OTSEGO/DAYTON
WATER SYSTEMS
INTERCONNECTION REPORT

December 2016

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under State of Minnesota Statutes Sections 326.02 to 326.16.

Ronald J. Wagner	26052	December 6, 2016
	Lic. No.	Date

TABLE OF CONTENTS

APPENDIX

Introduction

The City of Dayton (Dayton) has approached the City of Otsego (Otsego) requesting a water connection for emergency purposes only. Currently, Dayton lacks the ability to provide standard fire protection to an urban portion of their City known as the "the historic village". Otsego required a report to provide assurances that they can support Dayton's emergency needs without compromising their own ability to provide all municipal water services to the citizens of Otsego. Other items that will be reviewed within the report is the resultant pressure and flows that can be expected at a selected point in the Dayton system, along with the location, the required size of watermain, and potential cost of the connection. Lastly, the report discusses Minnesota Department of Health's (MDH) requirements regarding any interconnection of municipal water systems.

Analysis of the City of Otsego East Water System

Hakanson Anderson has reviewed the Otsego East Water System to provide standard fire protection to Dayton's "historic village". Standard fire protection for a water system in this report is considered providing 2,500 gallons per minute for 3 hours. Analysis of the Otsego East Water System focuses on the ability to supply Dayton 2,500 gallons per minute of water for 3 hours and not cause any issues with continuing to provide service to the Otsego system users. Analysis of the interconnection and Dayton system's ability to convey 1,000 gpm at a hydrant at a minimum of 20 psi is reviewed in the next section of the report. Parameters for the analysis are:

1) Provide 2,500 gpm for 3 hours for standard fire protection
2) Evaluate with Otsego's pumping capacity with Well #8, its best production well out of service at the time of need; water supplied from only Well #3 and Well #6.
3) Evaluate during a peak day demand
4) Maintain 20% reserve in water tower volume for continuation of domestic pressure needs
5) Considered with Water Tower #3 and Water Tower #1.

It should be noted that at the time of the report, Water Tower #1 and Well #6 are not in service but are expected to be in service by June of 2016. That timeline will likely coincide or be prior to the potential interconnection.

Our analysis of the effects of an emergency fire need in Dayton determined that the Otsego East Water System has the capability and the capacity. With continued growth within Otsego's East Water System estimated at 100 Residential Equivalent Connections (RECs), Otsego would not need to add flow or storage capacity until the year 2031 to meet all of the parameters as noted above. If both Otsego and Dayton had simultaneous fires and 5,000 gpm for 3 hours were required, addition flow or storage capacity would not be needed until 2021. The likelihood that all of the parameters and simultaneous fires occurred is so remote as to be unrealistic though.

The data for the Otsego East Water System is included in Appendix A

Analysis of the City of Dayton Water System

Hakanson Anderson has reviewed Dayton's "historic village" water system with respect to the interconnection and the ability to convey water and resultant pressure at a hydrant near St. John the Baptist Catholic Church. The hydrant was chosen due to the higher elevation and furthest distance from the water pressure source. This location should be very good indicator to minimum flows and minimum pressures that Dayton would obtain in each scenario. Other hydrants within the Dayton "historic village" would thus have slightly higher pressures and volumes. A typical minimum flow any hydrant should be able to provide is 1,000 gpm at 20 psi. All options considered can supply a single hydrant at 1,000 gpm at 20 psi. An entire system should be able to provide 2,500 gpm for 3 hours by using several hydrants. Our analysis has determined the Dayton water system would not be able to provide 2,500 gpm without major changes due to the length of the connection and the size of the existing Dayton system watermains.

Four different options were reviewed to allow Dayton to make an informed decision if they would like to proceed. For each option, we determined flow capability with the corresponding pressure. An engineer's opinion of cost for each option was calculated. Options to replace the watermain under 62nd Street between Wright CSAH 36 and Richardson Avenue with a largeR watermain or provide a loop within the Ranch Acres development were also analyzed to determine if an increase in watermain sizing or an addition of a watermain loop is warranted.

Dayton should be aware that in order to provide fire protection, pressure and velocities will increase in trunk, lateral and private lines within Dayton's water system and those increases could cause unforeseen issues.

See Appendix B for pertinent datA regarding the four options and estimated costs.

Easement for the Interconnection

The nearest current viable connection in Otsego is located at the north end of Randolph Avenue near what would be 60th Street. Otsego has a 12" watermain at that location. The interconnection would follow the same alignment as the forcemain which serves Dayton's "historic village". The watermain would need to be located near the section line between Section 1 T120N R23W and Section 36 T121N R23W. The existing forcemain is located within an easement that consists of the northern 30' of Section 1 T120N R23W. The interconnection watermain must maintain a minimum of 10' horizontal clearance from the sewer forcemain to meet MDH requirements and 10 State Standards. Due to the fact that Section 1 has been preliminary platted by Lennar for the housing development Meadows of River Pointe and was designed without the additional easement, the logical location for additional easement needed would be to the north of the section line within Section 36. If the watermain was constructed near or on the section line, a 15' wide utility easement along the southern extents of Section 36 would be sufficient. The interconnection watermain would then bend 90 degrees to the north following Wright CSAH 36 to 62nd Street where connection to the 6" watermain of Dayton's water system would occur. A right of way permit from Wright County would need to be obtained for placement of watermain within the right of way if there is sufficient space. The existing forcemain is located to the west and adjacent to Wright CSAH 36 and within the righ-of-way. The watermain would likely need to be located to the east and adjacent to Wright CSAH

36 if it were to be within Wright County right of way. If a right of way permit is not allowed by Wright County, a utility easement a minimum of 20' wide would be needed west of the Wright CSAH 36 right of way between 60th Street and 62nd Street. For the report purposes, we will include the utility easement between 60th Street and 62nd Street along the west side of Wright CSAH 36.

Appendix C includes a schematic of the connection and easement.

Potential Issues regarding Interconnection of the Water Systems

As stated earlier in the report, the Dayton system will inevitably incur greater pressures and higher velocities if the two systems are connected and the emergency valve is opened. The Dayton City Engineer should evaluate the potential issues that may arise to portions of the system including and private lines within older homes and businesses.

The MDH has recently taken a different approach in reviewing interconnection of water systems due to the recent issues in Flint, Michigan. Changes in water types can cause corrosive issues with older piping. In this instance, both water types are similar as they are both ground water and treated similarly. The interconnection would also be deemed short term under their draft policy for Interconnection of Public Water Systems. The MDH is more concerned with interconnections deemed interim or long term. The MDH will review the construction plans, potential major pressure changes, and water composition difference prior to permitting the interconnection. Our preliminary discussions with MDH did not raise any concerns and our opinion is the interconnection is viable.

Appendix D includes the MDH Draft Policy on Interconnection of Public Water Systems.

Conclusion

The current City of Dayton's existing water system does not provide the "historic village" urban type fire protection. Completing a water connection to Otsego East Water System for emergency service needs has been determined as feasible from an engineering stand point and will provide individual hydrants with 1,000 gpm at 20 psi. Economically, the Dayton will need to determine which option best suits their needs. Many issues will need to be addressed in a Joint Powers Agreement between the two Cities, but it is our opinion, none of those should be problematic for either side and the agreement would likely outline ownership, liability, cost participation and operating procedures.

APPENDIX A

General Notes: System Capacity - WT#3 and WT#1 and Wells #3, #6 and #8 w/ Odd/Even

1. The firm capacity of the East Water Tower and Well System is approximately 1700 gpm.
2. Average Daily Water Usage @ 350 gpc

3. Average daily demand of 350 gpd/REC, this equates to approximately 1698 RECs on the East Water Tower and Well System.

Individual Facility Capacities:

Facility	Capacity
Well No. 1	gpm
Well No. 2	gpm
Well No. 3	700 gpm
Well No. 6	1,000 gpm
Well No. 8	1,450 gpm
Water Tower No. 1	400,000 Gallons
Water Tower No. 3	1,000,000 Gallons

System Capacity Calculations:

Existing Conditions[7]:

Firm Pumping Capacity[1]:	1,700 gpm
Required Fire Flow[2]:	2,500 gpm
Fire Flow Duration (hrs):	3 hrs
Total Fire Flow Demand:	450,000 gallons
Average Day Demand:	594,000 gpd
Peak Day Demand Volume[8]:	1,782,000 gallons
Peak Day Demand[3]:	1,485 gpm
3 hr Peak Day Demand:	267,300 gallons
20% Reserve[4]:	356,400 gallons
Total Water Required[5]:	1,073,700 gallons
Total Firm Pumping (3 hrs):	306,000 gallons
Total Storage Required[6]:	767,700 gallons

Existing System Capacity:

Total Firm Pumping (3 hrs):	306,000 gallons
Total Storage Available:	**1,400,000** gallons
Total Water Available:	**1,706,000** gallons

$Q_{TWR} = Q_{TFFD} + (3hr \times 60min/hr \times P_D)/(20hr \times 60min) + (0.20)P_D$

Q_{TWR} = Total Water Available (gallons)
Q_{TFFD} = Total Fire Flow Demand (gallons)
P_D = Peak Day Demand (gallons)

Solution:

$1,126,000 \text{ gallons} = 450,000 \text{ gallons} + 3P_D/20 + 0.20P_D$

$1,400,000 \text{ gallons} = 0.35P_D$

$P_D = 4,000,000 \text{ gallons}$

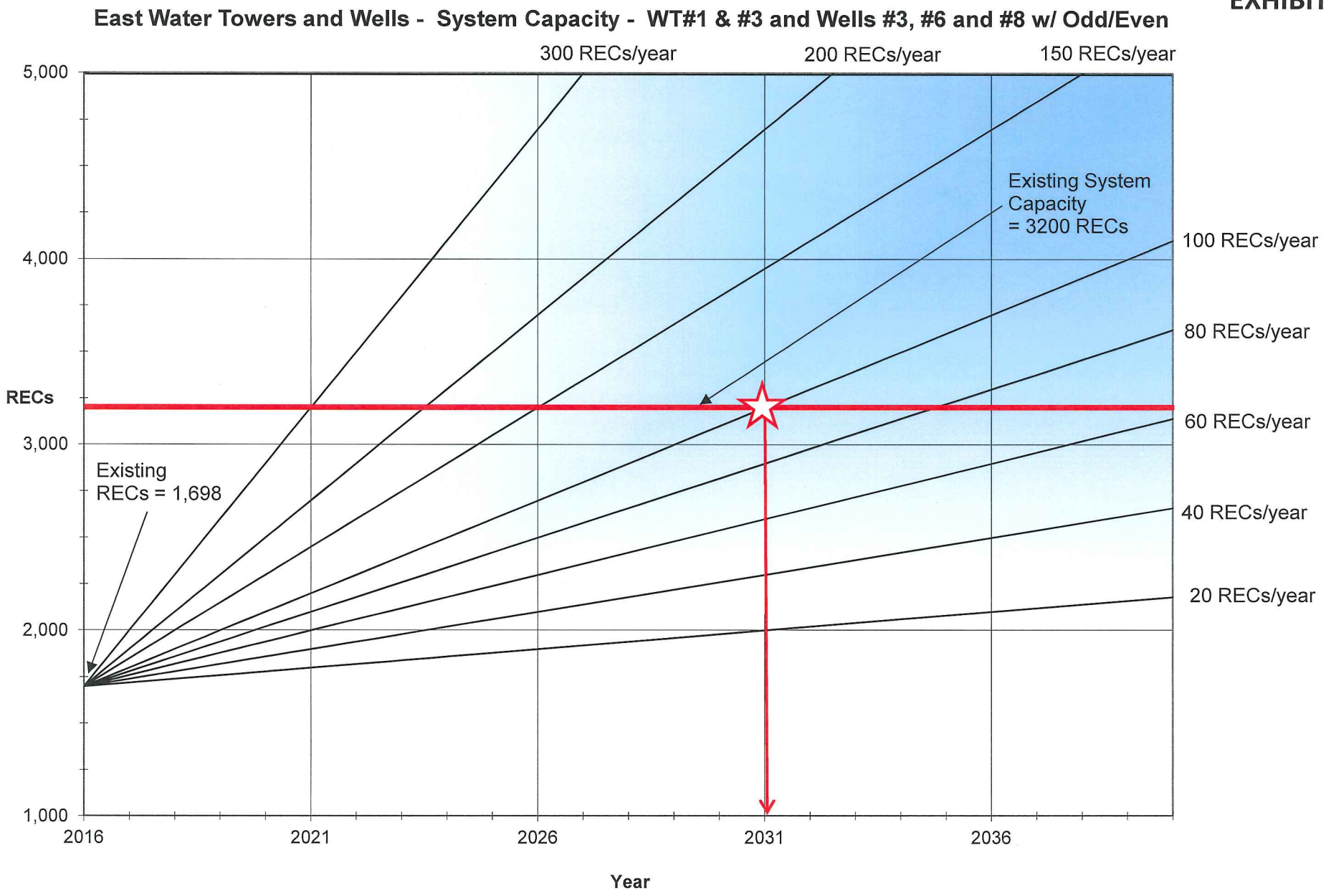
Average Daily Demand[8]*:*	3,585,000 gpd
REC Capacity (350 gpd/REC):	3200

[1] Firm pumping capacity represents the capacity of the system with the largest well out of service
[2] Per recommended standards referenced in Otsego Water Study
[3] Peak day demand rate based on 20 hour day
[4] Reserve is 20% of peak day demand volume
[5] Total Water Required (or available) = Total Fire Flow Demand + 3 hr Peak Day Demand + 20% Reserve
[6] Total Storage Required (or available) = Total Water Required (or available) - Total Firm Pumping (3 hrs)
[7] Based on 2016 Water Usage Records supplied by Kurt Neidermeier
[8] Assuming a ratio of maximum demand to average demand of 3.0

REC Projections (see Chart):

Y-Axis / X-Axis		RECs/Year 20	40	60	80	100	150	200	300	Existing Capacity
Year	2016	1,698	1,698	1,698	1,698	1,698	1,698	1,698	1,698	3,200
	2020	1,778	1,858	1,938	2,018	2,098	2,298	2,498	2,898	3,200
	2025	1,878	2,058	2,238	2,418	2,598	3,048	3,498	4,398	3,200
	2030	1,978	2,258	2,538	2,818	3,098	3,798	4,498	5,898	3,200
	2035	2,078	2,458	2,838	3,218	3,598	4,548	5,498	7,398	3,200
	2040	2,178	2,658	3,138	3,618	4,098	5,298	6,498	8,898	3,200

EXHIBIT A


East Water Towers and Wells - System Capacity - WT#1 & #3 and Wells #3, #6 and #8 w/ Odd/Even
300 RECs/year
200 RECs/year
150 RECs/year
100 RECs/year
80 RECs/year
60 RECs/year
40 RECs/year
20 RECs/year
Existing System Capacity = 3200 RECs
Existing RECs = 1,698
RECs
5,000
4,000
3,000
2,000
1,000
2016
2021
2026
2031
2036
Year

General Notes: System Capacity - WT#3 and WT#1 and Wells #3, #6 and #8 w/ Odd/Even

1. The firm capacity of the East Water Tower and Well System is approximately 1700 gpm.
2. Average Daily Water Usage @ 350 gpc

3. Average daily demand of 350 gpd/REC, this equates to approximately 1698 RECs on the East Water Tower and Well System.

Individual Facility Capacities:

Facility	Capacity
Well No. 1	gpm
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Well No. 6	1,000 gpm
Well No. 8	1,450 gpm
Water Tower No. 1	400,000 Gallons
Water Tower No. 3	1,000,000 Gallons

System Capacity Calculations:

Existing Conditions*[7]*:

Firm Pumping Capacity[1]:	1,700	gpm
Required Fire Flow[2]:	5,000	gpm
Fire Flow Duration (hrs):	3	hrs
Total Fire Flow Demand:	900,000	gallons
Average Day Demand:	594,000	gpd
Peak Day Demand Volume[8]:	1,782,000	gallons
Peak Day Demand[3]:	1,485	gpm
3 hr Peak Day Demand:	267,300	gallons
20% Reserve[4]:	356,400	gallons
Total Water Required[5]:	1,523,700	gallons
Total Firm Pumping (3 hrs):	306,000	gallons
Total Storage Required[6]:	1,217,700	gallons

Existing System Capacity:

Total Firm Pumping (3 hrs):	306,000	gallons	
Total Storage Available:	**1,400,000**	gallons	520.8571
Total Water Available:	**1,706,000**	gallons	

$Q_{TWR} = Q_{TFFD} + (3hr \times 60min/hr \times P_D)/(20hr \times 60min) + (0.20)P_D$

Q_{TWR} = Total Water Available (gallons)
Q_{TFFD} = Total Fire Flow Demand (gallons)
P_D = Peak Day Demand (gallons)

Solution:

$1,126,000 \text{ gallons} = 450,000 \text{ gallons} + 3P_D/20 + 0.20P_D$

$1,400,000 \text{ gallons} = 0.35P_D$

$P_D = 4,000,000 \text{ gallons}$

Average Daily Demand[8]*:*	1,782,000 gpd
REC Capacity (350 gpd/REC):	2220

[1] Firm pumping capacity represents the capacity of the system with the largest well out of service
[2] Per recommended standards referenced in Otsego Water Study
[3] Peak day demand rate based on 20 hour day
[4] Reserve is 20% of peak day demand volume
[5] Total Water Required (or available) = Total Fire Flow Demand + 3 hr Peak Day Demand + 20% Reserve
[6] Total Storage Required (or available) = Total Water Required (or available) - Total Firm Pumping (3 hrs)
[7] Based on 2016 Water Usage Records supplied by Kurt Neidermeier
[8] Assuming a ratio of maximum demand to average demand of 3.0

REC Projections (see Chart):

Y-Axis / X-Axis		RECs/Year								Existing Capacity
		20	40	60	80	100	150	200	300	
Year	2016	1,698	1,698	1,698	1,698	1,698	1,698	1,698	1,698	2,220
	2020	1,778	1,858	1,938	2,018	2,098	2,298	2,498	2,898	2,220
	2025	1,878	2,058	2,238	2,418	2,598	3,048	3,498	4,398	2,220
	2030	1,978	2,258	2,538	2,818	3,098	3,798	4,498	5,898	2,220
	2035	2,078	2,458	2,838	3,218	3,598	4,548	5,498	7,398	2,220
	2040	2,178	2,658	3,138	3,618	4,098	5,298	6,498	8,898	2,220

APPENDIX B

MINNEAPOLIS FIRE DEPARTMENT
FIRE PREVENTION BUREAU POLICY # 5-2
WATER SUPPLIES

Original issue 1- 02- 01 **Last revision 8-16-05** **Page 1 of 2**

ISSUE:

An adequate water supply for fire-fighter is to be provided for every building or facility.

CODE REQUIREMENTS:

The fire code requires an adequate, on site water supply for new buildings and facilities.

PROBLEM:

The MSFC gives general guidelines and does not list specific requirements for water supplies. This policy lists specific MFD requirements.

MFD ACCEPTABLE COMPLIANCE:

Fire hydrants that receive water from the Minneapolis Water Works system are the only acceptable water supply.

1. **Location and number of hydrants:**
   a. **All parts of the exterior of a new building or facility are to be within 400 feet of a hydrant which is located on a fire vehicle access road. (MSFC)**
      Exception: The distance between hydrants may be up to 600 feet for buildings protected throughout by a sprinkler system. (MSFC)
   b. **The spacing and number of hydrants is to be based on a MSFC Appendix.**
   c. **Hydrants are to be located within 15 feet of a fire vehicle access road, but no closer than 40 feet of a building of combustible construction or of openings in buildings of noncombustible construction. A 4½ inch outlet is to face, and be perpendicular to the fire vehicle access road.**
      Hydrants that are located in or near drive lanes or parking spaces are to be protected by bollards (the bollards are to be located at least three (3) feet from the hydrant).
      There is to be no parking within 10 feet of the front of hydrants.
   d. **Fire department connections (Siamese connections) that serve sprinkler and standpipe systems are to be located within 150 feet of a city fire hydrant as measured along a fire vehicle access road, (a city hydrant is one that is directly connected to a city water main and maintained by the Minneapolis Water Dept.).**
2. **Amount of water and pressure requirements:**
   Each hydrant is to provide at least 1,000 gpm at 20 psi with as many hydrants flowing as necessary to meet the fire flow requirements as determined in the MSFC Appendix for fire flow.
3. **Types of hydrants:**
   a. **City hydrants: May only be painted by the city.**
   b. **Private hydrants:**
      - **Piping supplying a hydrant is to be at least six (6) inch**

12-2-2016

DAYTON FIRE CONNECTION
TABLE OF FLOWS

Option	Connection Size	62nd Street Pipe	Loop (S of 62nd)	Flow	Pressure @ Church Hydrant (PSI)	Estimated Cost
1	12"	6" (EX)	N	1000	25	$336,500
				1500	NA	
				2000	NA	
				2500	NA	
2	12"	6" (EX)	6"	1000	38	$370,500
				1500	15	
				2000	NA	
				2500	NA	
3	12"	12"	N	1000	42	$456,000
				1500	22	
				2000	NA	
				2500	NA	
4	16"	16"	N	1000	45	$602,000
				1500	29	
				2000	12	
				2500	NA	

Junction Detailed Report: J-9

Scenario Summary	
ID	2940
Label	West Side Distribution System
Notes	
Active Topology	Base Active Topology
Physical	Base Physical
Demand	Demand Alternative - 1
Initial Settings	Base Initial Settings
Operational	West Side Distribution System
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Energy Cost	Base Energy Cost
Transient	Base HAMMER
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
SCADA	Base SCADA
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	24-Hour EPS
Transient Solver Calculation Options	Base

<General>			
ID	4302	Notes	
Label	J-9	Hyperlinks	<Collection: 0 items>

GIS-IDs

GIS-ID

<Geometry>			
X	83,879.29 ft	Y	46,232.30 ft

Active Topology	
Is Active?	True

Demand Collection

Demand (Base) (gpm)	Pattern (Demand)
1,000.00	Fixed

Unit Demand Collection

Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (gpm)	Pattern (Demand)

Junction Detailed Report: J-9

Customer Meter Demands

Customer	Pattern (Demand)	Demand (Base) (gpm)

Customer Meter Unit Demands

Customer	Number of Unit Demands	Unit Demand	
Unit Demand (Base) (gpm)	Pattern (Unit Demand)		

Fire Flow			
Specify Local Fire Flow Constraints?	False		

Physical			
Elevation	901.00 ft	Emitter Coefficient	0.000 gpm/psi^n
Zone	<None>		

Pressure Dependent Demand			
Use Local Pressure Dependent Demand Data?	False		

Transient (Initial)			
Vapor Volume (Initial)	0.0 gal		

Water Quality			
Age (Initial)	0.000 hours	Is Constituent Source?	False
Concentration (Initial)	0.0 mg/L	Trace (Initial)	0.0 %

Results (Fire Flow)			
Satisfies Fire Flow Constraints?	(N/A)	Fire Flow (Total Upper Limit)	(N/A) gpm
Fire Flow (Available)	(N/A) gpm	Pressure (Calculated Residual @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Residual)	(N/A) psi	Pressure (Calculated Zone Lower Limit @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Zone Lower Limit)	(N/A) psi	Velocity of Maximum Pipe	(N/A) ft/s
Pressure (Calculated System Lower Limit)	(N/A) psi	Junction w/ Minimum Pressure (System)	(N/A)
Is Fire Flow Run Balanced?	(N/A)	Junction w/ Minimum Pressure (Zone)	(N/A)
Fire Flow Iterations	(N/A)	Pipe w/ Maximum Velocity	(N/A)
Flow (Total Needed)	(N/A) gpm	Junction w/ Minimum Pressure (Zone @ Total Flow Needed)	(N/A)
Flow (Total Available)	(N/A) gpm		

Results (Pressure Dependent Demands)

Junction Detailed Report: J-9

Results (Pressure Dependent Demands)			
Demand Shortage	0 gpm	Shortfall (Cumulative)	0.00 MG
Demand (Cumulative)	0.00 MG	Supply Rate (Cumulative)	(N/A) %
Supply (Cumulative)	0.00 MG	Demand (Target)	1,000 gpm

Results (Statistics)			
Demand (Minimum)	1,000 gpm	Age (Minimum)	(N/A) hours
Demand (Maximum)	1,000 gpm	Age (Maximum)	(N/A) hours
Hydraulic Grade (Maximum)	958.73 ft	Trace (Minimum)	(N/A) %
Hydraulic Grade (Minimum)	958.73 ft	Trace (Maximum)	(N/A) %
Pressure (Minimum)	25 psi	Concentration (Minimum)	(N/A) mg/L
Pressure (Maximum)	25 psi	Concentration (Maximum)	(N/A) mg/L

Results (Transient)			
Head (Maximum, Transient)	(N/A) ft	Pressure (Minimum, Transient)	(N/A) psi
Head (Minimum, Transient)	(N/A) ft	Air Volume (Maximum, Transient)	(N/A) gal
Pressure (Maximum, Transient)	(N/A) psi	Vapor Volume (Maximum, Transient)	(N/A) gal

Results (Water Quality)			
Age (Calculated)	(N/A) hours	Concentration (Calculated)	(N/A) mg/L
Trace (Calculated)	(N/A) %		

Results			
Hydraulic Grade	958.73 ft	Demand Adjusted Population	(N/A) Capita
Demand	1,000 gpm	Alert Level (Ever)	None
Pressure	25 psi	Alert Level (Now)	None
Pressure Head	57.73 ft	Has Calculation Messages Now?	False

Calculation Messages

Time (hours)	Message

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
0.000	958.73	25	1,000
1.000	958.73	25	1,000
2.000	958.73	25	1,000
3.000	958.73	25	1,000
4.000	958.73	25	1,000
5.000	958.73	25	1,000
6.000	958.73	25	1,000
7.000	958.73	25	1,000
8.000	958.73	25	1,000

Junction Detailed Report: J-9

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
9.000	958.73	25	1,000
10.000	958.73	25	1,000
11.000	958.73	25	1,000
12.000	958.73	25	1,000
12.048	958.73	25	1,000
13.000	958.73	25	1,000
14.000	958.73	25	1,000
15.000	958.73	25	1,000
16.000	958.73	25	1,000
17.000	958.73	25	1,000
18.000	958.73	25	1,000
19.000	958.73	25	1,000
20.000	958.73	25	1,000
21.000	958.73	25	1,000
22.000	958.73	25	1,000
23.000	958.73	25	1,000
24.000	958.73	25	1,000
25.000	958.73	25	1,000
26.000	958.73	25	1,000
27.000	958.73	25	1,000
28.000	958.73	25	1,000
29.000	958.73	25	1,000
30.000	958.73	25	1,000
31.000	958.73	25	1,000
32.000	958.73	25	1,000
33.000	958.73	25	1,000
34.000	958.73	25	1,000
35.000	958.73	25	1,000
36.000	958.73	25	1,000
37.000	958.73	25	1,000
38.000	958.73	25	1,000
39.000	958.73	25	1,000
40.000	958.73	25	1,000
41.000	958.73	25	1,000
42.000	958.73	25	1,000
43.000	958.73	25	1,000
44.000	958.73	25	1,000
45.000	958.73	25	1,000
46.000	958.73	25	1,000
47.000	958.73	25	1,000
48.000	958.73	25	1,000
49.000	958.73	25	1,000
50.000	958.73	25	1,000
51.000	958.73	25	1,000
52.000	958.73	25	1,000
53.000	958.73	25	1,000
54.000	958.73	25	1,000

Junction Detailed Report: J-9

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
55.000	958.73	25	1,000
56.000	958.73	25	1,000
57.000	958.73	25	1,000
58.000	958.73	25	1,000
59.000	958.73	25	1,000
60.000	958.73	25	1,000
61.000	958.73	25	1,000
62.000	958.73	25	1,000
63.000	958.73	25	1,000
64.000	958.73	25	1,000
65.000	958.73	25	1,000
66.000	958.73	25	1,000
67.000	958.73	25	1,000
68.000	958.73	25	1,000
69.000	958.73	25	1,000
70.000	958.73	25	1,000
71.000	958.73	25	1,000
72.000	958.73	25	1,000

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ID	2940
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Transient	Base HAMMER
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
SCADA	Base SCADA
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	24-Hour EPS
Transient Solver Calculation Options	Base

<General>			
ID	4302	Notes	
Label	J-9	Hyperlinks	<Collection: 0 items>

GIS-IDs

GIS-ID

<Geometry>			
X	83,879.29 ft	Y	46,232.30 ft

Active Topology	
Is Active?	True

Demand Collection

Demand (Base) (gpm)	Pattern (Demand)
1,000.00	Fixed

Unit Demand Collection

Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (gpm)	Pattern (Demand)

Junction Detailed Report: J-9

Customer Meter Demands

Customer	Pattern (Demand)	Demand (Base) (gpm)

Customer Meter Unit Demands

Customer	Number of Unit Demands	Unit Demand	
Unit Demand (Base) (gpm)	Pattern (Unit Demand)		

Fire Flow			
Specify Local Fire Flow Constraints?	False		

Physical			
Elevation	901.00 ft	Emitter Coefficient	0.000 gpm/psi^n
Zone	<None>		

Pressure Dependent Demand			
Use Local Pressure Dependent Demand Data?	False		

Transient (Initial)			
Vapor Volume (Initial)	0.0 gal		

Water Quality			
Age (Initial)	0.000 hours	Is Constituent Source?	False
Concentration (Initial)	0.0 mg/L	Trace (Initial)	0.0 %

Results (Fire Flow)			
Satisfies Fire Flow Constraints?	(N/A)	Fire Flow (Total Upper Limit)	(N/A) gpm
Fire Flow (Available)	(N/A) gpm	Pressure (Calculated Residual @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Residual)	(N/A) psi	Pressure (Calculated Zone Lower Limit @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Zone Lower Limit)	(N/A) psi	Velocity of Maximum Pipe	(N/A) ft/s
Pressure (Calculated System Lower Limit)	(N/A) psi	Junction w/ Minimum Pressure (System)	(N/A)
Is Fire Flow Run Balanced?	(N/A)	Junction w/ Minimum Pressure (Zone)	(N/A)
Fire Flow Iterations	(N/A)	Pipe w/ Maximum Velocity	(N/A)
Flow (Total Needed)	(N/A) gpm	Junction w/ Minimum Pressure (Zone @ Total Flow Needed)	(N/A)
Flow (Total Available)	(N/A) gpm		

Results (Pressure Dependent Demands)

Junction Detailed Report: J-9

Results (Pressure Dependent Demands)			
Demand Shortage	0 gpm	Shortfall (Cumulative)	0.00 MG
Demand (Cumulative)	0.00 MG	Supply Rate (Cumulative)	(N/A) %
Supply (Cumulative)	0.00 MG	Demand (Target)	1,000 gpm

Results (Statistics)			
Demand (Minimum)	1,000 gpm	Age (Minimum)	(N/A) hours
Demand (Maximum)	1,000 gpm	Age (Maximum)	(N/A) hours
Hydraulic Grade (Maximum)	989.76 ft	Trace (Minimum)	(N/A) %
Hydraulic Grade (Minimum)	989.76 ft	Trace (Maximum)	(N/A) %
Pressure (Minimum)	38 psi	Concentration (Minimum)	(N/A) mg/L
Pressure (Maximum)	38 psi	Concentration (Maximum)	(N/A) mg/L

Results (Transient)			
Head (Maximum, Transient)	(N/A) ft	Pressure (Minimum, Transient)	(N/A) psi
Head (Minimum, Transient)	(N/A) ft	Air Volume (Maximum, Transient)	(N/A) gal
Pressure (Maximum, Transient)	(N/A) psi	Vapor Volume (Maximum, Transient)	(N/A) gal

Results (Water Quality)			
Age (Calculated)	(N/A) hours	Concentration (Calculated)	(N/A) mg/L
Trace (Calculated)	(N/A) %		

Results			
Hydraulic Grade	989.76 ft	Demand Adjusted Population	(N/A) Capita
Demand	1,000 gpm	Alert Level (Ever)	None
Pressure	38 psi	Alert Level (Now)	None
Pressure Head	88.76 ft	Has Calculation Messages Now?	False

Calculation Messages

Time (hours)	Message

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
0.000	989.76	38	1,000
1.000	989.76	38	1,000
2.000	989.76	38	1,000
3.000	989.76	38	1,000
4.000	989.76	38	1,000
5.000	989.76	38	1,000
6.000	989.76	38	1,000
7.000	989.76	38	1,000
8.000	989.76	38	1,000

Junction Detailed Report: J-9

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
9.000	989.76	38	1,000
10.000	989.76	38	1,000
11.000	989.76	38	1,000
12.000	989.76	38	1,000
12.048	989.76	38	1,000
13.000	989.76	38	1,000
14.000	989.76	38	1,000
15.000	989.76	38	1,000
16.000	989.76	38	1,000
17.000	989.76	38	1,000
18.000	989.76	38	1,000
19.000	989.76	38	1,000
20.000	989.76	38	1,000
21.000	989.76	38	1,000
22.000	989.76	38	1,000
23.000	989.76	38	1,000
24.000	989.76	38	1,000
25.000	989.76	38	1,000
26.000	989.76	38	1,000
27.000	989.76	38	1,000
28.000	989.76	38	1,000
29.000	989.76	38	1,000
30.000	989.76	38	1,000
31.000	989.76	38	1,000
32.000	989.76	38	1,000
33.000	989.76	38	1,000
34.000	989.76	38	1,000
35.000	989.76	38	1,000
36.000	989.76	38	1,000
37.000	989.76	38	1,000
38.000	989.76	38	1,000
39.000	989.76	38	1,000
40.000	989.76	38	1,000
41.000	989.76	38	1,000
42.000	989.76	38	1,000
43.000	989.76	38	1,000
44.000	989.76	38	1,000
45.000	989.76	38	1,000
46.000	989.76	38	1,000
47.000	989.76	38	1,000
48.000	989.76	38	1,000
49.000	989.76	38	1,000
50.000	989.76	38	1,000
51.000	989.76	38	1,000
52.000	989.76	38	1,000
53.000	989.76	38	1,000
54.000	989.76	38	1,000

Junction Detailed Report: J-9

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
55.000	989.76	38	1,000
56.000	989.76	38	1,000
57.000	989.76	38	1,000
58.000	989.76	38	1,000
59.000	989.76	38	1,000
60.000	989.76	38	1,000
61.000	989.76	38	1,000
62.000	989.76	38	1,000
63.000	989.76	38	1,000
64.000	989.76	38	1,000
65.000	989.76	38	1,000
66.000	989.76	38	1,000
67.000	989.76	38	1,000
68.000	989.76	38	1,000
69.000	989.76	38	1,000
70.000	989.76	38	1,000
71.000	989.76	38	1,000
72.000	989.76	38	1,000

Junction Detailed Report: J-9

Scenario Summary	
ID	2940
Label	West Side Distribution System
Notes	
Active Topology	Base Active Topology
Physical	Base Physical
Demand	Demand Alternative - 1
Initial Settings	Base Initial Settings
Operational	West Side Distribution System
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Energy Cost	Base Energy Cost
Transient	Base HAMMER
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
SCADA	Base SCADA
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	24-Hour EPS
Transient Solver Calculation Options	Base

<General>			
ID	4302	Notes	
Label	J-9	Hyperlinks	<Collection: 0 items>

GIS-IDs

GIS-ID

<Geometry>			
X	83,879.29 ft	Y	46,232.30 ft

Active Topology	
Is Active?	True

Demand Collection

Demand (Base) (gpm)	Pattern (Demand)
1,000.00	Fixed

Unit Demand Collection

Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (gpm)	Pattern (Demand)

Junction Detailed Report: J-9

Customer Meter Demands

Customer	Pattern (Demand)	Demand (Base) (gpm)

Customer Meter Unit Demands

Customer	Number of Unit Demands	Unit Demand
Unit Demand (Base) (gpm)	Pattern (Unit Demand)	

Fire Flow	
Specify Local Fire Flow Constraints?	False

Physical			
Elevation	901.00 ft	Emitter Coefficient	0.000 gpm/psi^n
Zone	<None>		

Pressure Dependent Demand	
Use Local Pressure Dependent Demand Data?	False

Transient (Initial)	
Vapor Volume (Initial)	0.0 gal

Water Quality			
Age (Initial)	0.000 hours	Is Constituent Source?	False
Concentration (Initial)	0.0 mg/L	Trace (Initial)	0.0 %

Results (Fire Flow)			
Satisfies Fire Flow Constraints?	(N/A)	Fire Flow (Total Upper Limit)	(N/A) gpm
Fire Flow (Available)	(N/A) gpm	Pressure (Calculated Residual @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Residual)	(N/A) psi	Pressure (Calculated Zone Lower Limit @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Zone Lower Limit)	(N/A) psi	Velocity of Maximum Pipe	(N/A) ft/s
Pressure (Calculated System Lower Limit)	(N/A) psi	Junction w/ Minimum Pressure (System)	(N/A)
Is Fire Flow Run Balanced?	(N/A)	Junction w/ Minimum Pressure (Zone)	(N/A)
Fire Flow Iterations	(N/A)	Pipe w/ Maximum Velocity	(N/A)
Flow (Total Needed)	(N/A) gpm	Junction w/ Minimum Pressure (Zone @ Total Flow Needed)	(N/A)
Flow (Total Available)	(N/A) gpm		

Results (Pressure Dependent Demands)

Junction Detailed Report: J-9

Results (Pressure Dependent Demands)			
Demand Shortage	0 gpm	Shortfall (Cumulative)	0.00 MG
Demand (Cumulative)	0.00 MG	Supply Rate (Cumulative)	(N/A) %
Supply (Cumulative)	0.00 MG	Demand (Target)	1,000 gpm

Results (Statistics)			
Demand (Minimum)	1,000 gpm	Age (Minimum)	(N/A) hours
Demand (Maximum)	1,000 gpm	Age (Maximum)	(N/A) hours
Hydraulic Grade (Maximum)	997.38 ft	Trace (Minimum)	(N/A) %
Hydraulic Grade (Minimum)	997.38 ft	Trace (Maximum)	(N/A) %
Pressure (Minimum)	42 psi	Concentration (Minimum)	(N/A) mg/L
Pressure (Maximum)	42 psi	Concentration (Maximum)	(N/A) mg/L

Results (Transient)			
Head (Maximum, Transient)	(N/A) ft	Pressure (Minimum, Transient)	(N/A) psi
Head (Minimum, Transient)	(N/A) ft	Air Volume (Maximum, Transient)	(N/A) gal
Pressure (Maximum, Transient)	(N/A) psi	Vapor Volume (Maximum, Transient)	(N/A) gal

Results (Water Quality)			
Age (Calculated)	(N/A) hours	Concentration (Calculated)	(N/A) mg/L
Trace (Calculated)	(N/A) %		

Results			
Hydraulic Grade	997.38 ft	Demand Adjusted Population	(N/A) Capita
Demand	1,000 gpm	Alert Level (Ever)	None
Pressure	42 psi	Alert Level (Now)	None
Pressure Head	96.38 ft	Has Calculation Messages Now?	False

Calculation Messages

Time (hours)	Message

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
0.000	997.38	42	1,000
1.000	997.38	42	1,000
2.000	997.38	42	1,000
3.000	997.38	42	1,000
4.000	997.38	42	1,000
5.000	997.38	42	1,000
6.000	997.38	42	1,000
7.000	997.38	42	1,000
8.000	997.38	42	1,000

Junction Detailed Report: J-9

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
9.000	997.38	42	1,000
10.000	997.38	42	1,000
11.000	997.38	42	1,000
12.000	997.38	42	1,000
12.048	997.38	42	1,000
13.000	997.38	42	1,000
14.000	997.38	42	1,000
15.000	997.38	42	1,000
16.000	997.38	42	1,000
17.000	997.38	42	1,000
18.000	997.38	42	1,000
19.000	997.38	42	1,000
20.000	997.38	42	1,000
21.000	997.38	42	1,000
22.000	997.38	42	1,000
23.000	997.38	42	1,000
24.000	997.38	42	1,000
25.000	997.38	42	1,000
26.000	997.38	42	1,000
27.000	997.38	42	1,000
28.000	997.38	42	1,000
29.000	997.38	42	1,000
30.000	997.38	42	1,000
31.000	997.38	42	1,000
32.000	997.38	42	1,000
33.000	997.38	42	1,000
34.000	997.38	42	1,000
35.000	997.38	42	1,000
36.000	997.38	42	1,000
37.000	997.38	42	1,000
38.000	997.38	42	1,000
39.000	997.38	42	1,000
40.000	997.38	42	1,000
41.000	997.38	42	1,000
42.000	997.38	42	1,000
43.000	997.38	42	1,000
44.000	997.38	42	1,000
45.000	997.38	42	1,000
46.000	997.38	42	1,000
47.000	997.38	42	1,000
48.000	997.38	42	1,000
49.000	997.38	42	1,000
50.000	997.38	42	1,000
51.000	997.38	42	1,000
52.000	997.38	42	1,000
53.000	997.38	42	1,000
54.000	997.38	42	1,000

Junction Detailed Report: J-9

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
55.000	997.38	42	1,000
56.000	997.38	42	1,000
57.000	997.38	42	1,000
58.000	997.38	42	1,000
59.000	997.38	42	1,000
60.000	997.38	42	1,000
61.000	997.38	42	1,000
62.000	997.38	42	1,000
63.000	997.38	42	1,000
64.000	997.38	42	1,000
65.000	997.38	42	1,000
66.000	997.38	42	1,000
67.000	997.38	42	1,000
68.000	997.38	42	1,000
69.000	997.38	42	1,000
70.000	997.38	42	1,000
71.000	997.38	42	1,000
72.000	997.38	42	1,000

Junction Detailed Report: J-9

Scenario Summary	
ID	2940
Label	West Side Distribution System
Notes	
Active Topology	Base Active Topology
Physical	Base Physical
Demand	Demand Alternative - 1
Initial Settings	Base Initial Settings
Operational	West Side Distribution System
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Energy Cost	Base Energy Cost
Transient	Base HAMMER
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
SCADA	Base SCADA
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	24-Hour EPS
Transient Solver Calculation Options	Base

<General>			
ID	4302	Notes	
Label	J-9	Hyperlinks	<Collection: 0 items>

GIS-IDs

GIS-ID

<Geometry>			
X	83,879.29 ft	Y	46,232.30 ft

Active Topology	
Is Active?	True

Demand Collection

Demand (Base) (gpm)	Pattern (Demand)
1,000.00	Fixed

Unit Demand Collection

Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (gpm)	Pattern (Demand)

Junction Detailed Report: J-9

Customer Meter Demands

Customer	Pattern (Demand)	Demand (Base) (gpm)

Customer Meter Unit Demands

Customer	Number of Unit Demands	Unit Demand	
Unit Demand (Base) (gpm)	Pattern (Unit Demand)		

Fire Flow			
Specify Local Fire Flow Constraints?	False		
Physical			
Elevation	901.00 ft	Emitter Coefficient	0.000 gpm/psi^n
Zone	<None>		
Pressure Dependent Demand			
Use Local Pressure Dependent Demand Data?	False		
Transient (Initial)			
Vapor Volume (Initial)	0.0 gal		
Water Quality			
Age (Initial)	0.000 hours	Is Constituent Source?	False
Concentration (Initial)	0.0 mg/L	Trace (Initial)	0.0 %
Results (Fire Flow)			
Satisfies Fire Flow Constraints?	(N/A)	Fire Flow (Total Upper Limit)	(N/A) gpm
Fire Flow (Available)	(N/A) gpm	Pressure (Calculated Residual @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Residual)	(N/A) psi	Pressure (Calculated Zone Lower Limit @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Zone Lower Limit)	(N/A) psi	Velocity of Maximum Pipe	(N/A) ft/s
Pressure (Calculated System Lower Limit)	(N/A) psi	Junction w/ Minimum Pressure (System)	(N/A)
Is Fire Flow Run Balanced?	(N/A)	Junction w/ Minimum Pressure (Zone)	(N/A)
Fire Flow Iterations	(N/A)	Pipe w/ Maximum Velocity	(N/A)
Flow (Total Needed)	(N/A) gpm	Junction w/ Minimum Pressure (Zone @ Total Flow Needed)	(N/A)
Flow (Total Available)	(N/A) gpm		
Results (Pressure Dependent Demands)			

Junction Detailed Report: J-9

Results (Pressure Dependent Demands)			
Demand Shortage	0 gpm	Shortfall (Cumulative)	0.00 MG
Demand (Cumulative)	0.00 MG	Supply Rate (Cumulative)	(N/A) %
Supply (Cumulative)	0.00 MG	Demand (Target)	1,000 gpm

Results (Statistics)			
Demand (Minimum)	1,000 gpm	Age (Minimum)	(N/A) hours
Demand (Maximum)	1,000 gpm	Age (Maximum)	(N/A) hours
Hydraulic Grade (Maximum)	1,005.78 ft	Trace (Minimum)	(N/A) %
Hydraulic Grade (Minimum)	1,005.78 ft	Trace (Maximum)	(N/A) %
Pressure (Minimum)	45 psi	Concentration (Minimum)	(N/A) mg/L
Pressure (Maximum)	45 psi	Concentration (Maximum)	(N/A) mg/L

Results (Transient)			
Head (Maximum, Transient)	(N/A) ft	Pressure (Minimum, Transient)	(N/A) psi
Head (Minimum, Transient)	(N/A) ft	Air Volume (Maximum, Transient)	(N/A) gal
Pressure (Maximum, Transient)	(N/A) psi	Vapor Volume (Maximum, Transient)	(N/A) gal

Results (Water Quality)			
Age (Calculated)	(N/A) hours	Concentration (Calculated)	(N/A) mg/L
Trace (Calculated)	(N/A) %		

Results			
Hydraulic Grade	1,005.78 ft	Demand Adjusted Population	(N/A) Capita
Demand	1,000 gpm	Alert Level (Ever)	None
Pressure	45 psi	Alert Level (Now)	None
Pressure Head	104.78 ft	Has Calculation Messages Now?	False

Calculation Messages

Time (hours)	Message

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
0.000	1,005.78	45	1,000
1.000	1,005.78	45	1,000
2.000	1,005.78	45	1,000
3.000	1,005.78	45	1,000
4.000	1,005.78	45	1,000
5.000	1,005.78	45	1,000
6.000	1,005.78	45	1,000
7.000	1,005.78	45	1,000
8.000	1,005.78	45	1,000

Junction Detailed Report: J-9

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
9.000	1,005.78	45	1,000
10.000	1,005.78	45	1,000
11.000	1,005.78	45	1,000
12.000	1,005.78	45	1,000
12.048	1,005.78	45	1,000
13.000	1,005.78	45	1,000
14.000	1,005.78	45	1,000
15.000	1,005.78	45	1,000
16.000	1,005.78	45	1,000
17.000	1,005.78	45	1,000
18.000	1,005.78	45	1,000
19.000	1,005.78	45	1,000
20.000	1,005.78	45	1,000
21.000	1,005.78	45	1,000
22.000	1,005.78	45	1,000
23.000	1,005.78	45	1,000
24.000	1,005.78	45	1,000
25.000	1,005.78	45	1,000
26.000	1,005.78	45	1,000
27.000	1,005.78	45	1,000
28.000	1,005.78	45	1,000
29.000	1,005.78	45	1,000
30.000	1,005.78	45	1,000
31.000	1,005.78	45	1,000
32.000	1,005.78	45	1,000
33.000	1,005.78	45	1,000
34.000	1,005.78	45	1,000
35.000	1,005.78	45	1,000
36.000	1,005.78	45	1,000
37.000	1,005.78	45	1,000
38.000	1,005.78	45	1,000
39.000	1,005.78	45	1,000
40.000	1,005.78	45	1,000
41.000	1,005.78	45	1,000
42.000	1,005.78	45	1,000
43.000	1,005.78	45	1,000
44.000	1,005.78	45	1,000
45.000	1,005.78	45	1,000
46.000	1,005.78	45	1,000
47.000	1,005.78	45	1,000
48.000	1,005.78	45	1,000
49.000	1,005.78	45	1,000
50.000	1,005.78	45	1,000
51.000	1,005.78	45	1,000
52.000	1,005.78	45	1,000
53.000	1,005.78	45	1,000
54.000	1,005.78	45	1,000

Junction Detailed Report: J-9

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
55.000	1,005.78	45	1,000
56.000	1,005.78	45	1,000
57.000	1,005.78	45	1,000
58.000	1,005.78	45	1,000
59.000	1,005.78	45	1,000
60.000	1,005.78	45	1,000
61.000	1,005.78	45	1,000
62.000	1,005.78	45	1,000
63.000	1,005.78	45	1,000
64.000	1,005.78	45	1,000
65.000	1,005.78	45	1,000
66.000	1,005.78	45	1,000
67.000	1,005.78	45	1,000
68.000	1,005.78	45	1,000
69.000	1,005.78	45	1,000
70.000	1,005.78	45	1,000
71.000	1,005.78	45	1,000
72.000	1,005.78	45	1,000

Otsego/Dayton
Watermain Connection
ENGINEER'S COST ESTIMATE

Option #1 - 12" Trunk and Connect to (1) Existing 6"

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Estimated Extension
	Mobilization, Bonding & Insurance (5%)	1	LS	$13,927.00	$ 13,927.00
	Bituminous Pavement Removal	424	SY	$5.00	$ 2,120.00
	Sawing Bit Pavement (Full Depth)	26	LF	$5.00	$ 130.00
	Concrete Curb Removal	226	LF	$5.00	$ 1,130.00
	Concrete Curb B618	226	LF	$15.00	$ 3,390.00
	6" Watermain Removal	0	LF	$5.00	$ -
	Cl 5 Aggregate Base	153	Ton	$15.00	$ 2,295.00
	Cl 2 Aggregate Shouldering	5	Ton	$50.00	$ 250.00
	Mill Bituminous Surface (1.5")	13	SY	$10.00	$ 130.00
	Bituminous Material For Tack Coat	20	GAL	$3.00	$ 60.00
	Type SP 9.5 Wearing Course Mixture (2,C)	36	TON	$75.00	$ 2,700.00
	Type SP 12.5 Non Wear Course Mixture (3,C)	48	TON	$80.00	$ 3,840.00
	Traffic Control	1	LS	$1,000.00	$ 1,000.00
	Boulevard Topsoil Borrow	48	CY	$56.00	$ 2,688.00
	Erosion Control Blanket - Category 2	263	SY	$3.25	$ 854.75
	Turf Establishment	1	LS	$2,000.00	$ 2,000.00
	Connect To Existing Watermain	2	EA	$1,000.00	$ 2,000.00
	Salvage And Reinstall Hydrant, 6" Pipe And 6" Gate Valve	1	LS	$2,200.00	$ 2,200.00
	Hydrant	5	EA	$3,700.00	$ 18,500.00
	6" Watermain PCV C900	147	LF	$30.00	$ 4,410.00
	8" Watermain PCV C900	32	LF	$30.00	$ 960.00
	12" Watermain PCV C900	4225	LF	$40.00	$ 169,000.00
	16" Watermain PCV C900	0	LF	$60.00	$ -
	6" Gate Valve And Box	5	EA	$1,350.00	$ 6,750.00
	8" Gate Valve And Box	0	EA	$1,900.00	$ -
	12" Butterfly Valve and Box	6	EA	$2,500.00	$ 15,000.00
	16" Butterfly Valve and Box	0	EA	$3,000.00	$ -
	6" DIP CL 52, Fastite Jt./ Fast Grip Gasket, Installed by Jacking and Boring of 14" Steel Casing	0	LF	$150.00	$ -
	12" DIP CL 52, Fastite Jt./ Fast Grip Gasket, Installed by Jacking and Boring of 20" Steel Casing	70	LF	$200.00	$ 14,000.00
	16" DIP CL 52, Fastite Jt./ Fast Grip Gasket, Installed by Jacking and Boring of 24" Steel Casing	0	LF	$233.00	$ -
	Watermain Fittings	4809	LBS	$4.50	$ 21,640.50
	Testing Watermain	1	LS	$1,500.00	$ 1,500.00

Total - Option #1 - 12" Trunk and Connect to (1) Existing 6" **$292,475.25**

OPTION #1 TOTAL CONSTRUCTION COST	**$292,475**
35% Administration, Legal, Engineering, & Contingency	**$43,871**
TOTAL ESTIMATED PROJECT COST	**$336,346**
Option #1 RIGHT-OF-WAY / EASEMENT Needed	**1.35 Acres**

Otsego/Dayton
Watermain Connection
ENGINEER'S COST ESTIMATE

Option #2 - 12" Trunk and Connect to (2) Existing 6"

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Estimated Extension
	Mobilization, Bonding & Insurance (5%)	1	LS	$15,341.00	$ 15,341.00
	Bituminous Pavement Removal	424	SY	$5.00	$ 2,120.00
	Sawing Bit Pavement (Full Depth)	26	LF	$5.00	$ 130.00
	Concrete Curb Removal	226	LF	$5.00	$ 1,130.00
	Concrete Curb B618	226	LF	$15.00	$ 3,390.00
	6" Watermain Removal	0	LF	$5.00	$ -
	CI 5 Aggregate Base	153	Ton	$15.00	$ 2,295.00
	CI 2 Aggregate Shouldering	5	Ton	$50.00	$ 250.00
	Mill Bituminous Surface (1.5")	13	SY	$10.00	$ 130.00
	Bituminous Material For Tack Coat	20	GAL	$3.00	$ 60.00
	Type SP 9.5 Wearing Course Mixture (2,C)	36	TON	$75.00	$ 2,700.00
	Type SP 12.5 Non Wear Course Mixture (3,C)	48	TON	$80.00	$ 3,840.00
	Traffic Control	1	LS	$1,000.00	$ 1,000.00
	Boulevard Topsoil Borrow	48	CY	$56.00	$ 2,688.00
	Erosion Control Blanket - Category 2	263	SY	$3.25	$ 854.75
	Turf Establishment	1	LS	$2,000.00	$ 2,000.00
	Connect To Existing Watermain	2	EA	$1,000.00	$ 2,000.00
	Salvage And Reinstall Hydrant, 6" Pipe And 6" Gate Valve	1	LS	$2,200.00	$ 2,200.00
	Hydrant	5	EA	$3,700.00	$ 18,500.00
	6" Watermain PCV C900	445	LF	$30.00	$ 13,350.00
	8" Watermain PCV C900	32	LF	$30.00	$ 960.00
	12" Watermain PCV C900	4225	LF	$40.00	$ 169,000.00
	16" Watermain PCV C900	0	LF	$60.00	$ -
	6" Gate Valve And Box	6	EA	$1,350.00	$ 8,100.00
	8" Gate Valve And Box	0	EA	$1,900.00	$ -
	12" Butterfly Valve and Box	8	EA	$2,500.00	$ 20,000.00
	16" Butterfly Valve and Box	0	EA	$3,000.00	$ -
	6" DIP CL 52, Fastite Jt./ Fast Grip Gasket, Installed by Jacking and Boring	70	LF	$150.00	$ 10,500.00
	12" DIP CL 52, Fastite Jt./ Fast Grip Gasket, Installed by Jacking and Borir	70	LF	$200.00	$ 14,000.00
	16" DIP CL 52, Fastite Jt./ Fast Grip Gasket, Installed by Jacking and Borir	0	LF	$233.00	$ -
	Watermain Fittings	5360	LBS	$4.50	$ 24,120.00
	Testing Watermain	1	LS	$1,500.00	$ 1,500.00

Total - Option #2 - 12" Trunk and Connect to (2) Existing 6" **$322,158.75**

OPTION #1 TOTAL CONSTRUCTION COST	**$322,159**
35% Administration, Legal, Engineering, & Contingency	**$48,324**
TOTAL ESTIMATED PROJECT COST	**$370,483**
Option #2 RIGHT-OF-WAY / EASEMENT Needed	**1.44 Acres**

Otsego/Dayton
Watermain Connection
ENGINEER'S COST ESTIMATE

Option #3 - 12" Trunk and Connect to Existing 10"

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Estimated Extension
	Mobilization, Bonding & Insurance (5%)	1	LS	$18,889.00	$ 18,889.00
	Bituminous Pavement Removal	1652	SY	$5.00	$ 8,260.00
	Sawing Bit Pavement (Full Depth)	26	LF	$5.00	$ 130.00
	Concrete Curb Removal	1206	LF	$5.00	$ 6,030.00
	Concrete Curb B618	1206	LF	$15.00	$ 18,090.00
	6" Watermain Removal	705	LF	$5.00	$ 3,525.00
	Cl 5 Aggregate Base	621	Ton	$15.00	$ 9,315.00
	Cl 2 Aggregate Shouldering	5	Ton	$50.00	$ 250.00
	Mill Bituminous Surface (1.5")	13	SY	$10.00	$ 130.00
	Bituminous Material For Tack Coat	79	GAL	$3.00	$ 237.00
	Type SP 9.5 Wearing Course Mixture (2,C)	139	TON	$65.00	$ 9,035.00
	Type SP 12.5 Non Wear Course Mixture (3,C)	186	TON	$70.00	$ 13,020.00
	Traffic Control	1	LS	$1,000.00	$ 1,000.00
	Boulevard Topsoil Borrow	255	CY	$56.00	$ 14,280.00
	Erosion Control Blanket - Category 2	1404	SY	$3.25	$ 4,563.00
	Turf Establishment	1	LS	$2,000.00	$ 2,000.00
	Connect To Existing Watermain	2	EA	$1,000.00	$ 2,000.00
	Salvage And Reinstall Hydrant, 6" Pipe And 6" Gate Valve	1	LS	$2,200.00	$ 2,200.00
	Hydrant	5	EA	$3,700.00	$ 18,500.00
	6" Watermain PCV C900	63	LF	$30.00	$ 1,890.00
	8" Watermain PCV C900	32	LF	$30.00	$ 960.00
	12" Watermain PCV C900	4824	LF	$40.00	$ 192,960.00
	16" Watermain PCV C900	0	LF	$60.00	$ -
	6" Gate Valve And Box	6	EA	$1,350.00	$ 8,100.00
	8" Gate Valve And Box	0	EA	$1,900.00	$ -
	12" Butterfly Valve and Box	7	EA	$2,500.00	$ 17,500.00
	16" Butterfly Valve and Box	0	EA	$3,000.00	$ -
	6" DIP CL 52, Fastite Jt./ Fast Grip Gasket, Installed by Jacking and Boring	0	LF	$150.00	$ -
	12" DIP CL 52, Fastite Jt./ Fast Grip Gasket, Installed by Jacking and Borir	70	LF	$200.00	$ 14,000.00
	16" DIP CL 52, Fastite Jt./ Fast Grip Gasket, Installed by Jacking and Borir	0	LF	$233.00	$ -
	Watermain Fittings	6290	LBS	$4.50	$ 28,305.00
	Testing Watermain	1	LS	$1,500.00	$ 1,500.00

Total - Option #3 - 12" Trunk and Connect to Existing 10" **$396,669.00**

OPTION #1 TOTAL CONSTRUCTION COST	**$396,669**
35% Administration, Legal, Engineering, & Contingency	**$59,500**
TOTAL ESTIMATED PROJECT COST	**$456,169**
Option #3 RIGHT-OF-WAY / EASEMENT Needed	**1.35 Acres**

Otsego/Dayton
Watermain Connection
ENGINEER'S COST ESTIMATE

Option #4 - 16" Trunk and Connect to Existing 10"

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Estimated Extension
	Mobilization, Bonding & Insurance (5%)	1	LS	$24,927.00	$ 24,927.00
	Bituminous Pavement Removal	1652	SY	$5.00	$ 8,260.00
	Sawing Bit Pavement (Full Depth)	26	LF	$5.00	$ 130.00
	Concrete Curb Removal	1206	LF	$5.00	$ 6,030.00
	Concrete Curb B618	1206	LF	$15.00	$ 18,090.00
	6" Watermain Removal	705	LF	$5.00	$ 3,525.00
	Cl 5 Aggregate Base	621	Ton	$15.00	$ 9,315.00
	Cl 2 Aggregate Shouldering	5	Ton	$50.00	$ 250.00
	Mill Bituminous Surface (1.5")	13	SY	$10.00	$ 130.00
	Bituminous Material For Tack Coat	79	GAL	$3.00	$ 237.00
	Type SP 9.5 Wearing Course Mixture (2,C)	139	TON	$65.00	$ 9,035.00
	Type SP 12.5 Non Wear Course Mixture (3,C)	186	TON	$70.00	$ 13,020.00
	Traffic Control	1	LS	$1,000.00	$ 1,000.00
	Boulevard Topsoil Borrow	255	CY	$56.00	$ 14,280.00
	Erosion Control Blanket - Category 2	1404	SY	$3.25	$ 4,563.00
	Turf Establishment	1	LS	$2,000.00	$ 2,000.00
	Connect To Existing Watermain	2	EA	$1,000.00	$ 2,000.00
	Salvage And Reinstall Hydrant, 6" Pipe And 6" Gate Valve	1	LS	$2,200.00	$ 2,200.00
	Hydrant	5	EA	$3,700.00	$ 18,500.00
	6" Watermain PCV C900	63	LF	$30.00	$ 1,890.00
	8" Watermain PCV C900	32	LF	$30.00	$ 960.00
	12" Watermain PCV C900	0	LF	$40.00	$ -
	16" Watermain PCV C900	4824	LF	$60.00	$ 289,440.00
	6" Gate Valve And Box	6	EA	$1,350.00	$ 8,100.00
	8" Gate Valve And Box	0	EA	$1,900.00	$ -
	12" Butterfly Valve and Box	0	EA	$2,500.00	$ -
	16" Butterfly Valve and Box	7	EA	$3,000.00	$ 21,000.00
	6" DIP CL 52, Fastite Jt./ Fast Grip Gasket, Installed by Jacking and Boring	0	LF	$150.00	$ -
	12" DIP CL 52, Fastite Jt./ Fast Grip Gasket, Installed by Jacking and Borir	0	LF	$200.00	$ -
	16" DIP CL 52, Fastite Jt./ Fast Grip Gasket, Installed by Jacking and Borir	70	LF	$233.00	$ 16,310.00
	Watermain Fittings	10395	LBS	$4.50	$ 46,777.50
	Testing Watermain	1	LS	$1,500.00	$ 1,500.00

Total - Option #4 - 16" Trunk and Connect to Existing 10" **$523,469.50**

OPTION #1 TOTAL CONSTRUCTION COST	**$523,470**
35% Administration, Legal, Engineering, & Contingency	**$78,521**
TOTAL ESTIMATED PROJECT COST	**$601,991**
Option #4 RIGHT-OF-WAY / EASEMENT Needed	**1.35 Acres**

APPENDIX C

MISSISSIPPI RIVER

(RIVER ROAD)

SEC 36
T121N R23W

COUNTY ROAD NO. 36

CROW

DAYTON RIVER RD
8" PVC WATERMAIN

8" PVC WATERMAIN

C.S.A.H. 12

CHURCH HYDRANTS

8" PVC WATERMAIN

10" HDPE WATERMAIN

OPTION #1 & 2 – EX. 6" WATERMAIN
OPTION #2 – 12" WATERMAIN
OPTION #3 – 16" WATERMAIN

ALL OPTIONS – 70 LF SLEEVED BORING/JACKING

62ND LANE

6" PVC WATERMAIN

6" PVC WATERMAIN

RIVER

20' EASEMENT ADJACENT TO CSAH 36 TO BE OBTAINED OR COUNTY ROW PERMIT

RICHARDSON

8" PVC WATERMAIN

OPTION #2 – 70 LF SLEEVED BORING/JACKING

(N.E. RAWLINGS AVENUE)

8" PVC WATERMAIN

8" PVC WATERMAIN

BATES STREET

6" DIP WATERMAIN

10' WATERMAIN EASEMENT TO BE OBTAINED

WATERMAIN TO FOLLOW PROPERTY LINE ~15' FROM FORCEMAIN

30' EXISTING EASEMENT FOR DAYTON FORCEMAIN

OPTION #2
6" WATERMAIN LOOP
20' EASEMENT TO BE OBTAINED

8" PVC WATERMAIN

OPTIONS #1, 2, 3 – 12" WATERMAIN
OPTION #4 – 16" WATERMAIN

RANDOLPH AVENUE N.E.

12" DIP WATERMAIN

59TH STREET N.E.

RANGER AVENUE N.E.

57TH STREET

JERRY AVE

RATHBUN AVENUE N.E.

SEC 1
T120N R23W

D'IVER

N

100 0 100 200
SCALE IN FEET

DATE	REVISION

DESIGNED BY: BML
DRAWN BY: BML
CHECKED BY: RJW

Hakanson Anderson
Civil Engineers and Land Surveyors
3601 Thurston Ave., Anoka, Minnesota 55303
763-427-5860 FAX 763-427-0520

CITY OF Otsego MINNESOTA

OTSEGO/DAYTON WATERMAIN CONNECTION

DATE 12/7/16 FILE NO. OT532

SHEET 1 OF 1 SHEETS

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APPENDIX D

MDH Minnesota Department of Health

Interconnection Policy

Neighboring community public water systems (PWSs) often use interconnection as a water management strategy. While these strategies improve reliability and security, liability, costs, and unintended consequences are also important considerations. Physical, chemical, or hydraulic compatibilities are often forgotten elements when developing a water-sharing agreement.

Minnesota Rules 4720.0040 requires the Minnesota Department of Health (MDH) approve interconnection agreements between municipalities. This policy describes requirements for MDH approval of interconnections between distinct community PWSs. It includes a summary section which describes applicable durations, extensions, documentation, and required actions. Lastly, guidance section found at the end of this document may serve as a planning resource.

Preparation

A fair and mutually beneficial interconnection agreement is valuable when connecting water distribution systems. Interconnection plan guidance found at the end of this document may be a useful tool for water-sharing agreement development.

Regulatory Compliance

The activation of a physical interconnection causes changes to distributed water quality, including water compatibility and stability, some of which are directly related to the Safe Drinking Water Act (SDWA). The most relevant example of applicable regulation is the Lead and Copper Rule Short-Term Revisions and Clarifications, Section 141.90(a)(3), which requires any PWS deemed to have optimized corrosion control to notify the MDH in writing, of any new source(s) or long-term change(s) in water treatment. It charges the primacy agencies and public water utilities to anticipate change and minimize impact when a "long-term" treatment or source change is made. MDH is expected to review and approve any "long-term" interconnection plans. However, further definition of "long-term" has not been provided in regulations, leaving that task to policy.

Policy

The MDH Drinking Water Protection Section (DWP) has defined interconnections based on active connection duration. Long-term interconnections have durations of at least six months and trigger regulatory requirements such as the CFR (Code of Federal Register) 141.90(a)(3) Lead and Copper

Rule Short-Term Revisions and Clarifications. Interim interconnections have durations between one and six months. Short-term interconnections must terminate within one month of activation. The MDH DWP may approve the extension of a short-term or interim interconnection, upon written request, for up to one or three months, respectively. Community PWSs participating in an approved interconnection must notify the MDH DWP within three days of activating the interconnection.

Any two community PWSs with a physical interconnection between their distribution systems are expected to enter into a water-sharing agreement. Community PWSs should follow the included interconnection plan guidance in order to obtain MDH interim or long-term interconnection approval.

Standard

Short-Term Interconnection

A short-term interconnection can be activated within hours of necessity for a duration of as long as one month. It is intended for interconnected utilities to share water during an emergency situation in order to, meet essential water needs i.e., minimal water necessary for residential or commercial food processing, drinking, sanitation, firefighting, medical care, or critical asset use. Community PWSs must notify the MDH DWP within three days of activation of any approved short-term interconnection.

Applicable emergency situations include but are not limited to:

- Failure of a major water treatment facility or infrastructure
- Catastrophic failure of a water distribution system
- Contamination of a raw water source
- Complete loss of a major raw water source due to external factors
- Reduced availability of a major water source due to external factors
- Reduced availability of a major water source due to drought

Interim Interconnection

An Interim Interconnection may last for up to six months. Its use is intended for:

- Construction
- Capacity management
- Substantial modifications to a community PWS
- Longer-term emergency situations (up to six months)

Because water quality changes are expected following activation of an interim interconnection, the interconnection plan should include a discussion of water quality compatibility as well as

evaluations of lead and copper release, disinfection byproduct formation, taste and odor effects, and any other potential Safe Drinking Water Act regulatory compliance or aesthetic issues. The agreement must also describe any strategies to minimize adverse consequences to regulated contaminants.

Community PWSs must notify the MDH DWP within three days of activation of any approved interim interconnection. The MDH DWP may include requirements for additional monitoring or adjustments of compliance schedules with approval of an interconnection plan. Such requirements will be intended to improve observation and evaluation of processes including but not limited to corrosion control treatment, disinfectant residual maintenance, and disinfection byproduct formation.

Long-Term Interconnection

A Long-Term Interconnection is expected to be active for at least six months. Its use is intended for:

- Construction
- Capacity management
- Substantial modifications to a community PWS
- Longer-term emergency situations (beyond six months)

Community PWSs must notify DWP within three days of activation of any approved Long-Term Interconnection. DWP will designate each participating community PWS as a wholesale or consecutive system. Such designations may impact compliance requirements for multiple SDWA regulations, e.g. Ground Water Rule, Lead and Copper Rule, Stage 2 Disinfectants and Disinfection Byproducts Rule.

Because water quality changes are expected following activation of a Long-Term Interconnection, the Interconnection Plan should include a discussion of water quality compatibility as well as evaluations of lead and copper release, disinfection byproduct formation, taste and odor effects, and any other potential Safe Drinking Water Act regulatory compliance or aesthetic issues. The Interconnection Plan must also describe any strategies to minimize adverse consequences to regulated contaminants.

DWP may include requirements for additional monitoring or adjustments of SDWA compliance schedules with approval of an Interconnection Plan. Such requirements are intended to improve observation and evaluation of processes, including but not limited to corrosion control treatment, disinfectant residual maintenance, and disinfection byproduct formation. The Categories document provides details for duration, extensions, documentation, and actions.

Procedure

The MDH DWP expects water quality concerns to be addressed in all interconnection plans submitted for review. At a minimum, all water-sharing agreements should lay out a basic communication requirement between the buyer and seller that states when and how problems should be communicated. Given the variation in types of problem, the agreement may include different policies to address different types of problems.

PWSs shall monitor for water quality problems that may develop within the distribution systems. Most agreements specify water will meet minimum criteria at the interconnection, yet the levels of many regulated contaminants may change as water travels to a consumer's tap.

Furthermore, water purchasers or sellers may need to perform unanticipated actions over time in order to comply with changing regulations. Examples of possible necessary steps may be water main flushing, treatment facility construction, or booster station installation. The effectiveness of a water-sharing agreement ultimately depends on involved parties understanding all possible implications. The interconnection plan guidance section provides specific examples for discussion.

Summary

	Short-Term Interconnection	Interim Interconnection	Long-Term Interconnection
Duration	Up to 1 month	1 to 6 months	At least 6 months
Extension Possibility	One month (per MDH approval)	Three months (per MDH approval)	
Documentation	• Water-sharing agreement • Hydraulic analysis	• Water-sharing agreement • Hydraulic analysis • Interconnection plan	• Water-sharing agreement • Hydraulic analysis • Interconnection plan
Requirements*	• Notify the MDH DWP about need -or- • Notify MDH DWP at least 3 days prior to activation	• Submit an interconnection plan to the MDH DWP at least 3 months prior to activation • Notify the MDH DWP within 3 days of activation	• Submit an interconnection plan to the MDH DWP at least 3 months prior to activation • Notify the MDH DWP within 3 days of activation

*Minnesota Rules 4720.0040 Municipality Approval of Water Supply Contracts

Interconnection Plan Guidance

A community PWS requesting interim or long-term (not short-term) interconnection approval should follow the guidance provided below. Questions or requests for technical assistance may be directed to the community PWS's MDH district engineer the MDH DWP central office, which may be reached by phone at 651-201-4700.

Interim or Long-Term Interconnection Information

Anticipated Start Date	*Expected End Date*	*Expected Duration (months)*

Community Public Water System (PWS) Information

Supplying CPWS Name	*Supplying CPWS ID*	*Supplying Pressure Zone(s)*
Receiving CPWS Name	*Receiving CPWS ID*	*Receiving Pressure Zone(s)*

Water-Sharing Agreement - Requirements

Issue	*Consideration Example(s)*	*Addressed (Y/N)*
Finished water compatibility	surface | ground | hardness	
Water age issues	disinfection byproducts	
Water quality issues	corrosion | iron | taste	
Disinfection compatibility	chlorine | chloramines	
Corrosion control compatibility	lead | copper | phosphate	
Service area delineation	current | future | growth	
Hydraulic analysis	mixing | isolation valves | flushing	
Communication	prior notice | complaints	

Water-Sharing Agreement - Recommendations

Issue	*Consideration Example(s)*	*Addressed (Y/N)*
Agreement review process	frequency | changes	
Agreement non-conformance	SDWA compliance | penalties	
Water pressure	limits | max | min | mean	
Water flow	daily | mean | max | min	
Service areas	current | future	
Production capacity	seasonal | regional | per interconnect	
Wholesale meter ownership	responsible party	
Wholesale meter maintenance	responsible party	
Costs, depreciation, and billing	in agreement | separate document	
Service interruption management	communication	
Conservation measures	transfer | sharing | compatibility	
Non-revenue water	accounting | cost | long-term issues	