

COMMONWEALTH OF KENTUCKY   )  
  ) SS:  
COUNTY OF HART                                    )

The undersigned, David Paige, being duly sworn, deposes and states that he is the General Manager of Green River Valley Water District and that he has personal knowledge of the matters set forth in the responses for which he is identified as the witness, and the answers contained therein are true and correct to the best of his information, knowledge and belief.

  
\_\_\_\_\_  
David Paige  
General Manager  
Green River Valley Water District

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 14<sup>th</sup> day of September 2020.

  
\_\_\_\_\_  
Notary Public

My Commission Expires: Jan. 17, 2024

Notary ID: KYNP960\_\_\_\_\_





**GREEN RIVER VALLEY WATER DISTRICT**

**Response to Commission Staff's First Request for Information  
Case No. 2019-00258**

Question No. 1

Responding Witnesses: David Paige/Vaughn Williams

**Q-1. Refer to Green River Valley District's Offer of Settlement filed August 25, 2020.**

- a. State the basis for the estimated cost of the proposed project and provide all workpapers used to arrive at the \$50,000 estimated cost.**
- b. Provide copies of all opinions or studies, including preliminary hydraulic data, that Green River Valley District relied upon when determining this construction project would address the low water pressure problem that is the subject of this complaint.**
- c. State how Green River Valley District will fund the construction project.**

- A-1.
- a. See Attachment 1. The estimated cost shown on Attachment 1 is less than the \$280,000 shown on Green River Valley Water District's submittal to the Kentucky Division of Water. The cost estimate provided to the Kentucky Division of Water, however, uses prices from similar projects in which contractors were used to construct the water mains and request for bids were obtained. Green River Valley Water District intends to construct the project using its own personnel and equipment, hence the lower estimated cost.
  - b. See Response to Question 11, Attachments 2B-2E.
  - c. Green River Valley Water District will use existing reserves to fund the proposed construction.

# **ATTACHMENT 1**



**Green River Valley Water District  
Edmonson County Water District Interconnect**

**Opinion of Probable Cost - Water District Constructing**

**September 4, 2020**

Item No.	Description	Unit	Quantity	Unit Price	Item Price
1	3" PVC, SDR-17 Pipe	9,775	LF	\$1.10	\$10,752.50
2	3" PVC, SDR-13.5 Pipe	2,100	EA	1.25	2,625.00
3	2" HDPE, DR-11 Pipe	50	LF	1.20	60.00
4	6" x 3" Tapping Sleeve & Valve	1	EA	420.00	420.00
5	3" Gate Valve	3	EA	400.00	1,200.00
6	2" Master Meter Vault	1	LS	5,000.00	5,000.00
7	3" Blowoff Assembly	2	EA	500.00	1,000.00
8	3/4" DR-9 Service Tubing	100	LF	1.00	100.00
9	Meter Reconnect	1	LF	100.00	100.00
10	Crushed Stone (Driveways)	200	LF	2.00	400.00
11	Water District Labor & Equipment	1	LS	15,000.00	15,000.00
<b>Total Construction Cost</b>					<b>\$36,657.50</b>

<b>Total Construction Cost</b>	\$36,657.50
Contingency	5,342.50
Engineering	8,000.00
<b>Total Project Cost</b>	<b>\$50,000.00</b>



**GREEN RIVER VALLEY WATER DISTRICT**

**Response to Commission Staff's First Request for Information  
Case No. 2019-00258**

Question No. 2

Responding Witness: Legal Counsel

**Q-2. State whether Mr. Gross has agreed to the settlement proposal. If not, provide a status update on the settlement negotiations.**

A-2. Green River Valley Water District's efforts to contact Mr. Gross have been unsuccessful. A copy of the Offer of Settlement was sent to Mr. Gross at the address set forth in her Complaint. Counsel has attempted to telephone Mr. Gross several times using the telephone numbers that he provided to Green River Valley Water District without success. Counsel also has sent e-mail and text messages to Mr. Gross at the e-mail address and telephone number that he provided to Green River Valley Water District requesting a response by e-mail or telephone. Counsel has not received any response to these e-mails or texts. Green River Valley Water District respectfully recommends that the Commission issue an Order directing Mr. Gross to advise the Commission in writing as to whether the Offer of Settlement satisfies his complaint and, if not, to state the reasons why it does not.

**GREEN RIVER VALLEY WATER DISTRICT**

**Response to Commission Staff's First Request for Information  
Case No. 2019-00258**

Question No. 3

Responding Witness: Vaughn Williams

- Q-3. State whether the three-inch polyvinyl chloride water main Green River Valley District proposes to use in this construction project is compatible in size and composition with the piping in Edmonson County Water District's (Edmonson District) system and the piping in Green River Valley District's system.**
- A-3. The proposed main is compatible in size and composition with Edmonson County Water District's system.

**GREEN RIVER VALLEY WATER DISTRICT**

**Response to Commission Staff's First Request for Information  
Case No. 2019-00258**

Question No. 4

Responding Witnesses: David Paige/Vaughn Williams

- Q-4. State whether Edmonson District's connection to Green River Valley District's distribution system will be valved to separate the two districts, or whether there will be any mixing of water from both districts.**
- A-4. The proposed water main will be valved to separate it from the rest of Green River Valley Water District's distribution system. There will be no mixing of waters.
- .

**GREEN RIVER VALLEY WATER DISTRICT**

**Response to Commission Staff's First Request for Information  
Case No. 2019-00258**

Question No. 5

Responding Witnesses: David Paige/Vaughn Williams

**Q-5. If there is mixing of water from both systems, state whether a study has been done to compare compatible water qualities and disinfection processes. Provide the results of any tests or studies conducted.**

A-5. There will be no mixing of waters.

**GREEN RIVER VALLEY WATER DISTRICT**

**Response to Commission Staff's First Request for Information  
Case No. 2019-00258**

Question No. 6

Responding Witnesses: David Paige/Vaugh Williams

- Q-6. State whether the proposed project includes the addition of a control valve or other apparatus to supply water to the Bonnieville Tank, or whether the only customers to be served by this project are Mr. Gross and the six additional customers.**
- A-6. Mr. Gross and the six additional customers are the only customers who will be served through the proposed project.

**GREEN RIVER VALLEY WATER DISTRICT**

**Response to Commission Staff's First Request for Information  
Case No. 2019-00258**

Question No. 7

Responding Witness: Vaughn Williams

- Q-7. State why the proposed line extension will not allow for a flow greater than 2.0 feet per second. Address proposed pipe size, type of blow off, and any other features unique to this project that contribute to or limit flow rate.**
- A-7. A hydraulic analysis was performed on the piping located between Edmonson County Water District's Tank and the Stuart Gross property located on Baumgardner Road. The results of this analysis showed that the pressure along the pipeline route would fall below 20 pounds per square inch if a flow greater than 55 gallons per minute, or 2.0 feet per second velocity, was flushed through the piping. The *Recommended Standards for Water Works* states that waterlines should be capable of being flushed at 2.5 feet per second. On past projects, the Kentucky Division of Water has allowed line extensions even though the 2.5 feet per second velocity cannot be achieved but has classified the area as "underserved" and not permitted further extensions of the pipeline.

**GREEN RIVER VALLEY WATER DISTRICT**

**Response to Commission Staff's First Request for Information  
Case No. 2019-00258**

Question No. 8

Responding Witness: Legal Counsel

- Q-8. State whether Green River Valley District will be required to reimburse Edmonson District for the water from Edmonson District's storage tank near Kessinger, Kentucky, used to feed into Green River Valley District's system. If so, state the billing rate Green River Valley District will pay.**
- A-8. KRS 278.160 requires that Edmonson County Water District assess its wholesale rate, which is currently \$3.13 per 1,000 gallons, to Green River Valley Water District for water sold to Green River Valley Water District. Edmonson County Water District and Green River Valley Water District currently have a contract for emergency water service. The water districts have not discussed a written agreement regarding the proposed arrangement to permit Green River Valley Water District to serve the Complainant. However, Green River Water District believes that a written contract to formalize the proposed service will be executed or that Edmonson County Water District will revise its current filed rate schedules to specifically list Green River Valley Water District as a wholesale customer under the current wholesale rate.

**GREEN RIVER VALLEY WATER DISTRICT**

**Response to Commission Staff's First Request for Information  
Case No. 2019-00258**

Question No. 9

Responding Witness: Vaughn Williams

- Q-9. If Green River Valley District will purchase water from Edmonson District, state the approximate amount of water that will be purchased on a daily basis through the master meter associated with this project.**
- A-9. In 2019 Green River Valley Water District's residential customers used an average 163 gallons per day (GPD). There are potentially eight customers along the proposed line extension. Therefore, the average daily volume of water to be purchased from Edmonson County Water District is estimated to be 1,304 gallons.



**GREEN RIVER VALLEY WATER DISTRICT**

**Response to Commission Staff's First Request for Information  
Case No. 2019-00258**

Question No. 10

Responding Witness: David Paige

**Q-10. State how Green River Valley District is addressing the low pressure problem at Mr. Gross's residence currently and how Green River Valley District plans to address the problem until construction is complete.**

A-10. Green River Valley Water District does not have any information on how Mr. Gross is currently addressing the low-pressure problem. Its recent efforts to contact Mr. Gross have been unsuccessful. Mr. Gross has not contacted Green River Valley Water District since the Public Service Commission established a formal proceeding to consider his complaint.

**GREEN RIVER VALLEY WATER DISTRICT**

**Response to Commission Staff's First Request for Information  
Case No. 2019-00258**

Question No. 11

Responding Witness: Vaughn Williams

**Q-11. Provide a copy of the application and all exhibits submitted to the Division of Water in connection with this project.**

A-11. See Attachment 2 to this Response.

# **ATTACHMENT 2**

**ATTACHMENT 2A**

**APPLICATION TO  
DIVISION OF WATER**

# GREEN RIVER VALLEY WATER DISTRICT

1180 East Main Street  
P.O. Box 460  
Horse Cave, KY 42749  
(270) 786-2134  
Fax (270) 786-5261  
TTY1-800-773-2135

David Paige, Manager

DISTRICT COMMISSIONERS  
Phillip Doyle, Chairman  
Pat Ross, Attorney  
John Bunnell, Secretary/Treasurer  
Ray Branstetter  
Pat Tucker  
Leland Glass

September 4, 2020

Mr. Terry Humphries  
Water Infrastructure Branch  
Engineering Section  
Division of Water  
300 Sower Blvd., 3<sup>rd</sup> Floor  
Frankfort, KY 40601

RE: Green River Valley Water District  
Edmonson County Water District Interconnect Project

Dear Mr. Humphries:

Attached for your review and approval are engineering plans, technical specifications, a Construction Application for Drinking Water Distribution, hydraulic calculations, project cost estimate, and a project location map for the above referenced project. The documents were prepared by Kenvirons, Inc., and have been reviewed by the Water District. The District concurs with their content. The existing Green River Valley Water District customers in the project vicinity will now be served via interconnect with Edmonson County Water District (ECWD). A separate letter will be provided from ECWD providing their concurrence with the plans and stating they have adequate capacity to provide the water.

If you should have any questions or need additional information, please contact Brandon L. Hamilton, P.E. with Kenvirons, Inc. at (502) 695-4357.

Sincerely, 

David Paige  
Manager



## Edmonson County Water District

September 10, 2020

Water Infrastructure Branch  
Engineering Section  
Division of Water  
300 Sower Blvd., 3rd Floor  
Frankfort, KY 40601

RE: Green River Valley Water District  
Edmonson County Water District Interconnect Project

Dear Mr. Humphries:

The Edmonson County Water District will be supplying the treated water for the above referenced project.

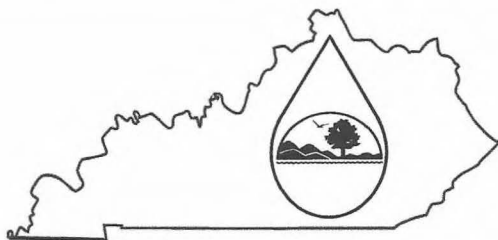
The existing Edmonson County Water District Distribution System has adequate capacity to supply the anticipated demand.

Green River Valley Water District will accept responsibility for the operation and maintenance of the water line upon completion of construction.

If you should have any questions or need any additional information, please contact me at your earliest convenience.

Respectfully,

Tony Sanders  
General Manager



**Commonwealth of Kentucky**  
 Energy and Environment Cabinet  
**Division of Water**

**Construction Application  
 For Drinking Water Distribution**

See the instructions for more information about selected portions of this application.  
 Questions on completing this application? Contact the Water Infrastructure Branch at 502/564-3410, by e-mail at [WIBEngineering@ky.gov](mailto:WIBEngineering@ky.gov) or visit our website at <http://water.ky.gov> for more information.

**I. Construction Project Information**

Project Name: Edmonson County Water District Interconnect

Project County: Hart Estimated Project Cost: \$ 280,000.00

Project Latitude/Longitude (DMS): 37° 21' 3.9" / -85° 55' 54.5"

Is this a federally funded project: No

DWSRF

SPAP

Other: Self Funded

If yes, has an Environmental Information Document been reviewed and approved? N/A

If the project has been submitted to the State Clearinghouse for review, provide the SAI number: N/A

Identify all other funding sources: N/A

Does the project contain any of the following:

Booster Pump Stations

Water Storage Tanks

Waterlines

Waterline Material	Waterline Size	Linear Feet
PVC, SDR-13.5	3"	2100'
PVC, SDR-17	3"	9775'
HDPE, DR-11	2"	Approx. 50'

Provide a DETAILED description of work to be performed for this project. Attach additional sheets as necessary:

The proposed project includes the construction of a 2" master meter and 11,875 linear feet of 3" waterline to supply existing Green River Valley Water District customers along Rocky Hill Road who have low water pressure. The proposed project will supply the existing customers with water from Edmonson County Water District under normal and peak demand conditions. During periodic waterline maintenance activities, flushing of the proposed waterline segment will be performed with water from Green River Valley Water District. Both systems utilize Free Chlorine Disinfection.

Identify how the sanitary wastewater produced as a result of this project will be handled:

Sanitary Sewer

WWTP: \_\_\_\_\_

Septic Tank

Other: \_\_\_\_\_

**II. Utility Information**

Utility Name: Green River Valley Water District PWSID: KY0500166

Street Address: 1180 East Main Street, P.O. Box 460 County: Hart

City, State, Zip: Horse Cave, KY 42749

Phone #: (270) 786-2134 Fax #: (270) 786-5261 Email: grvwd@scrvc.com

If another utility will serve any portion of the proposed project, provide the name and PWSID No.

Utility Name: Edmonson County Water District PWSID No. KY0310114

If the utility serving the project purchases water from another utility, provide the name and PWSID No. and purchase contract amount.

Utility Name: \_\_\_\_\_ PWSID No. \_\_\_\_\_ Purchase Contract Amount: \_\_\_\_\_

Utility Name: \_\_\_\_\_ PWSID No. \_\_\_\_\_ Purchase Contract Amount: \_\_\_\_\_

Utility Name: \_\_\_\_\_ PWSID No. \_\_\_\_\_ Purchase Contract Amount: \_\_\_\_\_

Is the system currently under any type of waterline or sewer sanctions? No

If yes, submit an exception request and attach supporting documentation to justify its approval.

**III. Design Considerations**

**A. Plans and Specifications**

Plans and specifications shall comply with 401 KAR 8:100 and “Recommended Standards for Water Works” 2007 Edition (Ten States’ Standards). All plans must contain a P.E. seal, signature and date of signature with at least one set having an original seal and signature. Provide detailed plans (no larger than 24” X 36”) which must comply with 401 KAR 8:100. See the instructions for additional details.

**B. Design Engineer**

Name: Brandon L. Hamilton, P.E. Firm: Kenvirons, Inc.

Street Address: 770 Wilkinson Blvd.

City, State, Zip: Frankfort, KY 40601

Phone #: (502) 695-4357 Fax #: (502) 495-4363 Email: bhamilton@kenvirons.com

**Design Capacities**

Identify the number of new connections and the projected average daily demand: No new customers

Identify the number of existing residents, and their projected water demand, that may be served as a result of this project:  
1 Existing Customer, Minimal change in existing demand expected, Existing Demand Approx. 180 GPD

Identify the number of connections in the service area: 6,850



**Other Information to be Submitted with the Project**

- 1. Provide a copy of the U.S.G.S. 7 1/2 minute topographic map or a detailed vicinity map with the location(s) of the proposed project.
- 2. If the project includes a new or upgraded pump station(s), provide the pump sizing calculations and the proposed pump's characteristics curve along with the efficiency, horsepower and NPSHR data. Also, identify each pump station's locations coordinates (DMS).
- 3. If the project proposes the addition of storage tanks, provide engineering calculations which demonstrates a complete fill and drain cycle every 72 hours. Also, identify each storage tank's location coordinates (DMS).
- 4. Provide engineering calculations or an electronic model demonstrating the availability of 30 psig in the waterline under peak demand conditions.
- 5. Provide engineering calculations or an electronic model that demonstrates if the proposed waterlines are capable of a 2.5 ft/sec flow velocity and show associated residual system pressures.
- 6. Provide a signed letter of acceptance from the utility, which states that the utility has reviewed and approved the plans and specifications and agrees to serve the proposed project upon completion. If another utility will own, operate and maintain any portion of this project provide an acceptance letter from that utility as well.
- 7. If the utility is a purchaser and the project demand is over 10,000 gallons per day or the utility has exceeded 85% of its purchase contract, provide a valid acceptance letter from the seller.
- 8. If the project will provide water service to existing residences, provide the names and addresses of all existing residences to be served by the project, if known.
- 9. If the project is funded by a State Revolving Fund Loan (SRF) provide a completed SRF Plans and Specifications Checklist along with 1 complete printed copy of the project specifications.

**IV. Environmental Benefits**

Identify the environmental benefit(s) of the project by checking all that apply.

- Construction of new waterlines serving existing residences previously without public water.
- Modifies/upgrades existing waterlines:
  - Inadequately sized waterlines.
  - Leaks, breaks, restrictive flow.
  - Replaces lead, copper or asbestos cement waterlines.
  - Other: Construction of new interconnect to improve service to existing customers.
- Provides fire protection.
- Replaces tanks/pumps due to age/condition.
- Installation of high efficiency/energy saving pumps.
- Other. Provide a brief description in the space below. \_\_\_\_\_

**V. Fees**

Check or money order must be made payable to "Kentucky State Treasurer" for the total amount. Fees do not apply to projects FUNDED by a municipality, water district, or other publicly owned utility.

Project Category: Water District Total Amount: \$ N/A

**ATTACHMENT 2B**

**FLUSHING DEMAND REPORT**

GRVWD to ECWD - Flushing Demand Report

CHANGES FOR NEXT SIMULATION (time = 1.0000 hours)

UNIT COST OF POWER FOR THIS SIMULATION PERIOD = 0.050 \$/kW-Hr

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

Time: 1.000

TIME FROM INITIATION OF EPS = 1.0000 HOURS ( 1.00AM, DAY: 1)

RESULTS OBTAINED AFTER 3 TRIALS: ACCURACY = 0.25190E-05

PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE NUMBERS		FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s	HL+ML/ 1000 ft/f	HL/ 1000 ft/f
	#1	#2						
P-458	J-408	J-418	-20.02	3.05	0.00	0.91	1.35	1.35
P-459-XX	J-408	J-420						
P-460	J-403	J-410	-0.57	0.00	0.00	0.01	0.00	0.00
P-461	J-410	J-411	-0.91	0.01	0.00	0.02	0.00	0.00
P-462	J-411	J-412	-1.10	0.01	0.00	0.03	0.00	0.00
P-463	J-412	J-413	-1.22	0.00	0.00	0.03	0.00	0.00
P-464	J-413	J-414	-1.41	0.02	0.00	0.04	0.00	0.00
P-465	J-414	R-1	-2.24	0.03	0.00	0.06	0.01	0.01
P-466	J-415	J-416	-11.85	0.01	0.00	0.13	0.02	0.02
P-467	J-416	Bonnievill	-11.89	0.00	0.00	0.13	0.02	0.02
P-468	J-419	J-415	-20.23	0.06	0.00	0.92	1.38	1.38
P-469	J-417	J-409	-20.10	6.48	0.00	0.91	1.36	1.36
P-470	J-418	J-417	-20.03	5.26	0.00	0.91	1.35	1.35
P-471	J-421	J-419	-20.21	0.96	0.00	0.92	1.38	1.38
P-472	J-409	J-421	-20.18	0.32	0.00	0.92	1.37	1.37
P-473	J-420	J-403	-0.16	0.00	0.00	0.00	0.00	0.00

FOLLOWING ADDITIONAL PIPES ARE CLOSED :

P-68 P-127 P-200 P-329 P-382  
P-457

PUMP/LOSS ELEMENT RESULTS

NAME	FLOWRATE gpm	INLET HEAD ft	OUTLET HEAD ft	PUMP HEAD ft	EFFIC- ENCY %	USEFUL POWER Hp	INCREMTL COST \$	TOTAL COST \$	#PUMPS PARALLEL	#PUMPS SERIES	NPSH Avail. ft	Time hrs
Chesnut Gr	0.10	119.05	1133.48	1014.4	75.00	0.	0.0	0.0	**	**	152.3	1.0000
Warning P2K107:Device												
Friendship	102.17	347.17	408.10	60.9	52.71	2.	0.0	0.1	**	**	380.3	1.0000
HWY 1079 P	39.39	107.46	308.32	200.9	75.00	2.	0.0	0.1	**	**	140.6	1.0000
Magnolia P	150.62	96.32	385.25	288.9	75.00	11.	0.1	0.6	**	**	129.3	1.0000
Mount Sher	0.78	346.31	348.79	2.5	4.00	0.	0.0	0.0	**	**	379.5	1.0000
Munfordvil	119.07	65.17	297.75	232.6	75.00	7.	0.0	0.4	**	**	98.3	1.0000
Warning P2K107:Device												
Quarry Roa	0.32	203.38	299.79	0.0	9.26	0.	0.0	0.0	**	**	236.6	1.0000
WTP Pump N	670.69	9.49	746.83	737.3	75.00	125.	0.7	6.9	**	**	42.6	1.0000
WTP Pump N	670.69	9.49	746.84	737.4	75.00	125.	0.7	6.9	**	**	42.6	1.0000
WTP Pump N	670.69	9.49	746.84	737.4	75.00	125.	0.7	6.9	**	**	42.6	1.0000
Pump-5	0.23	81.68	516.43	434.8	75.00	0.	0.0	0.0	**	**	114.9	1.0000
Pump-9	0.55	140.20	856.27	716.1	75.00	0.	0.0	0.0	**	**	173.4	1.0000

FOLLOWING ADDITIONAL PIPES ARE CLOSED :

GRVWD to ECWD - Flushing Demand Report

FOLLOWING ADDITIONAL PIPES ARE CLOSED :

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
Bonnievill		----	923.36	885.00	38.36	16.62
J-403		0.41(0.25)	1071.94	623.00	448.94	194.54
J-408		20.02(1.00)	907.22	786.00	121.22	52.53
J-409		0.08(0.25)	922.01	900.00	22.01	9.54
J-410		0.34(0.25)	1071.94	758.00	313.94	136.04
J-411		0.19(0.25)	1071.94	860.00	211.94	91.84
J-412		0.11(0.25)	1071.95	681.00	390.95	169.41
J-413		0.19(0.25)	1071.96	959.00	112.96	48.95
J-414		0.83(0.25)	1071.97	877.00	194.97	84.49
J-415		0.03(0.25)	923.35	873.00	50.35	21.82
J-416		0.03(0.25)	923.36	885.00	38.36	16.62
J-417		0.06(0.25)	915.53	873.00	42.53	18.43
J-418		0.02(0.25)	910.28	651.00	259.28	112.35
J-419		0.02(0.25)	923.30	873.00	50.30	21.79
J-421		0.03(0.25)	922.34	893.00	29.34	12.71
R-1		----	1072.00	992.00	80.00	34.67

M A X I M U M A N D M I N I M U M V A L U E S

P R E S S U R E S

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
O-Chesnut Gr	491.17	J-302	-9.34
J-400	461.53	J-303	0.63
O-Pump-9	371.05	J-356	1.29
J-402	368.49	J-52	1.29
J-3	332.52	J-1	1.30

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
P-1613	5.71	P-357	0.00
P-3	5.71	P-1629	0.00
P-1615	5.29	P-1514	0.00
P-7	5.29	P-43	0.00
P-8	5.29	P-114	0.00

H L + M L / 1 0 0 0

PIPE NUMBER	MAXIMUM HL+ML/1000 (ft/ft)	PIPE NUMBER	MINIMUM HL+ML/1000 (ft/ft)
P-251	13.98	P-357	0.00
P-69	13.98	P-1629	0.00
P-70	13.89	P-1514	0.00
P-71	13.86	P-262	0.00
P-15	11.06	P-381	0.00

H L / 1 0 0 0

PIPE NUMBER	MAXIMUM HL/1000 (ft/ft)	PIPE NUMBER	MINIMUM HL/1000 (ft/ft)

GRVWD to ECWD - Flushing Demand Report

P-251	13.98	P-357	0.00
P-69	13.98	P-1629	0.00
P-70	13.89	P-1514	0.00
P-71	13.86	P-262	0.00
P-15	11.06	P-381	0.00

S U M M A R Y   O F   I N F L O W S   A N D   O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES  
 (-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

NODE NAME	FLOWRATE gpm	NODE TITLE
-----		
Bonnieville	11.89	
Clearwell	2012.07	
Frenchmans	0.49	
Hudgins Tan	1.95	
Magnolia Ta	-1779.93	
Mt. Sherman	-118.52	
Pine Ridge	-85.65	
R-1	2.24	
R-3	139.99	

NET SYSTEM INFLOW = 2168.63  
 NET SYSTEM OUTFLOW = -1984.11  
 NET SYSTEM DEMAND = 184.52

T A N K   S T A T U S   R E P O R T (time = 1.0000 hours)

TANK NAME (*)	NET FLOW gpm	WATER ELEVATION ft	TANK DEPTH ft	TANK VOLUME gals	TANK VOLUME %	TANK STATUS	PROJECTED DEPTH ft
-----							
Bonnieville (2)	-11.89	923.36	13.36	17585.	70.3	DRAINING	12.82
Hudgins Tan (2)	-1.95	920.00	9.50	23745.	95.0	DRAINING	9.45
Magnolia Ta (2)	1779.93	951.92	6.92	345963.	69.2	FILLING	9.06
Mt. Sherman (2)	118.52	1060.52	5.52	68976.	55.2	FILLING	6.09
Pine Ridge (2)	85.65	925.37	5.37	89428.	59.6	FILLING	5.67

\* TANK TYPE: (1) - CONSTANT DIAMETER (2) - VARIABLE AREA

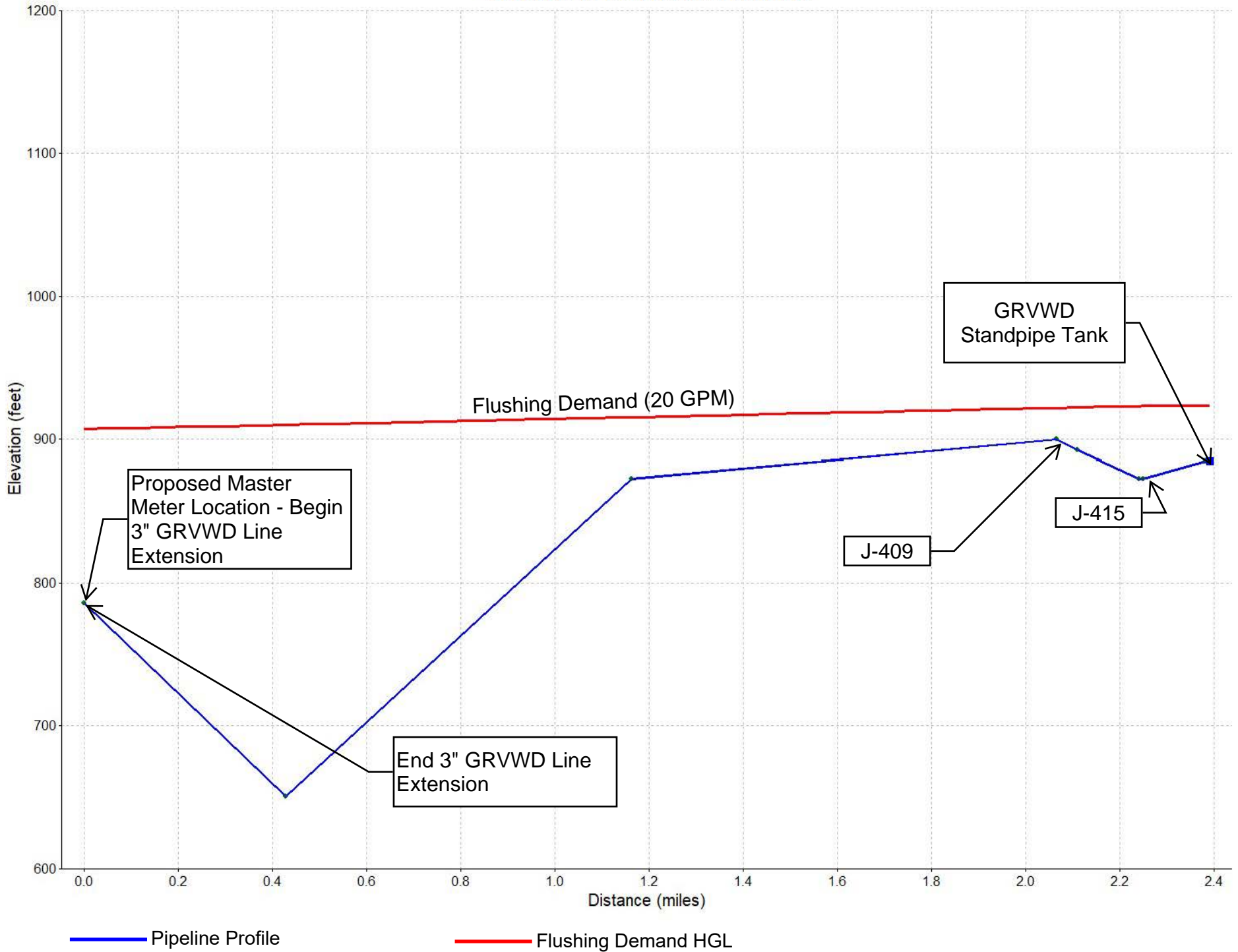
F L O W   M E T E R   R E P O R T (time = 1.0000 hours)

PIPE NUMBER	METERED FLOW gals
-----	
P-458	-1201.2

**ATTACHMENT 2C**

**FLUSHING DEMAND PROFILE**

# GRVWD to ECWD Interconnect





**ATTACHMENT 2D**

**PEAK DEMAND REPORT**

CHANGES FOR NEXT SIMULATION (time = 20.0000 hours)

UNIT COST OF POWER FOR THIS SIMULATION PERIOD = 0.050 \$/kW-Hr

JUNCTION DEMANDS CHANGED - PLEASE SEE RESULTS TABLE

Time: 20.000

TIME FROM INITIATION OF EPS = 20.0000 HOURS ( 8.00PM, DAY: 1)

RESULTS OBTAINED AFTER 3 TRIALS: ACCURACY = 0.55823E-06

PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE #1	NODE #2	FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s	HL+ML/1000 ft/f	HL/1000 ft/f
P-458	J-408	J-418	29.25	6.16	0.00	1.33	2.73	2.73
P-459	J-408	J-403	-30.50	2.74	0.00	0.78	0.73	0.73
P-460	J-403	J-410	-33.35	7.20	0.00	0.85	0.86	0.86
P-461	J-410	J-411	-35.74	4.79	0.00	0.91	0.97	0.97
P-462	J-411	J-412	-37.10	5.04	0.00	0.95	1.04	1.04
P-463	J-412	J-413	-37.90	2.62	0.00	0.97	1.09	1.09
P-464	J-413	J-414	-39.26	8.10	0.00	1.00	1.16	1.16
P-465	J-414	R-1	-45.06	6.84	0.00	1.15	1.50	1.50
P-466	J-415	J-416	0.23	0.00	0.00	0.00	0.00	0.00
P-467	J-416	Bonnievill	0.00	0.00	0.00	0.00	0.00	0.00
P-468-XX	J-419	J-415						
P-469	J-417	J-409	28.68	12.43	0.00	1.30	2.63	2.63
P-470	J-418	J-417	29.14	10.52	0.00	1.32	2.71	2.71
P-471	J-421	J-419	28.00	1.75	0.00	1.27	2.52	2.52
P-472	J-409	J-421	28.11	0.91	0.00	1.28	2.53	2.53

FOLLOWING ADDITIONAL PIPES ARE CLOSED :

P-68 P-127 P-200 P-329 P-382  
P-457

PUMP/LOSS ELEMENT RESULTS

NAME	FLOWRATE gpm	INLET HEAD ft	OUTLET HEAD ft	PUMP HEAD ft	EFFIC-ENCY %	USEFUL POWER Hp	INCREMTL COST \$	TOTAL COST \$	#PUMPS PARALLEL	#PUMPS SERIES	NPSH Avail. ft	Time hrs
Chesnut Gr	0.68	110.21	255.12	144.9	75.00	0.	0.0	0.0	**	**	143.4	20.0000
Warning P2K107:Device		Friendship is operating out of range.										
Friendship	103.47	309.83	368.31	58.5	51.22	2.	0.1	2.4	**	**	342.9	20.0000
HWY 1079 P	47.48	94.34	260.98	166.6	75.00	2.	0.1	2.1	**	**	127.5	20.0000
Magnolia P	150.24	81.60	371.26	289.7	75.00	11.	0.5	11.5	**	**	114.6	20.0000
Mount Sher	5.46	292.80	295.14	2.3	25.41	0.	0.0	0.0	**	**	326.0	20.0000
Munfordvil	115.52	60.14	299.88	239.7	75.00	7.	0.3	7.3	**	**	93.3	20.0000
Warning P2K107:Device		Quarry Road is operating out of range.										
Quarry Roa	2.28	165.18	260.53	0.0	15.93	0.	0.0	0.2	**	**	198.4	20.0000
WTP Pump N	688.56	9.49	727.70	718.2	75.00	125.	6.2	22.4	**	**	42.6	20.0000
WTP Pump N	688.56	9.49	727.70	718.2	75.00	125.	6.2	22.4	**	**	42.6	20.0000
WTP Pump N	688.55	9.49	727.70	718.2	75.00	125.	6.2	22.4	**	**	42.6	20.0000
Pump-5	1.59	81.67	143.78	62.1	75.00	0.	0.0	0.0	**	**	114.9	20.0000
Pump-9	3.87	131.34	233.63	102.3	75.00	0.	0.0	0.1	**	**	164.5	20.0000

FOLLOWING ADDITIONAL PIPES ARE CLOSED :

FOLLOWING ADDITIONAL PIPES ARE CLOSED :

N O D E R E S U L T S

NODE NAME	NODE TITLE	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
Bonnievill		----	887.26	885.00	2.26	0.98
J-403		2.84 (1.75)	1037.41	623.00	414.41	179.58
J-408		1.25 (1.75)	1034.68	786.00	248.68	107.76
J-409		0.57 (1.75)	1005.56	900.00	105.56	45.74
J-410		2.39 (1.75)	1044.61	758.00	286.61	124.20
J-411		1.37 (1.75)	1049.40	860.00	189.40	82.07
J-412		0.80 (1.75)	1054.44	681.00	373.44	161.82
J-413		1.37 (1.75)	1057.06	959.00	98.06	42.49
J-414		5.80 (1.75)	1065.16	877.00	188.16	81.54
J-415		0.23 (1.75)	887.26	873.00	14.26	6.18
J-416		0.23 (1.75)	887.26	885.00	2.26	0.98
J-417		0.46 (1.75)	1017.99	873.00	144.99	62.83
J-418		0.11 (1.75)	1028.51	651.00	377.51	163.59
J-419		28.00	1002.90	873.00	129.90	56.29
J-421		0.11 (1.75)	1004.65	893.00	111.65	48.38
R-1		----	1072.00	992.00	80.00	34.67

M A X I M U M A N D M I N I M U M V A L U E S

P R E S S U R E S

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
J-3	323.92	J-302	-9.39
J-5	323.17	J-303	0.57
O-WTP Pump N	315.34	Bonnieville	0.98
O-WTP Pump N	315.34	J-416	0.98
O-WTP Pump N	315.34	J-356	1.29

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
P-1613	5.86	P-357	0.00
P-3	5.86	P-1629	0.00
P-15	5.77	P-466	0.00
P-1615	5.43	P-1514	0.00
P-7	5.43	P-43	0.01

H L + M L / 1 0 0 0

PIPE NUMBER	MAXIMUM HL+ML/1000 (ft/ft)	PIPE NUMBER	MINIMUM HL+ML/1000 (ft/ft)
P-69	13.92	P-357	0.00
P-251	13.92	P-1629	0.00
P-70	13.26	P-466	0.00
P-15	13.21	P-1514	0.00
P-71	13.05	P-421	0.00

H L / 1 0 0 0

PIPE NUMBER	MAXIMUM HL/1000 (ft/ft)	PIPE NUMBER	MINIMUM HL/1000 (ft/ft)
P-69	13.92	P-357	0.00

GRVWD to ECWD - Peak Demand Report

P-251	13.92	P-1629	0.00
P-70	13.26	P-466	0.00
P-15	13.21	P-1514	0.00
P-71	13.05	P-421	0.00

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES  
 (-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

NODE NAME	FLOWRATE gpm	NODE TITLE
Clearwell	2065.67	
Frenchmans	3.41	
Hudgins Tan	13.65	
Magnolia Ta	-1344.83	
Mt. Sherman	74.44	
Pine Ridge	60.03	
R-1	45.06	
R-3	261.97	

NET SYSTEM INFLOW = 2524.24  
 NET SYSTEM OUTFLOW = -1344.83  
 NET SYSTEM DEMAND = 1179.41

T A N K S T A T U S R E P O R T (time = 20.0000 hours)

TANK NAME (*)	NET FLOW gpm	WATER ELEVATION ft	TANK DEPTH ft	TANK VOLUME gals	TANK VOLUME %	TANK STATUS	PROJECTED DEPTH ft
Bonnieville (2)	0.00	910.00	0.00	0.	0.0	EMPTY	0.00
Hudgins Tan (2)	-13.65	916.47	5.97	14914.	59.7	DRAINING	5.64
Magnolia Ta (2)	1344.83	946.88	1.88	94101.	18.8	FILLING	3.50
Mt. Sherman (2)	-74.44	1062.52	7.52	94008.	75.2	DRAINING	7.16
Pine Ridge (2)	-60.03	927.68	7.68	128034.	85.4	DRAINING	7.47

\* TANK TYPE: (1) - CONSTANT DIAMETER (2) - VARIABLE AREA

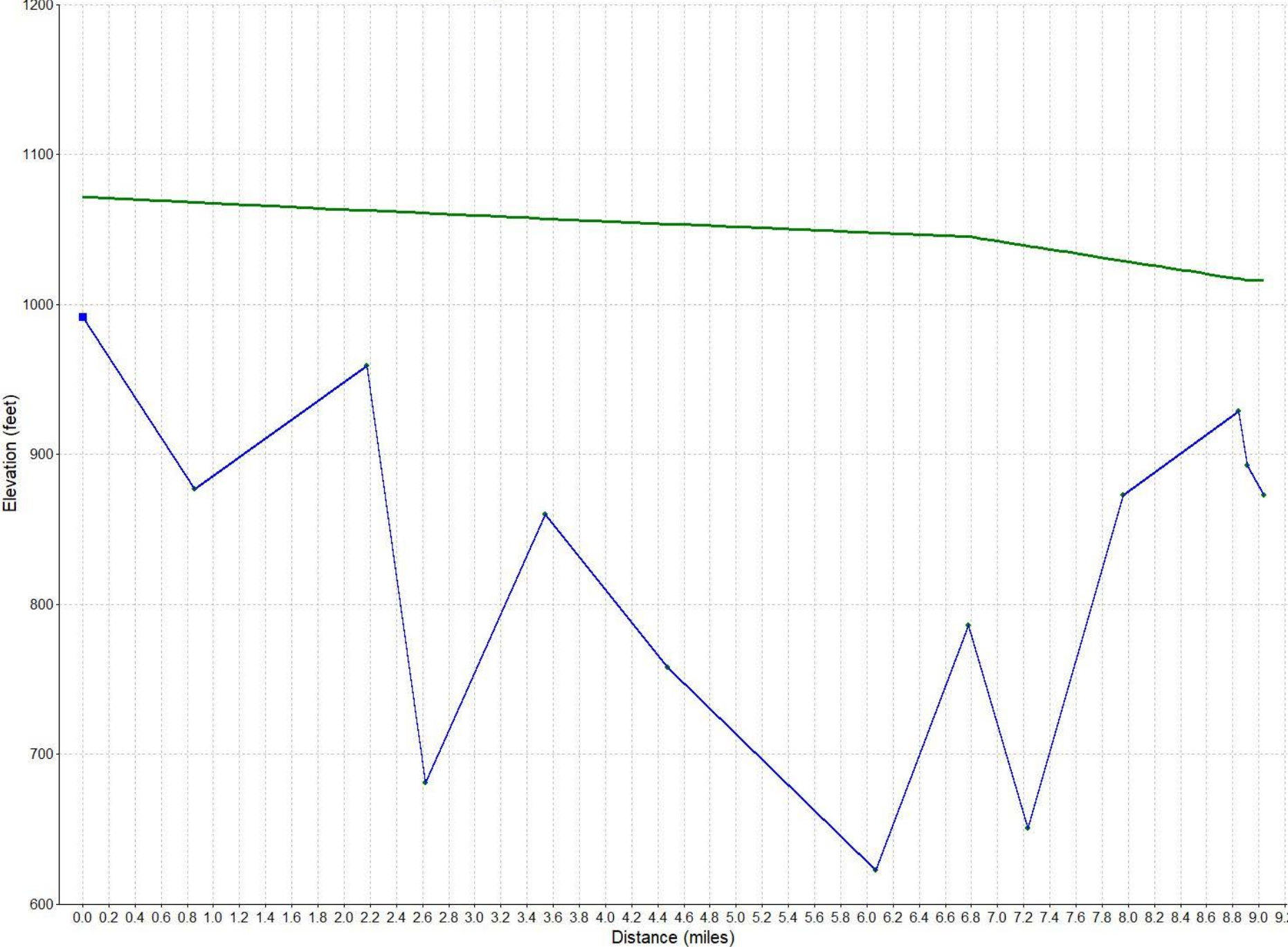
F L O W M E T E R R E P O R T (time = 20.0000 hours)

PIPE NUMBER	METERED FLOW gals
P-458	34423.5

**ATTACHMENT 2E**

**PEAK DEMAND PROFILE**

Baumgardner Road Interconnect with ECWD



**ATTACHMENT 2F**

**TECHNICAL SPECIFICATIONS**



**TECHNICAL SPECIFICATIONS**

**FOR THE**

**GREEN RIVER VALLEY WATER DISTRICT**

**EDMONSON COUNTY WATER DISTRICT**  
**INTERCONNECT**

**Prepared By:**

**KENVIRONS, INC.**  
**770 WILKINSON BLVD.**  
**FRANKFORT, KENTUCKY 40601**

**PROJECT No. 2020085**

**SEPTEMBER 2020**

**Kenvirons, Inc.**

*Civil & Environmental Engineering and Laboratory Services*



**TECHNICAL SPECIFICATIONS**

**FOR THE**

**GREEN RIVER VALLEY WATER DISTRICT**

**EDMONSON COUNTY WATER DISTRICT  
INTERCONNECT**

**Prepared By:**

**KENVIRONS, INC.  
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FRANKFORT, KENTUCKY 40601**

**PROJECT No. 2020085**

**SEPTEMBER 2020**

## TABLE OF CONTENTS

<b><u>Section</u></b>	<b><u>Specification Description</u></b>	<b><u>Pages</u></b>
13420	Flowmeters	4
15100	Water Lines	21
15101	Water Line Accessories	4
15102	Special Items of Construction	12
15103	Pressure Testing and Sterilization	9

## **SECTION 13420**

### **COMPOUND FLOW METER**

#### **PART 1 - GENERAL**

##### **1.1 SCOPE**

These specifications set forth the minimum acceptable design criteria and performance requirements for Compound type cold water meters including the following potential service applications and general considerations:

1. Intended where a wide range of flow is anticipated
2. Measurement of water usage for critical billing applications
3. Measurement intended for typical commercial and industrial applications

##### **1.2 CONFORMANCE TO STANDARDS**

The meter package shall meet or exceed all requirements of ANSI/AWWA Standard C701 and C702 latest revisions for Class II compound and turbine meter assemblies. Each meter assembly shall be performance tested to ensure compliance.

The meter package shall meet or exceed all requirements of NSF/ANSI Standard 61, Annex F and G, latest revisions.

##### **1.3 SUBMITTALS**

The following information shall be included in the submittal for this section:

1. Outline dimensions
2. Installation and operations manual
3. List of spare parts
4. Complete technical product description including a complete list of options provided
5. Any portions of this specification not met must be clearly indicated or the supplier and contractor shall be liable to provide all additional components required to meet this specification

#### **PART 2 – PRODUCTS**

##### **2.1 APPROVED MANUFACTURERS**

Basis-of-Design Product: Subject to compliance with specifications, provide flow measurement equipment by one of the following:

1. Sensus Meter
2. Or Approved Equal

## 2.2 MAINCASES

The meter maincase shall be made of epoxy coated ductile iron. The epoxy coating shall be as standard fusion-bonded and adhere to NSF for non-lead regulation compliance.

## 2.3 PERFORMANCE

The meter assembly shall have performance capability of continuous operation up to the rated maximum flows as listed below without affecting long-term accuracy or causing and undue component wear. The meter assembly shall also provide a 25% flow capacity in excess of the maximum flows listed for intermittent flow demands. Maximum headloss through the meter/strainer assembly shall not exceed those listed in the following table per meter size.

Meter Size	Low Flow (95% Min.)	Operating Range (98.5 – 101.5%)	Intermittent Flows (98.5 – 101.5%)	Pressure Loss (Not to Exceed)
1-1/2"	0.25 GPM	0.5 to 160 GPM	200 GPM	6.9 PSI @ 160 GPM
2"	0.25 GPM	0.5 to 160 GPM	200 GPM	4.3 PSI @ 160 GPM
3"	0.5 GPM	1.0 to 400 GPM	500 GPM	3.2 PSI @ 400 GPM
4"	0.75 GPM	1.5 to 800 GPM	1,000 GPM	6.4 PSI @ 800 GPM
6"	1.5 GPM	3.0 to 1,600 GPM	2,000 GPM	5.5 PSI @ 1,600 GPM
8"	2.5 GPM	4.0 to 2,700 GPM	3,400 GPM	4.0 PSI @ 2,700 GPM
10"	3.5 GPM	5.0 to 4,000 GPM	5,000 GPM	4.5 PSI @ 4,000 GPM

## 2.4 MEASURING CHAMBER

The measuring chamber shall consist of a measuring element, removable housing, and all-electronic register. The measuring element shall be mounted on a horizontal, stationary stainless-steel shaft with sleeve bearings and be essentially weightless in water. The measuring element shall come integrated with Floating Ball Technology. The measuring chamber shall be capable of operating within the above listed accuracy limits without calibration when transferred from one maincase to another of the same size. The measuring chamber shall be configured to capture all flows as specified above without the requirement of an automatic valve.

The meter shall be equipped with a direct magnetic drive and shall occur between the motion of the measuring element blade position and the electronic register. All additional intermediate, magnetic or mechanical drive couplings required for meter operations are not acceptable.

## 2.5 ELECTRONIC REGISTER

The meter's register shall be all electronic and shall not contain any mechanical gearing to display flow and accurate totalization. The electronic register shall include the following features/capabilities:

1. AMR resolution unit that is fully programmable
2. Pulse output frequency that is fully programmable
3. Integral data logging
4. Integral resettable accuracy testing feature
5. Large, easy-to-read liquid crystal display (LCD)
6. 10-year battery life guarantee

## 2.6 MAXIMUM OPERATING PRESSURE

The meter assembly shall operate properly, without leakage, damage, or malfunction up to a maximum working pressure of 200 pounds per square inch (psig).

## 2.7 STRAINERS

The meter strainer shall be integral and cast as part of the meters maincase. The strainer's screen shall have a minimum net open area of at least two (2) times the nominal pipe opening and be a "V" shaped configuration for the purpose of maintaining a full, unobstructed flow pattern. The strainer body shall be a coated ductile iron fusion-bonded epoxy identical to that of the meter maincase. All fasteners shall be stainless steel capable of maintaining the following static pressure ratings and overall physical dimensions:

Meter Size	Maximum Working Pressure	Centerline to Strainer Base	Overall Length (Not to Exceed)
1-1/2"	200 PSIG	2-5/16 Inches	13 Inches
2"	200 PSIG	2-5/16 Inches	15-1/4 Inches
3"	200 PSIG	4-1/8 Inches	17 Inches
4"	200 PSIG	4-3/4 Inches	20 Inches
6"	200 PSIG	5-3/4 Inches	24 Inches
8"	200 PSIG	6-3/4 Inches	30-1/8 Inches
10"	200 PSIG	8-1/2 Inches	41-1/8 Inches

## 2.8 STRAIGHTENING VANES

A straightening vane assembly is mandatory and shall be positioned directly upstream of the measuring element. The straightening vane assembly shall be an integral component of the measuring chamber.

## 2.9 CONNECTIONS

Flanges for the 1-1/2" and 2" size meter assemblies shall be of the 2-bolt oval (elliptical) flange configuration. The 3", 4", 6", 8" and 10" size meter assemblies shall have flanges of the Class 125 round type, flat faced and shall conform to ANSI B16.1 for specified diameter, drilling and thickness.

## 2.10 CERTIFICATIONS AND MARKINGS

All sizes of meter packages shall display their sizes, model, manufacturer name, and direction of flow. Such display shall be integrally cast into the side of the meter maincase.

## **PART 3 - EXECUTION**

### 3.1 INSTALLATION

Follow manufacturer's recommendation for installation. Installation will conform to the guidelines provided by the Installation & Operation Manual.

### 3.2 CALIBRATION

Each meter shall be provided with a calibration certificate indicating the measured error (percent deviation) at three different flows, respectively equivalent to 25%, 50% and 75% of the nominal flow rate for each size.

### 3.3 MANUFACTURER'S WARRANTY

The manufacturer of the above specified equipment shall warranty the Product to be free from defects in materials and workmanship for a period of one (1) year from the date of installation. In addition, the Product supplier shall submit nationally published literature clearly outlining the manufacturers maintenance program and most current pricing schedule covering a complete measurement chamber exchange.

**END OF SECTION**

13420-4

## SECTION 15100

### WATER LINES

#### 1.0 GENERAL

The Contractor shall furnish all labor, materials, and equipment to install the water lines as shown on the plans and as specified herein.

The water lines may be either pressure-rated plastic pipe (PVC) using the ASTM or AWWA C-900 standard, or ductile iron (DI), all as specified hereinafter and as noted on the plans. The bid documents shall show the anticipated approximate amounts of each type and class of pipe to be provided by the Contractor.

The Owner will obtain all rights-of-way for operations through private property. Owner will also secure building permits and the permits for all pipe laid in highway rights-of-way. Any charges for inspections or other fees required will be the responsibility of the Contractor since the amounts of these are dependent upon the operation of the Contractor.

#### 1.1 KENTUCKY TRANSPORTATION CABINET BONDING – N/A

The Kentucky Transportation Cabinet will require that the Owner post a bond for all work accomplished on their right-of-way. Each contract on which work is to be performed will be a separate application and will require a separate bond. Each permit will have conditions attached and these conditions will vary depending on the area where work is to be performed. In areas where traffic control may pose a problem, working hours may be limited. A copy of the encroachment permit will be provided to the Contractor. The Contractor will be responsible for knowledge of the permit's content and conditions in order that the construction may be accomplished in accordance with the specified requirements.

Should any additional bonds or requirements be imposed by the Kentucky Transportation Cabinet, the Owner shall also be responsible for the bonding of the additional requirements.

#### 2.0 MATERIALS

#### 2.1 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

This specification covers rigid, pressure-rated, polyvinyl chloride pipe and fittings, hereinafter called PVC pipe and PVC fittings, for sizes 1/2 inch through 12-inch. Pipe shall be as manufactured by North American, Diamond, J-M, Certainteed, or approved equal.

## 2.1.1 General.

2.1.1.1 Pipe Markings. Depending on the type of PVC pipe being used, the following shall be marked along the length of each joint of pipe: manufacturer's name, nominal pipe size and size base, material code (PVC 1120), dimension ratio or standard dimension ratio, pressure class or rating, production record code, certification seal (NSF logo), and, for C-900 PVC pipe, specification designation (i.e., AWWA C-900).

2.1.1.2 Underground Marking for PVC Pipe. Underground marking for either ASTM or C-900 PVC pipe shall be both of the following types.

2.1.1.2.1 Underground Marking Wire. At all locations where PVC pipe is utilized, a detectable underground marking wire shall be placed in the trench approximately 12-inches above the pipe. The wire used shall be No. 12 insulated copper wire. Extreme care shall be exercised in connecting and taping splices and joints to assure continuity. At each valve box the wire shall be looped to the surface extending 12-inches above the concrete valve box pad (see Std. Dwg. for valve). When the entire project or pipeline segment is complete, including meter installation and leak repairs, the locating wire system shall be checked for continuity.

2.1.1.2.2 Underground Marking Tape. At all locations where PVC pipe is utilized, a detectable underground marking tape shall be placed in the trench approximately twelve inches below the finished grade. The tape used shall be mylar encased aluminum foil with the printing "CAUTION - Buried Water Line Below". Printing shall be readable through the clear mylar and surface printing is not acceptable. Tape size shall be 2 inch width as provided by Lifeguard, Inc. or approved equal. Color of the tape shall be blue.

## 2.1.2 Polyvinyl Chloride (PVC) Pipe—ASTM Standard.

2.1.2.1 PVC Pipe. PVC pipe shall be extruded from Type 1, Grade 1, polyvinyl chloride material with a hydrostatic design stress of 2,000 psi for water at 73.4°F, designated as PVC 1120, meeting ASTM Specifications D-1784 for material and D-2241 for pipe, latest revisions. Pipe shall also meet all applicable provisions of the Product Standards and shall bear the National Sanitation Foundation (NSF) seal of approval in compliance with NSF Standard No. 14. PVC pipe having a maximum hydrostatic working pressure of 160 psi (SDR-26), 200 psi (SDR-21), 250 psi (SDR-17), or 315 psi (SDR-13.5) shall be used as shown in the Bid Documents and Plans.

Samples of pipe and physical and chemical data sheets shall be submitted to the Engineer for review and determination of compliance with these specifications before pipe is delivered to job. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects.

The workmanship, pipe dimensions and tolerances, outside diameters, wall thickness, eccentricity, sustained pressures (ASTM D-1598), burst pressures (ASTM D-1599), flattening, extrusion quality (ASTM D-2152), marking and all other requirements of the



Product Standard PS 22-70 shall be conformed to in all respects. No pipe, 2 inches in diameter or larger, with a wall thickness less than 0.090 inches may be used.

Pipe shall be furnished in 20 feet or 40 feet lengths. The pipe may be double plain end or with bell on one end. Male ends of pipe must be beveled on the outside. Pipe shall have a ring painted around the male end or ends in such a manner as to allow field checking of setting depth of pipe in the socket. This requirement is made to assist construction superintendents and inspectors in visual inspection of pipe installation.

Pipe must be delivered to job site by means which will adequately support it, and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical. Pipe must not be exposed to the direct rays of the sun for an extended period of time. If pipe is not to be installed shortly after delivery to the job site, it must be stored in a shaded location and strung as needed.

**2.1.2.2 PVC Pipe Jointing.** Pipe shall be joined with slip-type joints with rubber gaskets. Pipes with bells shall have all parts of the bell, including the gasket groove, made from the same extruded piece, integral with the pipe, and shall be thickened to meet standard dimension ratios of wall thickness to outside diameter. This manufacturing procedure shall be the normal practice of the pipe manufacturer and proven by past performance of pipe in service. The gasket groove shall be constructed such that gasket rollout will not occur. Rubber gasketing shall conform to ASTM D-3139.

Joint lubricant shall be of a type recommended by the manufacturer for their pipe subject to the Engineer approval. Lubricant shall be NSF approved water soluble, non-toxic and have no objectionable properties.

Due to special requirements for special gaskets for use within 200 feet of underground fuel tanks, gas lines, and/or oil transport lines, PVC pipe shall not be used under these circumstances.

**2.1.2.3 Fittings** Ductile iron mechanical joint fittings with appropriate adapter as manufactured by Tyler, U.S. Pipe, Clow, Union Foundry or approved equal, shall be used with PVC pipe. All such fittings shall be approved by the pipe manufacturer, and complete data sent to the Engineer, including the manufacturer's approval, for review. Fittings shall comply with AWWA C-110 or C-153 and shall be manufactured for the size and pressure class of the line on which they are used. Use of transition gaskets will not be allowed unless specifically approved by the pipe manufacturer. Coatings and lining shall be in accordance with section 2.2.7 of the Specifications.

**2.1.2.4 Service Connections.** All service connections on PVC lines shall be made by means of tees, factory tapped couplings, or bronze service clamps, manufactured specifically for use with PVC pipe as manufactured by Ford or approved equal, and

appropriate corporation stop. Whenever possible, corporation stops shall be installed in plastic lines before conducting hydrostatic tests.

### 2.1.3 Polyvinyl Chloride (PVC) Pipe—AWWA C-900 Standard.

This specification covers the requirements for AWWA approved Polyvinyl Chloride Pressure Pipe for water supply and distribution systems.

2.1.3.1 PVC Pipe—AWWA C-900 Standard. PVC pipe shall meet the requirements of AWWA C-900 or C-905, latest revision and shall be furnished in cast-iron pipe equivalent outside diameters with rubber gasketed joints.

C-900 PVC pipe shall be made from Class 12454-A or Class 12454-B virgin compounds as defined in ASTM D-1784. The standard code designation shall be PVC 1120. The PVC compounds shall be tested and certified as suitable for potable water products by the NSF Testing Laboratory and shall carry the NSF approval marking.

Solvent-cement couplings or joints shall not be used. PVC joints using elastomeric gaskets shall be tested as assembled joints and shall meet the laboratory performance requirements specified in ASTM D-3139.

Pipe shall be DR (Dimension Ratio) 18, or DR 14 as shown on the plans or the bid form.

Pipe and couplings shall meet or exceed the following test requirements:

Hydrostatic Integrity - Each standard and random length of pipe shall be proof-tested at four times its rated class pressure for a minimum of 5 seconds. Bells or couplings shall be tested with pipe. The pipe and couplings shall further meet or exceed the pressure test requirements of ASTM D-1598 and D-1599.

Flattening - The pipe shall not split, crack, or break when tested by the parallel-plate method as specified by ASTM D- 2241.

Extrusion quality - The pipe shall not flake or disintegrate when tested by the acetone-immersion method as specified in ASTM D-2241.

Standard length - Pipe shall be furnished in standard laying lengths of 20 ft.  $\pm$  1 in. A maximum of 15 percent of each pipe size may be furnished in random lengths of not less than 10 ft. each.

2.1.3.2 C-900 PVC Pipe Jointing. Pipe shall be joined with slip-type joints with rubber gaskets. Manufacturing and installation procedures shall be as recommended by the manufacturer and as described for PVC pipe in section 2.1.2 of this specification.

2.1.3.3 Fittings. Fittings for municipal PVC shall be ductile iron only. Fittings shall be mechanical joint. Fittings shall be manufactured for the size and pressure class of the

line on which they are used and shall comply with AWWA C-110 or C-153. Coatings and lining shall be in accordance with section 2.2.7 of the Specifications. Fittings shall be as manufactured by Tyler, Clow, U.S. Pipe, Union Foundry or approved equal.

2.1.3.4 Service Connections. Service connections shall be made by means of bronze service clamps manufactured specifically for use with C-900 PVC pipe and appropriate corporation stops. Clamps shall be Mueller Catalog No. H-161 or approved equal.

#### 2.1.4 Polyvinyl Chlorine (PVC) Pipe – Restrained Joints

2.1.4.1 PVC Pipe. Products delivered under this specification shall be manufactured only from water distribution pipe and couplings conforming to ASTM D2241. The restrained joint pipe system shall also meet all short and long term pressure test requirements of ASTM D2241. Pipe, couplings and locking splines shall be completely non-metallic to eliminate corrosion problems. The pipe and couplings shall be Certa-Lok Yelomine restrained-joint pipe from CertainTeed Corporation or approved equal.

Pipe and couplings shall be made from unplasticized PVC compounds having a minimum cell classification of 12454, as defined in ASTM D1784. The compound shall qualify for a Hydrostatic Design Basis (HDB) of 4000 psi for water at 73.4° F, in accordance with the requirements of ASTM D2837.

Restrained joint PVC pipe products shall have been tested and approved by NSF International. 2" through 16" PVC pipe and coupling systems up to Class 250 shall be listed in NSF14. All products intended for contact with potable water shall be evaluated, tested and certified for conformance with NSF 61 by an acceptable certifying organization. Copies of agency approval reports or product listings shall be provided to the Engineer.

Nominal outside diameters and wall thicknesses of thrust-restrained pipe shall conform to the requirements of ASTM D2241. Thrust-restrained pipe shall be furnished in 2", 3", 4", 6", 8", 10", 12" and 16" sizes, with pressure ratings from 90 psi to 315 psi. Pipe shall be furnished in standard lengths of 20 feet.

2.1.4.2 PVC Restrained Joints. Pipe shall be joined using non-metallic couplings to form an integral system for maximum reliability and interchangeability. High-strength, flexible thermostatic splines shall be inserted into mating, precision-machined grooves in the pipe and coupling to provide full 360° restraint with evenly distributed loading.

Couplings shall be designed for use at or above the rated pressures of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints shall be designed to meet the leakage test requirements of ASTM D3139.

## 2.2 DUCTILE IRON PIPE

These specifications cover ductile iron pipe (3-inch diameter and greater) to be used in water transmission systems with mechanical joints, rubber ring slip type joints or flanged joints.

2.2.1 General. Ductile iron pipe shall be designed in accordance with AWWA and for pressures and conditions as stated in these specifications or called for on the plans. Ductile iron pipe shall conform to AWWA C-151.

2.2.2 Minimum Nominal Thickness. The specified thickness will be determined for the given internal and external loading requirements in accordance with AWWA C-150. The class of pipe, wall thickness, and coatings required will be shown on the plans or the bid form and/or as specified herein for all ductile iron pipe installation.

2.2.3 River Crossing Pipe. River crossing pipe shall be ductile iron, Flex-Lok as manufactured by the American Cast Iron Pipe company or equal conforming to the appropriate requirements of AWWA C150/ANSI A21.50 and AWWA C151/ANSI A21.5 with a minimum thickness class of 54.

2.2.4 Lengths. Pipe may be furnished in 12, 16, 16 1/2, 18 or 20 feet nominal laying lengths.

2.2.5 Marking. The net weight, class or nominal thickness and sampling period shall be marked on each pipe.

2.2.6 Pipe Joints for Ductile Iron Pipe. Joints for buried pipe shall be either mechanical joint or push-on joint conforming to the requirements of AWWA C-111. Mechanical joint bolts and nuts shall be the low-alloy steel type conforming to AWWA C-111.

Interior piping of vaults, plants, etc. shall be supplied with flanged joints meeting the requirements of AWWA C-115. Special joints, such as the "locked" or "restrained" type, shall be as shown on the plans and/or called for in the bid schedule.

Gaskets resistant to hydrocarbon penetration shall be used within 200 feet of underground fuel tanks, gas lines, and/or oil transport lines. The gaskets shall be approved by the Engineer.

2.2.7 Coatings and Lining. All buried ductile iron pipe shall have manufacturer's outside coal tar or asphaltic base coating and a cement lining and bituminous seal coat on the inside. Cement mortar lining and a bituminous seal coat inside shall conform to AWWA C-104 latest revision.

Where specifically called for on the plans, pipe and fittings housed and in vaults shall be lined and coated on the inside as specified herein for buried ductile iron pipe and fittings, but shall be left uncoated on the outside so that it may be painted without the use of tar stop.

2.2.8 Fittings for Ductile Iron Pipe. Ductile iron mechanical, push-on and flanged joints shall conform to AWWA C-110 for centrifugally cast iron water pipe. Mechanical joints shall also conform in all respects to AWWA C-111. All fittings shall be manufactured for the size and pressure class of the pipeline in which they are to be used. All fittings shall be furnished complete with all joint accessories. All ductile iron pipe fittings for water, sewer, air, gas and force main service shall be coated outside and lined on the inside the same as the line on which they are installed.

## 2.3 POLYETHYLENE PIPE

This pipe is used primarily for stream crossings and other special applications in locations indicated on the Drawings. The required pressure class shall be as shown on the Drawings.

The pipe shall be PE 3408 high density, high molecular weight polyethylene pipe equal to DRISCOPIPE 1000 as manufactured by Phillips Driscopipe, Inc. The pipe shall meet or exceed the following specifications:

- a. ASTM 3350 having a cell classification of PE34534C
- b. ASTM F714 - Dimensions and Workmanship
- c. AWWA C901 - Potable Water Pipe
- d. ASTM D1248 - Type III, Class C, Category 5, Grade P34
- e. ASTM D3261 - Fittings Standard
- f. NSF - Listed, Standard #14

The pipe shall be joined by the butt fusion technique utilizing controlled temperatures and pressures to produce a fused, leak-free joint that has equal or greater strength than the pipe itself in both tension and hydrostatic loading. The joining system shall be equal to Phillips butt fusion joint system.

Transitions to the continuing pipeline shall be made with the appropriate fittings to maintain the integrity of the piping system as recommended by the pipe manufacturer.

Drawings showing details of the installation shall be submitted to the Engineer for approval prior to installation.

## **3.0 EXECUTION**

### 3.1 HAULING AND STORAGE

The Contractor shall notify the Engineer when pipe will be received on the job so that proper arrangements may be made for inspecting the unloading and stringing, as well as inspecting and examining the pipe materials.

All pipe shall be covered with tarpaulin during hauling from the manufacturer to the job site. It is acceptable for the front end only to be covered. The intent is to prevent diesel exhaust residue from coating the pipe and/or contaminating the gaskets.

Care must be exercised in the handling of all materials and equipment. The Contractor will be held responsible for all breakage or damage to items caused by his workmen, agents, or appliances for handling or moving. Pipes and other castings shall in no case be thrown or dropped from cars, trucks, or wagons to the ground, but shall be lowered gently and not allowed to roll against or strike other castings and unyielding objects violently.

Valves, castings, fabricated metal, reinforcing steel, etc. shall be yarded or housed in some convenient location by the Contractor and delivered at the construction site as required. All equipment and materials subject to damage from the weather, dampness, changes in temperature, or exposure shall be protected by a dry, weatherproof enclosure until ready for installation or use. The cost of all hauling, handling, and storage shall be included in the prices bid for equipment and materials in place. The Owner takes no risk or responsibility for fire, flood, theft, or damage until after the final acceptance of the Work.

### 3.2 LINES AND GRADES

The Contractor will be required to accomplish any detailed layout, including that required for establishing the grade of the pipe line.

### 3.3 TRENCH EXCAVATION

3.3.1 General. This section describes the acceptable methods of trenching for the installation of pressure pipe and casing pipe in an open trench.

Trenching may be accomplished by means of a backhoe, trenching machine or by hand depending on the construction area.

At the Contractor's option, trenching, by a trenching machine or by backhoe is acceptable except as noted below:

Where the pipe line is being constructed close to other utilities, structures, building, or large trees, and it is reasonable to anticipate possible damage from the use of a backhoe, then trenching shall be made by hand methods.

The Contractor shall include in his unit price bid, all trenching necessary for installation of all pipelines as planned and specified. Trenching shall include all clearing and grubbing, including all weeds, briars, trees, stumps, etc. encountered in the trenching. The Contractor shall dispose of any such material by burning, burial, or hauling away (or as noted on the drawings), at no extra cost to the Owner. It shall be the Contractor's responsibility to notify the appropriate State and local Air Pollution Control agencies

when he conducts open burning of refuse. Ornamental shrubs shall be removed, protected, and replanted. Trenching also includes such items as minor street, road, sidewalk, pipe and small creek crossings, and cutting, moving or repairing damage to fences, poles, gates and/or other surface structures regardless of whether shown on the plans.

The Contractor shall protect existing facilities against danger or damage while pipeline is being constructed and backfilled, or from damage due to settlement of this backfill. In case of damage to any existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structures will be in as good condition and serve its purpose as completely as before and such restoration and repair shall be done without extra cost to the Owner. The use of trench-digging machinery will be permitted except where its operations will cause damage to trees, buildings or existing structures above or below the ground. At such locations hand methods shall be employed to avoid such damage. All excavated material shall be piled in a manner that will not endanger the work and will avoid obstructing sidewalks and driveways. Gutters shall be kept clear or other satisfactory provisions made for street drainage.

All excavation shall be open trenches, except where the drawings call for tunneling, boring, or jacking under structures, railroads, sidewalks and roads. The construction procedure for these types of excavation is described elsewhere in these specifications.

All trench excavation shall be termed unclassified and costs shall be included in the unit price bid for the pipe.

**3.3.2 Clearing.** The Contractor shall accomplish all clearing and/or grubbing as required for the construction under this contract. Clearing and grubbing shall include the cutting and removal of trees, stumps, brush, roots, logs, fences and other loose or projecting material and natural obstructions which, in the opinion of the Engineer, must be removed to properly construct and operate the facilities. Ornamental shrubs, plantings, fences, walls, etc. shall be removed and replanted or replaced or protected from the construction activity. Clearing and/or grubbing shall be incidental to the various bid items and no additional compensation will be paid for same.

**3.3.3 Trench Depth.** Trenches shall be excavated to the line and grade required for the installation of pipe at the elevations indicated on the plans. The minimum depth of cover shall be 30 inches above the top of the pipe, unless shown otherwise on the plans or on the Standard Details. When the pipe is laying in or on solid rock, the minimum depth of cover shall also be 30 inches above the top of the pipe. No additional compensation will be made for extra depth where required by the plans or due to Contractor error. Excavation, except as required for exploration, shall not begin until the proposed work has been staked out. Materials which are not required for backfill and site grading shall be removed and disposed of as directed by the Engineer. Hauling, bedding, and backfilling shall be considered incidental to the various bid items and will not be paid for directly. Excavation shall be of sufficient depth to allow the piping to be

laid on the standard pipe bedding in accordance with Section 3.4. The trenches shall be excavated to a minimum of six inches below the bottom of the pipe barrel in rock. In all cases where lines are under traffic a minimum cover of forty-two inches (42") shall be provided. Should it be necessary to avoid existing utilities, culverts, outlets, or other structures, the water line shall be carried deeper at no additional expense to the Owner.

Where the plans call for extra trench depth, this extra depth shall be provided at no extra cost.

3.3.4 Trench Width. Trench widths shall exceed the minimum width that will provide free working space on each side of the pipe and to permit proper backfilling around the pipe as shown in the accompanying table and unless specifically authorized by the Engineer, shall not be excavated to wider than two feet (2') plus the nominal diameter of the pipe at the top of the trench. Before laying the pipe, the trench shall be opened far enough ahead to reveal any obstruction that may necessitate changing the line and grade of the pipe. Should the Contractor fail to accomplish this, and changes are required, they shall be at his sole expense. In rock, all ledge rocks, boulders and large stones shall be removed to provide six inches (6") of clearance on each side and below all pipe and fittings.

**Minimum Trench Width**

Size	Width
Up to 4" Pipe	1'-6"
6" Pipe	2'-0"
8" Pipe	2'-0"
10" Pipe	2'-4"
12" Pipe	2'-6"
14" Pipe	2'-6"

Size	Width
15" Pipe	2'-8"
16" Pipe	2'-8"
18" Pipe	3'-0"
20" Pipe	3'-2"
21" Pipe	3'-4"
24" Pipe	3'-8"

3.3.5 Shoring, Sheet piling, and Bracing of Excavation. Where unstable material is encountered, or where the depth of the excavation in earth exceeds five feet (5'), the sides of the trench or excavation shall be supported by substantial sheet piling, bracing, or shoring. The design and installation of all sheet piling, sheet piling, bracing or shoring shall be based on computations of pressure exerted by the materials to be retained under retaining conditions. Adequate and proper shoring of all excavations will be the entire responsibility of the Contractor. The Standards of the Federal Occupational Safety and Health Act and the Kentucky Department of Labor shall be followed.

The Engineer will not be responsible for determining requirements for bracing or sheet piling.

3.3.6 Removal of Water. The Contractor shall provide for adequate removal of all water and the prevention of surface water from entering the excavation. The Contractor shall maintain dry conditions within the excavations until the backfill is placed. No additional compensation will be paid for replacement and/or stabilization of prepared excavations due to flooding and/or deterioration from extended exposure. All water



pumped or drained from the excavation shall be disposed of in a suitable manner without damage to adjacent property or to other work under construction.

**3.3.7 Pavement Removal.** Pavement removal shall be as indicated on the plans or directed by the Engineer. When so required, or when directed by the Engineer, only one-half (1/2) of the street crossings or road crossings shall be excavated before placing temporary bridges over the side excavated, for the convenience of the traveling public. All backfilled ditches shall be maintained in such a manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and the property Owners abutting the improvements shall be taken into consideration. All public or private drives shall be promptly backfilled or bridged at the direction of the Engineer. Pavement replacement shall be in accordance with Section 15120 of these specifications. Excavated materials shall be disposed of so as to cause the least interference and in every case the disposition of excavated materials shall be satisfactory to the Engineer.

**3.3.8 Traffic Maintenance.** The Contractor shall be held responsible for any damage that may occur to persons or property by reason of the failure of the Contractor to properly guard and flag all open trenches or obstructions along the routes of the water lines. The Contractor at his own expense shall maintain warning signs, barricades and watchmen or flag men to control traffic at such times as his work would interfere with the flow of traffic. No excavation shall begin that may present a safety hazard unless the signs, barricades, lights, etc. are available to protect the open excavation at the conclusion of the day. The Contractor will comply with all Federal and State Occupational Safety and Health requirements for this type of construction. The Contractor shall also comply with all local and Kentucky Department of Highways requirements for signing and traffic control.

**3.3.9 Line Location.** The location of pipelines and their appurtenances as shown are those intended for the final construction. However, conditions may present themselves before construction on any line is started that would indicate desirable changes in location. In such cases, the Owner reserves the right to make reasonable changes in line and structure locations without extra cost, except as may be determined by extra units of materials and construction actually involved. The Owner is under no obligation to locate pipelines so they can be excavated by machine.

### **3.4 BEDDING OF PIPELINE**

In all cases the foundation for pipe shall be prepared so that the entire load of the backfill on top of the pipe will be carried uniformly on the barrel of the pipe. The bells of the pipe shall not carry any of the load of the backfill. The Contractor should refer to the Standard Details for pipe bedding shown in the plans. The bedding specifications shall govern the backfill from the bottom of the trench up to the centerline or spring line of the pipe.

All ductile iron pipe shall be installed in accordance with Standard ANSI/AWWA C150-A21.50 Laying Condition Type 3 unless otherwise noted.

3.4.1 Stable Earth Foundation. On all PVC pipelines, the trench bottoms shall be smooth and free of frozen material, dirt clods and stones over 1/2" diameter. Bottom dirt left by trenching equipment will usually provide adequate material to level the trench bottom and provide bedding support for the pipe barrel. If the trench bottom is free of dirt, soft material may be shoveled off the side walls or shoveled under the pipe to insure proper pipe barrel bedding. In areas where the trench bottom is hard, a layer of soft backfill must be provided to insure the pipe barrel is properly cushioned. See the Plans for proper bedding material depth.

If the foundation is good firm earth the pipe may be laid directly on the undisturbed earth provided the pipe barrel is supported for its full length.

Bedding of No. 9 stone, fine gravel, sand or compacted finely graded select earth shall be used to correct irregularities in the subgrade.

As an alternative to the above method, excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe on a bed of granular material or finely graded select earth to provide continuous support for the pipe barrel. Bedding depth shall be as shown on the plans.

The bedding is not a separate pay item and shall be included as incidental expense in the unit price for the pipe bid per foot of pipe.

3.4.2 Trenches In Rock. All installation in rock will utilize the undercutting method. Bedding will be with 6 inches crushed stone or suitable earth material.

3.4.3 Unstable Trenches. If unstable material is encountered which may not provide a suitable foundation for the pipe, the unstable material will be removed and an adequate layer of encasement concrete or other special bedding shall be placed for the pipe foundation in accordance with the Standard Details in the plans. Such "special pipe foundation" shall only be installed if directed by the Engineer in writing or on the plans.

### 3.5 PIPE LAYING

3.5.1 General. Proper instruments, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. Each pipe manufacturer shall have an experienced representative on the job for at least one day at the commencement of jointing and laying operations.

Before any length of pipe is placed in the trench, a careful inspection shall be made of the interior of the pipe to see that no foreign material is in the pipe. In order to properly remove any foreign materials, a swab of necessary length is to be available at all times.

All pipe shall be lowered carefully into the trench, properly aligned and properly jointed by use of suitable tools and equipment, in such a manner as to prevent damage to water line materials and protective coatings and linings. Excessive scratching of the exterior surface of the pipe will be cause for rejection of the pipe.

Under no circumstances shall pipeline materials be dropped or dumped into the trench. The pipe and fittings shall also be inspected for the purpose of determining if they are sound and free from cracks. Laying of pipe shall be commenced immediately after excavation is started. Pipe shall be laid with bell ends facing in the direction of laying.

When pipe laying is not in progress, the open ends of pipe shall be closed by approved means to prevent entrance of trench water into the line. Whenever water is excluded from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent floating. Any pipe which has floated shall be removed from the trench and re-laid as directed by the Engineer. No pipe shall be laid in water or on frozen trench bottom, or whenever the trench conditions or the weather are unsuitable for such work.

If any defective pipe and fittings shall be discovered after the pipeline is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge to the Owner. Open ends of unfinished pipe lines shall be securely plugged or closed at the end of each day's work or when the line is left temporarily at any other time.

**3.5.2 Laying Ductile Iron Pipe.** Ductile iron pipe shall first be thoroughly cleaned at joints, then joined according to instructions and with tools recommended by the manufacturer. Three (3) copies of instructions shall be furnished to the Engineer and one (1) copy shall be available at all times at the site of the work. The lining inside ductile iron pipe must not be damaged by handling.

All pipes must be forced and held together, or "homed" at the joints, before sealing or bolting. Pipe must be aligned as each joint is placed, so as to present as nearly true, straight lines and grades as is practical, and all curves and changes in grades must be laid in such a manner that the manufacturer's recommended maximum deflection is not exceeded at any joint.

Cutting of pipe may be done by wheeled pipe cutters or saws as the Contractor may elect, but the Contractor will be held responsible for breakage or damage caused by careless cutting or handling.

All ductile iron pipe shall be installed per AWWA C150 Laying Condition Type 3 unless otherwise noted, six inches (6") crushed stone bedding or suitable earth shall be used in rock. No pipe shall be laid resting on rock, blocking, or other unyielding objects. Jointing before placing in trench, and subsequent lowering of more than one section jointed together may be allowed, subject to the Engineer approval and direction.

When using pipe with push-on joints care must be exercised to make certain that the correct gasket is being used for the type of joint installed and that the gasket faces the

proper direction. Before inserting the gasket, the groove and bell socket should be carefully cleaned of all dirt. If sand or dirt is permitted to remain in the groove, leaks may occur. Lubricant must be applied to bell socket, gasket and plain-end of pipe as required by manufacturer. Plain-end must be beveled before joint is made. Deflection required at the joint shall be obtained after the joint is made.

**3.5.3 Laying Plastic Pipe.** The trench bottom must be smooth and uniform and the alignment must conform to the Plans. Bedding and cover as specified herein and shown in the Standard Details is required.

To make a clean and unobstructed joint, it is necessary to wipe the ring, groove and pipe spigot free from all foreign materials at the time of assembly. The ring must be positioned properly in the fitting to receive the pipe by a worker who is not in contact with the lubricant. In general, the lubricant is applied to the spigot (not the ring or groove). However, the manufacturer's instructions are to be followed in all cases. Only an approved lubricant may be used in accordance with the manufacturer's recommendations. All plastic pipe shall be joined by hand.

Where good bedding conditions are obtained PVC pipe smaller than 4 inches may be assembled outside the trench in longer sections (as conditions allow) and then lowered into the trench. At any time when improper bedding is discovered or the pipe is severely deflected the pipe will be removed from the trench and the condition corrected. Pipe in sizes 4 inch and above may be assembled outside the trench but must be lowered into the trench as each joint is assembled. Regardless of installation methods all joints must be inspected after laying in trench for proper insertion and alignment. Field cuts and bevels will be allowed in accordance with the manufacturer's recommendations for these operations. A new reference mark shall be installed before joining any field cut pipe. The same requirements for clearance from rock or other objects, thrust blocking and deflections shall apply to PVC pipe as for other pipe materials.

C-900 PVC pipe of all sizes must be assembled in the trench in strict accordance with the manufacturer's requirements.

**3.5.4 Installation of River Crossing Pipe.** The ball joint pipe shall be assembled and installed in accordance with manufacturer's recommendations. Installation shall be made at time of low flow, using cofferdams as necessary to divert stream flow. The ball joint pipe shall be laid and allowed to settle before joining to the pipe on each side of the stream. The ball and joint pipes shall be tested separately once in place to detect any leaks or bad joints. After connecting to the land pipe, it shall be tested the same as specified for the other water mains. See the Drawings for additional installation requirements.

### 3.6 BACKFILLING

Backfilling must be started as soon as practicable after pipe has been laid. The Engineer shall be given a minimum of 8 hours for inspection before backfilling. The backfill shall be crushed rock, sand, or finely divided earth free from debris, organic material and stones, placed simultaneously on both sides of pipe to the same level by hand.

In backfilling of the lower part of the trench beginning at the top of the bedding, the backfill material shall be carefully selected and walked-in around the pipe in 6" layers to a point 8 inches higher than the top of the pipe. The filling of the trench and the tamping of the backfill shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipe line will not be disturbed and injurious side pressures do not occur.

After the above specified backfill is hand placed, rock may be used in the backfill in pieces no larger than 18 inches in any dimension and to an extent not greater than one-half (1/2) the backfill materials used. If additional earth is required, it must be obtained and placed by the Contractor. Filling with rock and earth shall proceed simultaneously, in order that all voids between rocks may be filled with earth. Above the hand placed backfill, machine backfilling may be employed without tamping, (if not contrary to specified conditions for the location) provided caution is used in quantity per dump and uniformity of level of backfilling. Backfill material must be uniformly ridged over trench and excess hauled away, with no excavated rock over 1-1/2 inch in diameter or pockets of crushed rock or gravel in top 6 inches of backfill. Ridged backfill shall be confined to the width of the trench and not allowed to overlap onto firm original earth and its height shall not be in excess of needs for replacement of settlement of backfill. All rock, including crushed rock or gravel from construction, must be removed from yards and fields. Streets, roadways and walks shall be swept to remove all earth and loose rock immediately following backfilling.

In the case of street, highway, railroad, sidewalk and driveway crossings or within any roadway paving or about manholes, valve and meter boxes, the backfill must be machine tamped in not over 4-inch layers, measured loose in accordance with the standard details. Where backfill is under paved driveways, streets, highways, railroads, sidewalks, paved parking areas and other areas where settlement is not allowed, flowable fill only shall be used up to the paving surface. Crushed stone shall be Kentucky Department of Highways Standard Specification No. 57. Tunnels shall be backfilled in not over 3-inch layers, measured loose, with selected material suitable for mechanically tamping. If material suitable for tamping cannot be obtained, sand, gravel or crushed rock shall be blown, packed or sluiced to complete fill all void spaces.

Where local conditions permit, pavement shall not be placed until 30 days have passed since placing backfill. As appropriate for roads, parking areas and sidewalks, crushed stone or flowable fill shall temporarily be placed to the top of trench. Backfills shall be

maintained easily passable to traffic at original ground level, until acceptance of project or replacement of paving or sidewalks.

The Kentucky Transportation Cabinet requires that water and sewer lines—when placed within the limits of the roadway embankment and/or beneath the roadway itself—be backfilled with flowable fill as defined by Section 601.03.03.B(5) of their “Standard Specifications for Road and Bridge Construction”. The Cabinet typically requires that flowable fill be used to backfill the trench and/or bore pit up to the subgrade elevation and extending to the outside edge of the shoulder.

Railroad Company and Highway Department requirements in regard to backfilling will take precedence over the above general specification where they are involved.

The Contractor shall protect all sewer, gas, electric, telephone, water and drain pipes or conduits, power and telephone poles and guy wires from danger of damage while pipelines are being constructed and backfilled, or from danger due to settlement of his backfill.

In case of damage to any such existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structure will be in as good condition and serve its purpose as completely as before uncovering and such restoration and repair shall be done without extra charge.

No extra charge shall be made for backfilling of any kind, except as provided in the Bid. Backfilling shall be included as a part of the unit price bid for which it is subsidiary. No extra charge shall be made for supplying outside materials for backfill.

Before completion of contract, all backfills shall be reshaped, holes filled and surplus material hauled away, and all permanent walks, street, driveway and highway paving, and sod, replaced and reseeding performed.

The line Contractor shall be responsible for clean-up, grading, seeding, sodding or otherwise restoring all areas that he disturbs.

Any deficiency in the quantity of material for backfilling the trenches or for filling depressions caused by settlement, shall be supplied by the Contractor.

### 3.7 TIE-INS TO EXISTING PIPELINES

This work shall consist of connecting new water pipes to the existing system where shown on the plans and shall include the necessary fittings, tapping sleeves, valves and necessary equipment and material required to complete the connection.

Knowledge of pipe sizes in the existing system may not be accurate, therefore, it is recommended that the Contractor check outside diameters of existing pipe and types of

pipe prior to ordering the required accessories. No additional payment will be allowed for matching pipe and/or accessories when the proper size is not ordered.

Neither the Owner nor the Engineer can guarantee the location of the existing lines. The Contractor shall verify the location of all existing water mains and valves pertaining to the proposed improvements before excavation is started.

The necessary regulation or operation of the valves on existing mains, to allow for the connections being made, shall be supervised by the Engineer. Before shutting down an existing water main or branch main for a proposed connection, prior approval for a specific time and time interval shall be obtained from a representative of the Owner. At no time shall an existing main be shut down without the Owner's knowledge and permission.

Excavation to existing water mains shall be carefully made, care being exercised not to damage the pipe. The excavation shall not be of excessive size or depth beneath the pipe. The sides of the excavation shall be as nearly vertical as possible.

The Contractor shall be responsible for any damage to the existing system and any such damage shall be repaired to the satisfaction of the Engineer at the Contractor's expense.

The Contractor shall verify, by field inspection, the necessary sizes, lengths and the types of fittings needed for each inter-connection. Typical connections are shown on the plans and any modifications or changes shall be subject to the approval of the Engineer. The exact length of the proposed water main needed for this work shall also be determined by field measurement as required.

The probing required to locate existing mains is not a separate pay item.

### 3.8 PIPE ENTERING STRUCTURES

Ductile iron, steel or PVC pressure pipe, 4-inch diameter or larger, entering structure below original earth level, unsupported by original earth for a distance of more than six feet (6'), shall be supported by #57 crushed stone. Costs for the support shall be included in the unit price for the pipe.

### 3.9 OWNERSHIP OF OLD MATERIALS

Pipe – Unless otherwise indicated, all existing pipe that is to be abandoned that interferes with construction or is easily removed shall become the property of the Contractor. All pipe that is not easily removed or not required to be removed as a result of the new construction, shall be abandoned in place by this Contractor.

Pipe Line Fittings and Appurtenances – All pipe line fittings, valves, hydrants and other like appurtenances that are removed as a result of new construction shall be removed

by this Contractor but shall become the property of the Owner. All such fittings and appurtenances shall be delivered to a point by the Contractor. Said point shall be on the Owner's property and shall be designated by the Engineer.

Other Materials – All other materials or items that are to be removed, demolished, or abandoned as a part of this contract shall become the property of the Contractor and shall be disposed of by him.

### 3.10 THRUST BLOCKS AND ANCHORAGE

Thrust blocks shall be installed whenever the pipe line changes direction, as at tees, bends, crosses, stops, as at a dead end; or at valves. The locations of thrust blocks depend on the direction of thrust and type of fitting. Their size and type depends on pressure, pipe size, kind of soil, and the type of fitting. Where thrusts act upward (as at vertical curves) the weight of the pipe, the water in the pipe and the weight of the soil over the pipe should be determined to make certain that the total weight is sufficient to resist upward movement. If there is not enough soil or if it will not compact over the pipe or it is too soft to resist movement, then ballast or concrete may be placed around the pipe in sufficient weight and volume to counteract the thrust. Where a fitting is used to make a vertical bend, the fitting may be anchored to a concrete thrust block designed to key in to undisturbed soil and to have enough weight to resist upward and outward thrust, since the new placed backfill may not have sufficient holding power.

Thrust blocks shall be constructed of not less than Class B concrete conforming to KTC Specification 601 and placed between the fitting and the trench wall. It is important to place the concrete so it extends to undisturbed (freshly cut) trench wall.

### 3.11 MAINTENANCE OF FLOW OF DRAINS AND SEWERS

Adequate provision shall be made for the flow of sewers, drains and water courses encountered during construction. Any structures which are disturbed shall be satisfactorily restored by the Contractor.

### 3.12 INTERRUPTION OF UTILITY SERVICES

No valve, switch or other control on any existing utility system shall be operated for any purpose by the Contractor without approval of the Engineer and the Utility. All consumers affected by such operations shall be notified by the Contractor as directed by the Engineer and Utility before the operation and advised of the probable time when service will be restored.

### 3.13 FENCING

Where water supply line is being constructed in fields where stock is being grazed, Contractor shall provide temporary fence as approved by the Engineer around open trenches to prevent stock from falling in trenches. Where trenching operations should



isolate grazing stock from their source of water, Contractor will either provide temporary bridging over trench or else provide water for such stock.

Where trench crosses near sound existing corner posts and existing fence is in good condition, fence may be taken loose, rolled back and stored until pipe line is completed at this point, then replaced by stretching tightly and thoroughly stapling. Additional posts will be provided and additional new fence shall be provided when it is necessary to place the fence crossed by the water line in a condition equal to existing fence before water line was constructed.

Where it is necessary to cut existing fence, new end posts shall be installed on each side of the water line and the old fence thoroughly stapled to these new posts before cutting. After pipe line is completed at this point, a new fence of galvanized wire (No. 9 gauge with No. 11 filler wires) shall be stretched between these new end posts and thoroughly stapled to existing posts and any new intermediate posts necessary to provide a good fence. Replacement of fences shall be on a replacement in-kind basis, and shall be considered incidental to laying of the lines and any additional cost shall be included in the unit price bid per linear foot of pipe.

### 3.14 PROTECTION OF ADJACENT LANDSCAPE

Reasonable care shall be taken during construction of the water lines to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

In the course of construction, the Contractor may deflect horizontal alignment of the water line to avoid trees and to keep from damaging their roots. The Contractor shall be fully responsible for settling all claims by private property owners concerning damage to trees and shrubs.

### 3.15 COORDINATION WITH UTILITIES

The Plans show the general location of existing utilities such information having been determined from the utilities. However, such information shall be considered general and is not guaranteed by Owner, Engineer or the Utility.

Prior to construction, the Contractor shall arrange to meet with representatives of all utilities, and provide them with his anticipated work schedule. The Contractor shall have the utilities make their best determination of utility locations in the areas in which he is working. Throughout the progress of the work, such field markings of utilities shall be kept current.

Repairs to any utilities damaged by the Contractor shall normally be performed by the utility at the Contractor's expense, unless the Contractor and the utility negotiate other understandings and/or procedures.

### 3.16 BLASTING AND ROCK EXCAVATION

The Contractor shall make his own investigation as he deems necessary to ascertain the sub-surface conditions to be encountered in the Work.

All blasting operations shall be conducted in accordance with municipal ordinances, state and federal laws and Section 9, Explosives, of the "Manual of Accident Prevention in Construction", published by the Associated General Contractors of America, Inc. Soil particle velocity shall not exceed limit set by Kentucky law. All explosives shall be stored in conformity with said ordinances, laws and safety regulations. No blasting shall be done within five feet of any water mains, sewer lines, natural or manufactured gas lines, liquid petroleum product lines or other utilities. Any damage done by blasting is the responsibility of the Contractor and shall be promptly and satisfactorily repaired by him.

The Contractor shall use delay caps or other approved methods to reduce earth vibrations and noise. Mud capping, as defined in the above manual, will not be permitted as a method of breaking boulders. No blasting shall be permitted on Sundays or after dark.

Prior to commencing with the work, the Contractor shall, during a preconstruction conference with the Owner and the Engineer, state clearly his approach to performing the excavations on the project. He shall be familiar with the laws and ordinances covering blasting and shall also give consideration to the use of hydraulically operated rock breaking devices in lieu of blasting where considered necessary. If blasting is not handled in an expert manner at all times, the Engineer reserves the right to suspend blasting and require the work to proceed without it.

Prior to blasting, the Contractor shall make his own detailed preblast survey of adjacent walks, curbs, retaining walls, house foundations, etc. to determine conditions prior to the work. Such a file of information, including photographs, may be certified in such a manner as the Contractor believes necessary since this information that may stand in his defense.

## **4.0 PAYMENT**

Payment for supplying, transporting and storing pipe, trenching, bedding, pipe installation, fittings, thrust-blocking, pipe locating wire and tape, testing, backfilling (including flowable fill, if required), disinfection, seeding, crop damage, regular stream crossings, clean-up, tie-ins to other structures and other incidental items in this section shall be made on the basis of the unit price per linear foot for the type and size of pipe installed. Payment will include all those items not specifically covered by another

proposal. Pipe will be measured along the centerline of the pipe as installed with no deduction for valves and fittings.

**END OF SECTION**

15100-21

## SECTION 15101

### WATERLINE ACCESSORIES

#### 1.0 GENERAL

The Contractor is to supply and install all valves, hydrants, blow-offs and other equipment at the locations shown on the plans in complete accordance with these specifications.

#### 2.0 GATE VALVES

All gate valves shall be the resilient seat-type, iron body, non-rising stem, fully bronze mounted, and suitable for working water pressures of not less than 200 psi for installations on PVC pipe and not less than 250 psi for installations on DI pipe. Valves shall be of standard manufacture and of the highest quality both of materials and workmanship and shall conform to the latest revision of AWWA C-509 Standard. Valves shall be furnished with flanged connections for exposed piping and push-on or mechanical joint connections for buried service. Gate valves shall have a clear water way equal to the nominal diameter, and shall be opened by turning counter-clockwise. The operating nut or wheel shall have an arrow cast in the middle, indicating the direction of opening. Each valve shall have the maker's initials, pressure rating and the year in which manufactured, cast on the body. Prior to shipment from the factory each valve shall be tested by hydraulic pressure of at least 300 pounds per square inch. The valves shall be Mueller or Kennedy brand or approved equal.

Underground valves shall be nut operated, unless otherwise shown on the plans. Valve supplier shall furnish two standard stem iron wrenches for turning nut operated valves. All underground valves which have nuts deeper than thirty inches (30") below the top of valve box shall have extended stems with nuts located within two feet (2') of valve box cap. Buried service valves shall have either epoxy-coated or tar-coated exteriors.

The valve maker is to supply the Engineer, through the bidder, within one week after award is made, complete catalogs or other material giving complete details and dimensions of valves and accessories.

Gate valves installed in underground piping systems may be installed in the vertical position for sizes to 12-inch. Gate valves 14-inch and larger shall be installed in the horizontal position with bevel gear operators unless otherwise noted on the drawings. Gear operators shall be the totally enclosed type, oil filled and designed for buried and submerged service. Gear housing shall be ductile iron. Gears shall be steel. Pinion shafts shall be stainless steel. Shaft bearings shall be Teflon with "O"-Ring bearings.

### **3.0 FIRE HYDRANTS**

#### **3.1 WORK INCLUDED**

Under this Item, the Contractor shall provide all labor, tools, equipment and materials to furnish and install hydrants with gate valves as shown on the drawing and as directed by the Engineer.

#### **3.2 MATERIALS**

All fire hydrants shall have a six inch bell connection, shall have two hose outlets and one pumper connection, shall be designed for 250 pounds working pressure or 300 pounds hydrostatic pressure and shall conform to the latest specifications of the AWWA C502. All working parts shall be bronze. Both hose outlets shall be 2 1/2 inch with NST threads and the pumper outlet shall be 4 1/2 inch with NST thread. Hydrants shall be designed so that no water will be lost when they are broken off and so they can be repaired with a repair kit. Design, materials, and workmanship shall be similar and equal to the latest stock pattern ordinarily produced by the manufacturer. Length of barrel shall be such to provide a 3 1/2 foot bury depth. Working drawings and full description of hydrants shall be submitted to the Engineer before ordering. All hydrants shall have a 5 1/4 inch valve opening against pressure. The hydrants shall be Mueller or Kennedy brand or approved equal. All hydrant extensions will be the responsibility of the Contractor.

#### **3.3 PAINT**

Hydrants shall be painted one coat of red paint and two finish coats of approved paint of color directed by the Engineer. All hydrants are to receive the final coat of paint after field installation.

#### **3.4 INSTALLATION**

Hydrants shall be set at such elevations that the connecting pipe will have the same depth of cover as the distribution main. The back of the hydrant opposite the pipe connection shall be firmly wedged against one and one-half square feet or enough of the vertical face of the trench with concrete to prevent the hydrants from blowing off the line. In addition, all fittings, valves and hydrants shall be joined by the use of all-thread rods, nuts and "DUC-LUG" offsets as shown on the attached drawing to prevent movement of the hydrant. If the character of the soil is such, in the opinion of the Engineer, that the hydrant cannot be securely wedged, bridle rod collars shall be used which shall be not less than three-fourths inch stock and shall be protected by a coat of acid resistant paint.

Not less than seven cubic feet of No. 9 stone shall be placed around the base of the hydrant to insure drainage. Before the No. 9 stone is placed and before it is backfilled the drain hole shall be inspected and thoroughly cleaned if necessary. The backfill

around the hydrant shall be thoroughly compacted to the grade line in a manner satisfactory to the Engineer. Hydrants shall have the interior cleaned of all foreign matter before installation.

All hydrants will be installed with the pumper connection facing the main access road or as directed by the Engineer.

Stuffing boxes shall be tightened and the hydrants shall be inspected in open and closed position to see that all parts are in working condition.

#### **4.0 AIR VALVES – N/A**

##### **4.1 AIR RELEASE VALVES**

A valve designed to allow exhaust of small pockets of air from the water main while in use shall be installed where shown on the plans or where directed by the Engineer. The air release valve shall have a 3/4" iron pipe thread inlet, cast iron body construction, bronze trim, with all internal parts of stainless steel. The valve shall have a minimum orifice size of 3/32". Valves shall be suitable for a working water pressure of 250 PSIG. The air release valve shall be mounted on 3/4" bronze riser pipe. The riser pipe shall be connected to the water main by use of a service clamp and a corporation stop. The riser shall also have a 3/4" bronze ball valve with stainless steel handle and be suitable for a 250 PSIG working water pressure. Air release valves shall be as manufactured by DeZurik Models 65 or 50, or approved equal.

Air release valves will be installed in the same type of box used for meter installation. The box must allow for adequate cover over the pipe at the installation.

In locations where the air release valve can not be placed directly above the water main, such as roadway drainage ditches, then a section of service tubing shall be used to locate the valve as directed by the Engineer. The service tubing shall be installed with a continuous upward slope to eliminate air pockets. Additional payment for the tubing shall be made based on the linear foot bid for service tubing. Tubing shall also be rodded through the box to support the valve. No additional payment will be made for the tubing supports.

#### **5.0 VALVE BOXES**

All valves (gate, air release, check, etc.) installed underground shall be installed in an approved valve box. Each gate valve shall be installed in a vertical position with a valve box. Valve boxes shall be of a cast iron, two or three-piece, slip-type consisting of a base, a center section and a top section with a cover marked "water". Where valve box is constructed in a paved area the box shall be a screw type box. The entire assembly shall be adjustable for elevation and shall be set vertically and be properly adjusted so that the cover will be in the same plane as the finished street surface (no more than 1/2" above ground in yards or pastures or 2" in unsodded areas). The assembly must provide for the required cover over the pipe at the installation site and

shall rest on concrete pads as shown in the Standard Details. The Contractor shall furnish two valve wrenches for the project.

## **6.0 BLOW-OFF ASSEMBLY**

Blow-off assembly shall be installed in accordance with the details and the specifications at locations shown on the plans and in other locations as directed by the Engineer. The gate valve is included in the unit bid price for blow-off assembly. The Contractor should refer to the Standard Details for blow-off installation.

The blow-off pipe from the main to the flush valve shall be connected to the main by means of a tee. Do not use a corporation stop for this connection. The gate valve included in the blow-off connection shall be a resilient seat gate valves in conformance with AWWA C509.

## **7.0 TAPPING SLEEVE AND VALVE**

Tapping sleeves shall be as manufactured by Mueller or approved equal, and shall be rated for a minimum working water pressure of 250 psi. Contractor shall ascertain the type and size of pipe to which the connection is to be made prior to selection. The valve shall be as specified under Section 2.0 of this specification.

## **8.0 TIE-IN CONNECTIONS**

All tie-in connections shall include any fittings suitable to make the required connection. The fittings shall be mechanical joint, ductile iron type as specified in other sections.

## **9.0 END CAPS**

All end caps installed to deaden existing lines shall be installed in accordance with the details shown on the plans as appropriate.

## **10.0 MEASUREMENT AND PAYMENT**

Payment for the pressure reducing station shall include all work and materials necessary for a complete and working installation at the unit bid price. Payment for all valves, tapping sleeve and valves, tie-in connections, and fire hydrants or blow-off assemblies will be made at their respective unit bid prices.

**END OF SECTION**

## SECTION 15102

### SPECIAL ITEMS OF CONSTRUCTION

#### 1.0 GENERAL

These specifications govern special crossings, installations and construction procedures required to deal with unusual construction items or special requirements of governing agencies.

#### 2.0 STATE HIGHWAY CROSSINGS

In all cases, these crossings will be made in compliance with the requirements of the State Highway Department. Such requirements will normally be described by the appropriate District Highway Office. In general, unless otherwise shown on the plans or directed otherwise by the Engineer, the crossing of all State Highways shall be accomplished by boring under the roadway. In addition, the crossing of service lines 1-1/2 inches and greater under rigid and flexible surfaced paved roads shall be accomplished by boring and jacking a casing pipe under said roadway. In certain cases, as shown on the plans, service lines of all sizes will require casing pipe installed with the crossing.

##### 2.1 OPEN TRENCH CROSSINGS

The trench shall be excavated to a minimum width that will allow the pipe installation. The trench walls shall be kept as nearly vertical as possible. The minimum specified cover above the pipe shall be maintained. The Miscellaneous Detail Drawings show the requirements for open trench crossings.

The backfill in the trench under any roads, driveways, or parking areas where the open trench method is used shall be of the type shown in the Miscellaneous Details and shall be deposited and compacted in uniform layers not to exceed the depth shown in the Miscellaneous Details.

The surface of the road, driveway, or parking area shall be replaced with the same type of material as specified under pavement replacement.

##### 2.2 BORING AND JACKING

The work is herein defined as the operations in which both the boring by auger and the jacking of the casing pipe are done mechanically and in which the diameter of the casing pipe is too small to permit hand working at the heading of the casing pipe. Two basic methods are; (1) pushing the casing pipe into the fill or earth simultaneously as the boring auger drills out the ground; and (2) drilling the hole through the fill or earth and pushing the casing or carrying pipe into the hole after the drill auger has completed the bore.



A suitable approach trench shall be opened adjacent to the slope of the embankment, or adjacent to point of bored and jacked section as shown on the plans. The approach trench shall be long enough to accommodate the selected working room. Guide timbers or rails for keeping the casing pipe on line and grade shall be accurately set and maintained in the bottom of the approach trench and with heavy timber back-stop supports installed at the rear of the approach trench to adequately take thrust of the jacks without any movement or distortion. It is paramount to the securing of acceptable tolerance limits of workmanship in the boring and jacking operation that extreme care be taken in the setting of all guides, rails and jacks to the end that the casing pipe in final position be within the limits of acceptability for the placing and laying of the carrier pipe. The minimum cover of forty-two inches (42") under the roadway must be maintained. Additional depth may be required as shown on the plans.

In general, the diameter, thickness, style, joints and materials selected for casing pipe shall be as shown on the plans and shall be considered as "minimum" requirements, all subject to prior approval of the Engineer. In all cases, the approval for construction by agreement with the private company and/or construction permit issued by the State, County, or Municipal agency will be required before construction starts.

Steel casing pipe for road and railroad crossings using the boring and jacking method shall be steel, plain end, uncoated and unwrapped, and shall be furnished in at least 18-foot lengths. Steel pipe shall meet the requirements of ASTM Specification A-120 and AWWA C200. Pipes up to and including 4 inches in diameter shall be Schedule 40. Pipe larger than 4 inches shall have a wall thickness equal to or greater than 0.312 inches under railroads and 0.250 for all other uses. The inside diameter of all casing pipes shall be a minimum of four (4") inches greater than the largest outside diameter of the carrier pipe, joint or coupling.

The steel casing pipe shall be bored and/or jacked in place at the locations as shown on the plans or as directed by the Engineer. All joints between lengths shall be solidly welded with a smooth non-obstructing joint inside. Any field welding shall be performed by a certified welder and shall be in accordance with AWWA C206. The casing pipe may be extended beyond the boring limits by open trenching as shown in the Standard Details. This would apply when the casing is required from right-of-way to right-of-way or ditch line to ditch line. Open trenching at jacked or bored locations will be allowed no closer than 3 feet from edge of pavement.

Positioning guides (insulators) shall be utilized on all carrier pipe which is within the casing pipe. Positioning shall be accomplished by the use of prebuilt spacers such as those manufactured by CALPICO or an approved equal. The Contractor shall submit the type of position guide proposed for use for the approval of the Engineer. Spacing of the positioning guides shall be in accordance with the Standard Drawings.

The ends of the casing pipe shall be plugged and made watertight in a manner acceptable to the Engineer prior to backfilling. Casing seals as manufactured by

Pipeline Seal & Insulator, Inc. (PSI), Advance Products & Systems, Inc. (APS) or equal shall be used.

Where road crossings are made using plastic pipe or copper, the location of joints under the roadway should be avoided by using lengths of adequate dimension for the crossing. This principle also applies to other types of pipe where sufficiently long lengths are available.

### **3.0 RAILROAD CROSSINGS**

At all railroad crossings, cover pipe (casing) for water lines (carrier pipe) shall be jacked or pushed beneath tracks and the carrier pipe jointed and pushed through the cover pipe. Detailed drawings of railroad crossings including the length of casing and depth below track are shown in the plans. Contractor shall obtain and pay for services of a representative of the railroad to direct the Contractor's operations while on the railroad property when required by the railroad.

### **4.0 STREAM CROSSINGS**

#### **4.1 NO-FLOW CONDITION**

Where required on the plans or instructed by the Engineer, the Contractor shall construct a special creek crossing as shown in the Miscellaneous Detail Drawings. Crossings shall be scheduled for construction in times of no flow or very low flow, if practicable, otherwise the stream shall be directional bored. Concrete shall not be placed under water and Contractor shall provide suitable pumps to keep water out of trench excavation during stream crossing construction. Special creek crossings shall be designated as Type A or Type B as contained in the Miscellaneous Detail Drawings.

#### **4.2 NORMAL EARTHEN STREAM CROSSING**

Where the stream crossing is made in earth or other beds which are stable (no casing or anchorage required), then the pipe will be laid in a narrow trench at the depth specified in the Miscellaneous Details to maintain the required cover between pipe and stream bed. Initial backfill will be mechanically compacted. Trench backfill in any stream crossing area from one foot (1') above the top of the pipe shall consist of trench excavated rock, if available. No extra payment will be made above normal construction for this type of creek crossing.

#### **4.3 BLUE LINE STREAM CROSSINGS**

All crossing of streams that appear as a blue line on a USGS 7.5 minute topographical map shall be accomplished in accordance with:

GENERAL CERTIFICATION  
NATIONWIDE PERMIT #12  
UTILITY LINE BACKFILL AND BEDDING

This document is bound in back of the specifications. The Contractor shall read, understand, and comply with the requirements and procedures.

Stream size, for purposes of this specification, is differentiated as large or small. A stream is classified as small when the distance across the stream channel at top of banks is 15 L.F. or less. A stream is classified as large when this measurement is greater than 15 L.F.

It is the intent of the plans to identify a stream crossing at each blue line stream. Small stream crossings may frequently be accomplished by trenching when the stream is in a no-flow condition. If the stream is in a flow condition, irregardless of the size classification, the crossing shall be accomplished by directional boring or other method that complies with the General Certification and is approved by the Engineer. Specific details for stream crossings are contained in the Miscellaneous Detail Drawings.

See Section 15 for Basis of Payment.

#### 4.4 BYPASS TEST METER

At locations as indicated on the Plans, where a new creek crossing is installed, a bypass test meter shall be installed. The meter shall be installed as a normal water meter with taps on each side of a valve, as shown in the Miscellaneous Detail Drawings.

#### 5.0 RIVER OR LAKE CROSSINGS

Crossings in rivers or lakes where the pipe cannot be laid in a trench shall normally be made with ductile iron pipe having ball and socket joints or polyethylene pipe or directional bored as indicated on the Drawings. Details for any required installations of this type including pipe required; number, size and location of anchors; and, installation technique are shown in the plans and Miscellaneous Detail Drawings. See Section 15100 for installation requirements.

#### 6.0 BRIDGE CROSSINGS

Wherever possible bridges will not be utilized for stream crossings. However, where it is necessary for the water line to be attached to bridges, the pipe shall be securely fastened to bridge stringers or beams using supports as dimensioned and located in the plans. The carrier pipe shall be insulated with Vermiculite or other approved material to prevent freezing. Expansion joints to allow for movement of the bridge will be required as shown on the plans.

## **7.0 FREE BORE**

### **7.1 WORK INCLUDED**

Under this item, the Contractor shall provide all labor, tools, equipment and materials to install the free bore at all bituminous and concrete driveways and/or county road unless otherwise directed by the Engineer.

### **7.2 INSTALLATION**

The Contractor shall provide a jacking pit and bore through the earth at the proper line and grade. The augured hole shall be as small as practical to allow the carrier pipe to pass through.

This bid item does not apply to service tubing.

### **7.3 MEASUREMENT AND PAYMENT**

The unit price bid per linear foot for free boring, as measured from edge of pavement to edge of pavement, regardless of size of bore, shall constitute full compensation for the work specified.

## **8.0 WATER LINE AND SEWER LINE SEPARATION**

### **8.1 GENERAL**

Wherever sewer lines cross, or are adjacent to, each other, special precautions shall be taken.

### **8.2 PARALLEL WATER AND SEWER LINES**

Water lines must, if possible, be located a minimum lateral distance of 10 feet from any existing or future sewer lines measured from outside diameters. Where water lines and sewer lines must be placed in the same trench, the water line must be located on a shelf, 2 feet above and 2 feet to the side of the sewer line. Whenever this condition cannot be met, and upon direction from the Engineer, the water line shall be uncovered and encased with concrete per the standard encasement detail.

### **8.3 CROSSING WATER AND SEWER LINES**

Wherever sewer lines and water lines cross, it is desirable, if practical, that the sewer line be at least 24 inches below the water line.

Where it is not practical to provide such a separation, care shall be taken to ascertain that the existing water line or existing sewer line is in good sound condition and that no

evidence of joint leakage is known in that vicinity. If any such evidence does exist, the existing line shall be exposed by the Contractor at least 10 feet each side of the new pipe crossing, carefully examined and any defects positively corrected. The Owner will arrange for examining and correcting any defects in the existing lines, but the Contractor shall cooperate in every way possible.

When the water line must be below or less than 2 feet above the sewer line, the Contractor shall encase the water line 5 feet in each direction from the crossing as directed by the Engineer. This encasement should only be accomplished when directed by the Engineer and shall be accomplished in accordance with the details shown on the drawings. The encasement is a separate pay item.

## **9.0 CLEANUP, SEEDING AND SODDING**

### **9.1 GENERAL**

Upon completion of the installation of the work, the Contractor shall remove all debris and surplus construction materials resulting from the work. The Contractor shall fine grade all the disturbed surfaces around the area of the work in a uniform and neat manner leaving the construction area in a condition as near as possible to the original ground line or to the lines as directed by the Engineer. The Contractor shall provide effective cleanup of the work as it progresses. Procrastination of cleanup will not be tolerated.

### **9.2 ROUGH GRADE WORK AND CLEANUP**

Rough Grade Work and Cleanup (Rough Cleanup) shall be defined to include the final backfill and windrowing of the ditch line, disposal of excess excavated material, level grading of the disturbed areas adjacent to the ditch line, filling and leveling street and driveway cuts, cleaning up and removal of rubbish, repair of fences and structures, and any other such work that may be required to result in a neat, orderly project area. Rough Cleanup shall be performed as other construction progresses and must be completed within **one week** of the adjacent pipeline construction.

Rough Cleanup is not a separate pay item. The cost for this work shall be included in the unit bid price for water lines. If Rough Cleanup is not performed as specified, the Owner, after notification to the Contractor, will refuse payment for additional pipeline installation until the Rough Cleanup is accomplished.

### **9.3 FINAL CLEANUP**

Final cleanup, grade work and seeding shall be performed on each line when backfilled trenches have had adequate time to settle, but at least within **30 days** from the date each line is constructed. Final grade work and seeding on Kentucky Transportation Cabinet rights-of-way shall be done in accordance with said Cabinet's specifications and the permit granted to the Owner specifically for this project.

Where work was performed on private property in lawns, earth of good quality, free from rock shall be spread over the disturbed area and graded and compacted to match adjacent ground contours. The graded and seed bed area shall be prepared with a power landscape rake and further hand raked if necessary, until smooth and free from rock, potholes, and bumps. The disturbed area shall then be seeded with the seed variety used on the original lawn (e.g., a bluegrass lawn shall be reseeded with bluegrass seed). In the case of no preference by the Owner, the mixture of grasses shall consist of one-third (1/3) Rye grass, one-third (1/3) Kentucky Fescue and one-third (1/3) Kentucky Bluegrass by weight and shall be applied in accordance with the supplier's recommendations. The area shall be fertilized with 12-12-12 fertilizer applied at a rate of 6 pounds per 1,000 square feet of area. After the seed and fertilizer have been applied, the Contractor shall then lightly cover the seed by use of a drag or other approved device. The seeded area shall then be covered with clean straw to a depth of approximately one (1) inch.

Where work was performed on private property and not in lawns the trench line shall be graded and filled if necessary to match adjacent contours. All rock larger than 1-1/2" in diameter shall be removed from the disturbed area. In general, pasture and fallow land shall be fertilized and seeded with Kentucky 31 Fescue and plowed fields shall be left unseeded, however, the desire of each property owner shall govern regarding seeding. The entire pipeline length that is seeded shall be strawed.

In all cases on private property the rate of seed and fertilizer application shall be that recommended by the material supplier or the University of Kentucky Cooperative Extension Service for new plantings of the variety of grass seed used. If the trench line settles following final grade work or if grass seed fails to germinate within a reasonable time, the Contractor shall regrade or reseed the area in question as specified above and as directed by the Engineer.

Final cleanup will not constitute a separate pay item.

## **10.0 PAVEMENT AND OTHER STRUCTURE REPLACEMENT**

The Contractor shall replace all pavement cut or disturbed, with pavement similar in all respects to existing pavement in accordance with the Standard Details and at those locations approved by the Engineer. Every effort shall be made to avoid cutting the pavement. In restoring pavement, new pavement is required, except that granite paving blocks, sound brick or sound asphalt paving blocks may be reused. No permanent paving shall be placed within thirty (30) days after the backfilling has been completed. All concrete and asphalt paving materials shall be in conformance with the Miscellaneous Details shown in the plans. The pipeline trench through all paved areas (parking lots, driveways, roads, etc.) shall be fully backfilled with crushed stone.

## 10.1 CLASSIFICATIONS OF PAYMENTS

- A. Concrete Pavement Replacement - This pavement replacement shall be Portland cement concrete construction in accordance with the requirements shown in the Standard Details. It shall include all pavement replacement on concrete surfaced roads, concrete driveways, concrete sidewalks and concrete parking areas, both public and private.
- B. Heavy-Duty Bituminous Pavement Replacement - This type of asphalt pavement replacement shall be bituminous concrete surface over concrete base in accordance with the details. This type of pavement replacement shall be used on all heavily trafficked roads having an existing pavement greater than 2", whether public or private, or in other locations as directed by the Engineer.
- C. Light-Duty Bituminous Pavement Replacement - This type of pavement replacement shall be bituminous concrete constructed in accordance with the details. This item shall include all light-duty bituminous concrete roadways, bituminous driveways and bituminous parking lots, both public and private.
- D. Crushed Stone Surface Replacement - This type of surface replacement shall include all graveled roadways, driveways, parking areas, or other gravel surfaced areas, both private and public. This type of surfacing may also be required as a base course for other pavement replacement.

## 10.2 MATERIALS

The crushed stone backfill as noted on the drawings shall be dense graded aggregate per Kentucky Department of Highways Specifications or as noted on the Drawings. The Contractor shall continuously be responsible for the maintenance of the aggregate and the surface of the trenches until the pavement replacement is completed.

Portland cement concrete for pavement replacement shall contain a minimum of 6 sacks of cement per cubic yard, the maximum free water content shall be 6 gallons per sack of cement, the slump shall be between 2 and 4 inches, and the concrete shall have minimum 28-day compression strength of at least 3,500 PSI. Cement, aggregate and water shall be described in these specifications for Class "A" concrete. A set of cylinders shall be made and tested for each 25 cubic yards of concrete placed, or fraction thereof, to supply representative sampling and testing of the concrete, upon the direction of the Engineer. The Contractor shall produce a broomed, or burlaped uniformly smooth and nonskid surface, consistent with the existing pavement.

Bituminous materials and mixes shall be consistent with the recommended practice of the asphalt institute and it shall conform to the requirements of the Kentucky

Department of Highways for prime coat and Class 1 bituminous concrete. The bituminous concrete shall consist of a binder or base course and a surface course.

### 10.3 INSTALLATION OF PAVEMENT REPLACEMENT

The Contractor shall cut back the surfacing adjacent to the trench for 12 inches on both sides of the trench and shall cut down the dense graded aggregate he has placed to a depth required for either type of pavement replacement. The resulting surface shall be rolled to yield a smooth, dense surface and a uniform depth.

The concrete shall be placed in accordance with standard practice, with the welded wire mesh if required in proper position and thoroughly vibrated into place. The Contractor shall produce a surface consistent with the existing pavement. The Contractor shall apply a liquid curing component, sprayed on the surface of the concrete, and shall provide adequate protection to the pavement until it has set.

For bituminous concrete, the Contractor shall clean and broom the prepared surface, then apply the prime coat at the rate of 0.20 to 0.25 gallons per square yard, with a pressure distributor or approved pressure spray method. When the prime coat has become tacky but not dry and hard, the bituminous binder course, or base course, whichever applies, shall be placed and compacted. The Contractor shall then apply the surface course. It is recommended, but not required, that the base course remain in place for approximately one week before placing the surface course. The finished course shall be compacted and the completed surface shall match the grades and slopes of the adjacent existing surfacing and be free of offsets, depressions, raised places and all other irregular surfaces.

### 10.4 SEASONAL AND WEATHER LIMITATIONS FOR PAVEMENT REPLACEMENT

In the event the progress and scheduling of the work is such that the bituminous pavement replacement would occur in the winter months, during adverse cold weather and/or during such times the asphalt plants are not in operation, then the final pavement replacement shall be postponed until favorable weather occurs in the spring and the asphalt plants resume normal operations. No bituminous concrete shall be laid when the temperature is below 40°F except by written permission of the Engineer.

Concrete pavement shall not be placed when the temperature is such that the pavement placed will freeze before it has had adequate time to set and shall be placed in conformance with the temperature conditions approved by the Engineer.

The Contractor shall be responsible for replacement of pavement which he has placed which has been damaged by cold weather or freezing without additional compensation.

In the meantime, the Contractor will be required to maintain the temporary surfacing until the permanent pavement is placed. Such labor, materials and equipment as is required for temporary maintenance of the streets, roadways and driveways shall be provided at the Contractor's expense and is not a pay item. The Contractor will be



required to use a cold mix asphaltic concrete as a temporary surface for trenches under heavy traffic use.

#### **10.5 GUARANTEE**

The one year guarantee as specified in the contract documents is also applicable to trench settlement and pavement replacement.

#### **11.0 SIDEWALK AND DRIVEWAY REPLACEMENT**

Sidewalks and driveways will be replaced if damaged by the Contractor in any way. Payment will be made for those pavements necessarily damaged by the line installation in accordance with the Standard Details. No pavements are to be replaced over a backfilled trench for at least 30 days after filling. Pavements damaged otherwise are to be replaced immediately at the Contractor's expense.

Materials and dimensions are to be at least equal to existing pavement and are to conform to the Standard Details.

#### **12.0 PAYMENT FOR WATER**

All water used from the Utility shall be metered with meters supplied by the Contractor. The Contractor shall pay for such water monthly at the rates published by the water utility. Unmetered water lost through water line breakage shall also be paid at the rates published by the water utility. The quantity lost shall be computed on the basis of a discharge velocity of 7 feet/second, the diameter of the line, and the estimate duration of free uncontrolled discharge.

#### **13.0 FINAL CLEAN-UP**

The Contractor shall provide effective cleanup of the work as it progresses. Procrastination of cleanup will not be tolerated. At the time of final inspection, no trenches shall show any undue evidence of the previous construction. All areas shall be left free of ruts due to construction equipment and shall have a clean and neat appearance without rubble or debris. The areas shall not be mounded up and shall be completely restored, and all yards and fields shall be reseeded so land may be cultivated, mowed, etc. Straw and fertilizer shall accompany the seeding. If necessary to hasten proper restoration of terraces, principally along ditch lines, the Contractor shall sod such areas at the Engineer's direction. For all line segments, final cleanup shall be performed within 30 days from day of installation.

#### **14.0 PROTECTION OF ADJACENT LANDSCAPE**

Reasonable care shall be taken during construction of the water lines to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall

be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

In the course of construction, the Contractor may deflect horizontal alignment of the water line to avoid trees and to keep from damaging their roots. The Contractor shall be fully responsible for settling all claims by private property owners concerning damage to trees and shrubs.

## **15.0 PAYMENT**

Casing pipe will be paid according to the unit bid price for boring or open cutting, as appropriate. The price shall include, as necessary, the cost of the casing pipe, the cost of boring or cutting, and the cost of special requirements for the road or railroad crossing. Carrier pipe will be paid according to Section 15100.

The unit price bid per linear foot for free boring, as measured from edge of pavement to edge of pavement, regardless of size of bore, shall constitute full compensation for the work specified.

Payment for special creek crossings will be at the unit price bid per linear foot for that item and shall include encasement pipe, crushed stone, concrete, solid rock excavation and all other work necessary for a satisfactory installation. The carrier pipe installed in the casing shall be paid separately under the unit price bid for pipe installed.

Payment for Bypass Test Meter or Leak Detection Test Meter shall include a meter setting (5/8" x 3/4") and taps on both sides of a gate valve. The gate valve, sized for the line, is a separate pay item, covered in Section 15101.

Additional costs for normal earth creek crossings shall be included in the unit price bid for pipe installation and no special payment will be made for these crossings.

Payment for asphalt and concrete pavement replacement will not be based on the quantities purchased by the Contractor. Payment for surfacing will be paid on the basis of linear feet installed in accordance with the Standard Drawings with a maximum width of pipe diameter plus twenty-four inches (24"). Crushed stone sub-grade under paving shall be included in paving price and not paid for separately. Any additional cost estimated by the Contractor must be included in the cost of pipe in place.

Sidewalk /driveway crossings when included as a bid item shall include the extra cost of free-boring or the removal and disposal of existing pavement and replacement with new construction. Payment for pavement replacement will be on the basis of linear feet installed. Width for payment for a standard trench crossing is shown in the Standard Details. When sidewalk/driveway crossings or replacement are not included as a bid item, their costs shall be considered subsidiary to the bid for pipe installation.

Where required by the Special Provisions or the Bid Proposal, the cost of pavement replacement, boring, crossings of all types and other incidental construction shall be included in the unit price bid for pipe line installation and shall comprise total compensation for all such work.

All clean-up associated with installing water lines is incidental to the cost of installing the water lines. There is no separate pay item for clean-up.

**END OF SECTION**

15102-12

## SECTION 15103

### PRESSURE TESTING AND STERILIZATION

#### 1.0 TESTING

After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure test of at least 1.5 times the working pressure at the point of testing, but in no case less than that required by other Sections herein. In addition, a leakage test shall be conducted concurrently with the pressure test.

#### 1.1 PRESSURE TEST

A. Test pressure shall:

1. Not be less than 1.25 times the working pressure at the highest point along the test section.
2. Not exceed pipe or thrust restraint design pressures at the lowest point along the test section.
3. Be of at least six (6) hour duration unless otherwise stipulated by Owner.
4. Not vary by more than plus or minus 5 psi.
5. Not exceed twice the rated pressure of the valves or hydrants when the pressure of the test section includes closed gate valves or hydrants.
6. Not exceed the rated pressure of resilient seat butterfly valves when used.

B. Each valved section of pipe shall be filled with water slowly and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer.

C. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged, or left in place at the discretion of the Engineer.

D. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, hydrants or other appurtenances that are discovered during or following the pressure test shall be repaired or replaced with sound equipment and materials, and the test shall be repeated until all test results are satisfactory in the opinion of the Engineer.

## 1.2 LEAKAGE TESTING

- A. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.
- B. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = ND(P \text{ exp } 1/2)/133,200$$

in which L is the allowable leakage, in gallons per hour; N is the length of pipeline tested in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge.

1. Allowable leakage at various pressures is shown in Table K-1.
  2. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/hr/in of nominal valve size shall be allowed.
  3. When hydrants are in the test section, the test shall be made through the open isolation valve and against the closed hydrant valve.
- C. Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than that specified in Section 1.03.B the Contractor shall, at his own expense, locate and repair the defective material until the leakage is within the specified allowance.

All visible leaks are to be repaired regardless of the amount of leakage.

**Table K-1**  
**Allowable Leakage Per 1,000 Ft. Of Pipeline (GPH)**

Avg. Test Pressure (psi)	Nominal Pipe Diameter (Inches)								
	2	3	4	6	8	10	12	14	16
450	0.32	0.48	0.64	0.95	1.27	1.59	1.91	2.23	2.55
400	0.30	0.45	0.60	0.90	1.20	1.50	1.80	2.10	2.40
350	0.28	0.42	0.56	0.84	1.12	1.40	1.69	1.97	2.25
300	0.26	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08
275	0.25	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99
250	0.24	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90
225	0.23	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80
200	0.21	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70

15103-2

175	0.20	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59
150	0.19	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47
125	0.17	0.25	0.34	0.50	0.67	0.84	0.01	1.18	1.34
100	0.15	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20

Avg. Test Pressure (psi)	Nominal Pipe Diameter (Inches)							
	18	20	24	30	36	42	48	54
450	2.87	3.18	3.82	4.78	5.73	6.69	7.65	8.60
400	2.70	3.00	3.60	4.50	5.41	6.31	7.21	8.11
350	2.53	2.81	3.37	4.21	5.06	5.90	6.74	7.58
300	2.34	2.60	3.12	3.90	4.68	5.46	6.24	7.02
275	2.24	2.49	2.99	3.73	4.48	5.23	5.98	6.72
250	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41
225	2.03	2.35	2.70	3.38	4.05	4.73	5.41	6.03
200	1.91	2.12	2.55	3.19	3.82	4.46	5.09	5.73
175	1.79	1.98	2.38	2.98	3.58	4.17	4.77	5.36
150	1.66	1.84	2.21	2.76	3.31	3.86	4.41	4.97
125	1.51	1.68	2.01	2.52	3.02	3.53	4.03	4.53
100	1.35	1.50	1.80	2.25	2.70	3.15	3.60	4.05

## 2.0 STERILIZATION

### 2.1 GENERAL

It is the intent of this Section to present essential procedures for disinfecting new and repaired water mains. This Section is patterned after AWWA C651. The basic procedure comprises:

- A. Preventing contaminating materials from entering the water mains during construction or repair and removing by flushing materials that may have entered the water main.
- B. Disinfecting any residual contamination that may remain.
- C. Determining the bacteriologic quality by laboratory test after disinfection.

### 2.2 PREVENTIVE MEASURES DURING CONSTRUCTION

- A. Precautions shall be taken to protect pipe interiors, fittings, and valves against contamination. Pipe delivered for construction shall be strung so as to minimize entrance of foreign material. When pipe laying is not in progress,

for example at the close of the day's Work, all openings in the pipe line shall be closed by water tight plugs. Joints of all pipe in the trench shall be completed before Work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

If dirt that, in the opinion of the Engineer, will not be removed by the flushing operation (Section 2.3) enters the pipe, the interior of the pipe shall be cleaned and swabbed as necessary, with a five (5%) percent hypochlorite disinfecting solution.

- B. Packing Materials and Joints—No contaminated material or any material capable of supporting prolific growth of micro-organisms shall be used for sealing joints. Packing material shall be handled in such a manner as to avoid contamination. Where applicable, packing materials must conform to AWWA standards. Packing material for cast iron pipe must conform to AWWA C600. Yarning or packing material shall consist of molded or tubular rubber rings, rope of asbestos or treated paper. Materials such as jute or hemp shall not be used. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water. It shall be delivered to the job in enclosed containers and shall be kept clean.

### 2.3 PRELIMINARY FLUSHING

The main shall be flushed prior to disinfection unless disinfected by the method in Section 2.04.B.1. It is recommended that the flushing velocity be not less than 2.5 ft/sec. The rate of flow required to produce this velocity in various diameters is shown in Table K-2. No site for flushing should be chosen unless it has been determined that drainage is adequate at the site.

**Table K-2  
Required Openings To Flush Pipelines  
(40-PSI Residual Pressure)**

Pipe Size (in.)	Flow Required to Produce 2.5 fps Velocity (gpm)	Orifice Size (in.)	Hydrants Required	
			Number of Hydrants	Nozzle Size (in.)
4	100	15/16	1	2 1/2
6	220	1 3/8	1	2 1/2
8	390	1 7/8	1	2 1/2
10	610	2 5/16	1	2 1/2
12	880	2 13/16	1	2 1/2
14	1,200	3 1/4	2	2 1/2
16	1,565	3 5/8	2	2 1/2
18	1,980	4 3/16	2	2 1/2

## 2.4 FORM OF CHLORINE FOR DISINFECTION

The most common forms of chlorine used in the disinfecting solutions are liquid chlorine (gas at atmospheric pressure), calcium hypochlorite granules, and sodium hypochlorite solutions.

### A. Liquid Chlorine

1. Use: Liquid chlorine shall be used only when suitable equipment is available and only under the direct supervision of a person familiar with the physiological, chemical, and physical properties of this element and who is properly trained and equipped to handle any emergency that may arise. Introduction of chlorine-gas directly from the supply cylinder is unsafe and shall not be permitted.

NOTE: The preferred equipment consists of a solution fed chlorinator in combination with a booster pump for injecting the chlorine-gas water mixture into the main to be disinfected. Direct feed chlorinators are not recommended because their use is limited to situations where the water pressure is lower than the chlorine cylinder pressure.

### B. Hypochlorites

1. Calcium Hypochlorite: Calcium hypochlorite contains seventy (70%) percent available chlorine by weight. It is either granular or tabular in form. The tablets, 6-8 to the ounce, are designed to dissolve slowly in water. Calcium hypochlorite is packaged in containers of various types and sizes ranging from small plastic bottles to one hundred (100) pound drums.

A chlorine-water solution is prepared by dissolving the granules in water in the proportion requisite for the desired concentration.

2. Sodium Hypochlorite: Sodium hypochlorite is supplied in strengths from five and one-quarter (5.25%) to sixteen (16%) percent available chlorine. It is packaged in liquid form in glass, rubber, or plastic containers ranging in size from one (1) quart bottles to five (5) gallon carboys. It may also be purchased in bulk for delivery by tank truck.

The chlorine-water solution is prepared by adding hypochlorite to water. Product deterioration must be reckoned with in computing the quantity of sodium hypochlorite required for the desired concentration.

3. Application: The hypochlorite solutions shall be applied to the water main with a gasoline or electrically powered chemical feed pump designed for feeding chlorine solutions. For small applications, the solutions may be



fed with a hand pump, for example, a hydraulic test pump. Feed lines shall be of such material and strength as to withstand safely the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the hypochlorite solution is applied to the main.

## 2.5 METHODS OF CHLORINE APPLICATION

A Continuous Feed Method: This method is suitable for general application.

1. Water from the existing distribution system or other approved sources of supply shall be made to flow at a constant, measured rate into the newly-laid pipe line. The water shall receive a dose of chlorine, also fed at a constant, measured rate. The two rates shall be proportioned so that the chlorine concentration in the water in the pipe is maintained at a minimum of 50 mg/L available chlorine. To assure that this concentration is maintained, the chlorine residual should be measured at regular intervals in accordance with the procedures described in the current edition of Standard Methods and AWWA M12—Simplified Procedures for Water Examination.

NOTE: In the absence of a meter, the rate may be determined either by placing a pitot gauge at the discharge or by measuring the time to fill a container of known volume.

Table K-3 gives the amount of chlorine residual required for each one hundred (100) feet of pipe of various diameters. Solutions of one (1%) percent chlorine may be prepared with sodium hypochlorite or calcium hypochlorite. The latter solution requires approximately one pound (1 lb.) of calcium hypochlorite in eight and five tenths (8.5) gallons of water.

**Table K-3**  
**Chlorine Required To Produce 50 mg/L Concentration**  
**In 100 Ft. Of Pipe (By Diameter)**

Pipe Size (in.)	100 Percent Chlorine (lb)	1 Percent Chlorine Solutions (gal)
4	0.027	0.33
6	0.061	0.73
8	0.108	1.30
10	0.170	2.04
12	0.240	2.88

2. During the application of the chlorine, valves shall be manipulated to prevent the treatment dosage from flowing back into the line supplying the water. Chlorine application shall not cease until the entire main is filled with the chlorine solution. The chlorinated water shall be retained in the main for at least twenty-four (24) hours during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this twenty-four (24) hour period, the treated water shall contain no less than 25 mg/L chlorine throughout the length of the main.
- B. Slug Method: This method is suitable for use with mains of large diameter for which, because of the volumes of water involved, the continuous feed method is not practical.
1. Water from the existing distribution system or other approved source of supply shall be made to flow at a constant, measured rate (see section 2.5.1.1) into the newly laid pipe line. The water shall receive a dose of chlorine also fed at a constant, measured rate. The two rates shall be proportioned so that the concentration in the water entering the pipe line is maintained at no less than 300 mg/L. The chlorine shall be applied continuously and for a sufficient period to develop a solid column or "slug" of chlorinated water that will, as it passes along the line, expose all interior surfaces to a concentration of at least 300 mg/L for at least three (3) hours. The application shall be checked at a tap near the upstream end of the line by chlorine residual measurements.
  2. As the chlorinated water flows past tees and crosses, related valves and hydrants shall be operated as to disinfect appurtenances.

## 2.6 FINAL FLUSHING

After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system, or less than 1 mg/L. Chlorine residual determination shall be made to ascertain that the heavily chlorinated water has been removed from the pipe line.

## 2.7 BACTERIOLOGIC TESTS

1. After final flushing, and before the water main is placed in service, a sample or samples shall be collected from the end of the line and tested for bacteriologic quality and shall show the absence of coliform organisms. If the number and frequency of samples is not prescribed by the public health authority having jurisdiction, at least one (1) sample shall be collected from chlorinated supplies where a chlorine residual is maintained throughout the new main. From unchlorinated supplies at

least two (2) samples shall be collected at least twenty-four (24) hours apart.

2. Samples for bacteriologic analysis shall be collected in sterile bottles treated with sodium thiosulphate. No hose or fire hydrant shall be used in collection of samples. A suggested sampling tap consists of a standard corporation cock installed in the main with a copper tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed, and retained for future use.

## 2.8 REPETITION OF PROCEDURE

If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained. The tablet method cannot be used in these subsequent disinfections. When the sample tests indicate that disinfection has been effective, the main may be placed in service.

## 2.9 PROCEDURE AFTER CUTTING INTO OR REPAIRING EXISTING MAINS

The procedures outlined in this Section apply primarily when mains are wholly or partially dewatered. Leaks or breaks that are repaired with clamping devices while the mains remain full of water under pressure present little danger of contamination and require no disinfection.

- A. Trench "Treatment": When an old line is opened, either by accident or by design, the excavation will likely be wet and may be badly contaminated from nearby sewers. Liberal quantities of hypochlorite applied to open trench areas will lessen the danger from such pollution. Tablets have the advantage in such a situation because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation.
- B. Main Disinfection: The following procedure is considered as a minimum that may be used.
  1. Swabbing With Hypochlorite Solution: The interior of all pipe and fittings used in making the repair (particularly couplings and tapping sleeves) shall be swabbed with a five (5%) percent hypochlorite solution before they are installed.
  2. Flushing: Thorough flushing is the most practical means of removing contamination introduced during repairs. If valving and hydrant locations permit, flushing from both directions is recommended. Flushing shall be started as soon as the repairs are completed and continued until discolored water is eliminated.

3. Slug Method: Where practicable, in addition to the procedures of section 2.9.2.1, a section of main in which the break is located shall be isolated, all service connections shut off, and the section flushed and chlorinated as described in section 2.5.2, except that the dose may be increased to as much as 500 mg/L, and the contact time reduced to as little as one-half (1/2) hour. After chlorination, flushing shall be resumed and continued until discolored water is eliminated.
- C. Sampling: Bacteriologic samples shall be taken after repairs to provide a record by which the effectiveness of the procedures used can be determined. If the direction of flow is unknown, samples shall be taken on each side of the main break.

### **3.0 PAYMENT**

No separate payment shall be made for testing and sterilization of water lines. Items described in this Section shall be incidental to the cost of installing the water line.

**END OF SECTION**

**ATTACHMENT 2G**

**ENGINEERING PLANS**  
**(FILED SEPARATELY)**

**GREEN RIVER VALLEY WATER DISTRICT**

**Response to Commission Staff's First Request for Information  
Case No. 2019-00258**

Question No. 12

Responding Witnesses: David Paige/Vaughn Williams

**Q-12. State how Green River Valley plans to satisfy Mr. Gross's complaint should the Division of Water deny its application for a deviation from flushing regulations.**

A-12. No contingency plans have been developed. In our preliminary discussions with the Division of Water, its representatives did not raise any concerns regarding the deviation. The Division of Water has previously granted such requests for deviation but placed restrictions upon the number of connections that can be made to a water main.