TOWN OF ALBERTON WATER IMPROVEMENTS PROJECT – ENGINEERING REPORT- AUGUST 2023

Anderson~ Montgomery
CONSULTING ENGINEERS

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1.1 ENGINEER'S REPORT

Town of Alberton, Montana – Water System Improvements Project

- <u>Phase 2</u>**: Distribution system replacement, upsizing, looping; new meters & reader/billing equipment; security/production enhancements at Spring source.**

1.1.1 General information, including:

a. description of the existing water works and sewer facilities; **The Town of Alberton operates a drinking water system consisting of:**
   - **Spring source – gravity feeds to storage tank;**
   - **Groundwater well – feeds to distribution system in Town;**
   - **Sodium hypochlorite disinfection at both spring and well;**
   - **300,000-gallon welded steel storage tank;**
   - **Distribution system consisting of 1¼" to 8" watermains: cast iron, PVC, galvanized steel;**
   - **Individual water meters – many inoperative;**
   - **One pressure reducing station at the east end of distribution system;**

b. identification of the municipality or area served; **Drinking water system serves the entire area within the Town boundary, population approximately 452, number of residences approximately 150.**

c. name and mailing address of the owner, developer and official custodian; **Town of Alberton, Montana. 607 Railroad Avenue, Alberton, 59820. Engineer acting on the Town's behalf: Anderson-Montgomery Consulting Engineers, Inc. 1064 N. Warren St. Helena, MT 59601 406-449-3303**

d. imprint of professional engineer's seal: ***Done***

1.1.2 Extent of water works system, including:

a. description of the nature and extent of the area to be served; **Area to be served is the incorporated area of Alberton, Montana. Service map attached.**

b. provisions for extending the water works system to include additional areas; **All improvements will be designed to anticipate 0.5% annual growth for the 20-year design period.**

c. appraisal of the future requirements for service, including existing and potential industrial, commercial, institutional, and other water supply needs. **Improvements will be designed to allow for another 46 residents, or another 15 individual residential service connections.**

1.1.3 Alternate plans:

Where two or more solutions exist for providing public water supply facilities, each of which is feasible and practicable, discuss the alternate plans. Give reasons for selecting the one recommended, including financial considerations, and a comparison of the minimum classification of water works operator required for operation of each alternative facility. **Much of the distribution system mains in Alberton are undersized, deteriorated and dead-end. The only feasible alternative to address these problems is to replace the existing mains and install new segments to eliminate dead-ends. Pipe bursting will be evaluated during the design process and may be bid as an alternative to replacement/upsizing some of the old cast iron mains.**

1.1.4 Site Conditions:

Soil, ground water conditions, and foundation problems, including a description of:

a. the character of soil through which water mains are to be laid: **A geotechnical site evaluation, boreholes, test pits and a summary report was conducted for the proposed improvements. Two boreholes were made along Railroad Avenue (State Hwy. 507) at two other points in Town and two more up at the existing storage tank site. That geotechnical report is attached.**

b. foundation conditions prevailing at sites of proposed structures; **proposed foundations (for the new tank as well as a new well house) will be based on the geotechnical report recommendations for maximum allowable bearing pressure, seismic characteristics and avoidance of general/differential settlement.**

c. the approximate elevation and flow direction of ground water in relation to subsurface structures. **Approximate direction of groundwater flow is from north to south….. from the Ninemile Divide mountains toward the Clark Fork.**

1.1.5 Water use data, including:

a. a description of the population trends as indicated by available records, and the estimated population which will be served by the proposed water supply system or expanded system, a minimum of 20 years in the future in five year intervals or over the useful life of the critical structures and equipment; **Growth trends in Alberton have been relatively flat over the past two decades, even showing a slight decline. However, there is the potential for moderate growth within the Town boundaries – so an annual growth rate of 0.5% is baked in to the design criteria for the year 2042.**

b. present water consumption and the projected average and maximum daily demands or peak instantaneous demand where appropriate, including fire flow demand (see Section 1.1.6); **Current domestic water consumption for the Town of Alberton is as follows:**

- **Average Day Demand = 121,500 gpd**
- **Average Summer Demand = 311,800 gpd**
- **Maximum Day Demand (highest recorded day) = 346,100 gpd**
- **Peak Demand (Fire demand: 2,500 gpm for 2 hrs plus ADD) = 421,500 gpd**

c. present and/or estimated yield of the sources of supply; **The Town has two sources of drinking water:**

- **Spring: water right = 50 gpm or 26,346,500 gal/yr total. Actual production/usage = 100-155 gpm;**
- **Groundwater well: water right = 120 gpm or 52,458,400 gal/yr total. Actual production/usage = 115 gpm.**

d. unusual occurrences; **no unusual occurrences documented**

e. current estimated percent of unaccounted water for the system and the estimated reduction of unaccounted water after project completion, if applicable: **estimated current water losses through leakage and under-metered usage is approximately 2MG/yr. After replacement of deteriorated watermains and the installation of new water meters, the losses are expected to approach zero.**

1.1.6 Flow requirements, including:

a. hydraulic analyses based on flow demands and pressure requirements (See Section 8.2.1); **an hydraulic model for the Town's existing system was constructed and calibrated (through field measurements) in September 2022. Several demand scenarios were simulated in order to determine the most efficient pipe sizes, looping routes, valve and hydrant locations, etc. See the end of this Engineering Report for the results of the model.**

b. fire flows, when fire protection is provided, meeting the recommendations of the fire protection agency in which the water system is being developed: **Fire protection assistance was sought from the Frenchtown Fire Chief (Joe Calnan) regarding fire flow capacity and hydrant configuration. Planning for a minimum of 1,500 gpm for 2 hours was considered adequate**.

1.1.7 Sources of water supply:

Describe the proposed source or sources of water supply to be developed, the reasons for their selection, and provide information as follows:

1.1.7.1 Surface water sources, including:
No additional surface water sources are being developed under the proposed project scope

1.1.7.2 Ground water sources including:

a. sites considered; **potential groundwater well sites are currently being considered by the Water Environment Technologies, the engineer's water supply source subconsultant. It is virtually assured that any new well will be located in general proximity and will tap the same aquifer as that of the existing well. The site will be selected based on property ownership and the ability to control the surround ground in order to protect the well from contamination under the Town's wellhead protection program.**

b. advantages of the site selected; **The selection of the well site will incorporate the advantages of property ownership, isolation from contaminant sources and suitability of the site for locating an above-ground wellhouse structure.**

c. elevations with respect to surroundings; **The eventual well site will likely be at virtually the same elevation as that of the existing well in Town.**

d. probable character of formations through which the source is to be developed through nearby well logs; **It is expected that a new groundwater well (when designed at some future date) will exhibit the same geology as that of the existing well, as follows:**

Section 9: Well Log
Geologic Source
400BELT - BELT SUPERGROUP

From	To	Description
0	2	SANDY BLACK TOP SOIL
2	11	TAN SILTY SABD
11	32	BROWN SANDY CLAY
32	42.5	GRAVEL IMBEDDED IN BROWN SILTY CLAY
42.5	52	GRAVEL MIXED IN BROWN SILTY CLAY
52	71	SAND AND SILTY BROWN CLAY WITH A FEW GRAVELS MIXED IN SEEP OF WATER AT 58 FEET
71	74	DENSE BROWN SILTY AND SANDY CLAY
74	78	GRAVEL IMBEDDED IN BROWN SANDY CLAY
78	86.5	GRAYISH TAN SILTY SAND GRAVEL AND COBBLESTONES
86.5	89	GRAVEL & COBBLESTONES IMBEDDED IN LIGHT BROWN CLAY
89	92	GRAVEL IMBEDDED IN GRAYISH TAN CLAY
92	94.5	GRAYISH TAN SILTY SAND AND GRAVEL
94.5	103	TAN CLAY WITH SOME GRAVEL MIXED IN
103	112	GRAVEL EMBEDDED IN REDDISH TAN SILTY CLAY SEEP OF WATER AT 111 FEET
112	114	GRAVEL IMBEDDED IN LIGHT BROWN SILTY CLAY

e. geologic conditions affecting the site, such as anticipated interference between proposed and existing wells; **The Engineer's subconsultant, Water Environment Technologies, has conducted a well pump test on the existing supply well and monitoring surrounding private wells in order to determine aquifer characteristics. <u>A new well has been sited, but budgetary constraints and indecision regarding a new well vs. spring source have postponed drilling a new well</u>.**

f. summary of source exploration, test well depth, and method of construction; placement of liners or screen; test pumping rates and their duration; water levels and specific yield; water quality;

g. sources of possible contamination, such as sewers and sewage treatment/disposal facilities, highways, railroads, landfills, outcroppings of consolidated water-bearing formations, chemical facilities, waste disposal wells, agricultural uses, etc.; **any new well will be sited so as to avoid possible contamination sources to the greatest extent possible. Mitigation measures will be implemented in the event that one or more contamination sources cannot be avoided within the new well drawdown area.**

h. a preliminary assessment for proposed ground water sources that may be under the direct influence of surface water, prepared in accordance with PWS-5, "Assessment of Ground Water Sources Under the Direct Influence of Surface Water"; **New well construction has been postponed – not part of the current project scope.**

i. a source water assessment report prepared in accordance with PWS-6. **New well construction has been postponed – not part of the current project scope..**

1.1.8 Proposed treatment processes:

Summarize and establish the adequacy of proposed processes and unit parameters for the treatment of the specific water under consideration. **N/A – the project scope does not include new supply or treatment**.

1.1.9 Sewage system available:

Describe the existing or proposed sewage collection system and sewage treatment works, **Alberton owns/operates a permitted system that collects wastewater from the entire Town, treats/disinfects and discharges treated wastewater to the Clark Fork under MPDES permit MT-0021555**

1.1.10 Waste disposal:

Discuss the various wastes from the water treatment plant, their volume, proposed treatment, and disposal locations. If discharging to a sanitary sewer system, verify that the system, including any lift stations, is capable of handling the flow to the sewage treatment works and that the treatment works is capable and will accept the additional loading: **The wastewater collection and treatment system was designed to handle an average daily flow of 54,000 gpd. Maximum flowrate that has been measured over the past 5 years has been 50,000 gpd.**

1.1.11 Automation:

Provide supporting data justifying automatic equipment, including the servicing and operator training to be provided. Manual override must be provided for any automatic controls. Highly sophisticated automation may put proper maintenance beyond the capability of the plant operator, leading to equipment breakdowns or expensive servicing. Adequate funding must be assured for maintenance of automatic equipment. **N/A**

1.1.12 Financing:

Provide financial information for new systems or significant improvements with economic impacts as required in Appendix A. **Attached to this Engineering Report is the overall project budget, including funding sources that have been secured.**

1.1.13 Future extensions:

Summarize planning for future needs and services. **Future system needs include the identification and**

implementation of an additional water source (contemplating a new groundwater well or possibly another spring source (Limestone Spring) east and north of Town. The Town and the landowner are engaged in preliminary discussions about securing the Limestone Spring site and water rights (150 gpm of 252 gpm available) for domestic use. This would satisfy the DEQ-1 source capacity requirements found under Section 3.2.1.1.a.

1.2 PLANS

Included with the project document package

1.2.1 General layout, including:

a. suitable title;
b. name of municipality or other entity or person responsible for the water supply;
c. area or institution to be served;
d. scale, in feet;
e. north point;
f. datum used;
g. boundaries of the municipality or area to be served;
h. date and name of the designing engineer;
i. ink imprint of registered professional engineer's seal and signature;
j. location and size of existing water mains; and
k. location and nature of any existing water works structures and appurtenances affecting the proposed improvements noted on one sheet.

1.2.2 Detailed plans, including, where pertinent:

a. stream crossings, providing profiles with elevations of the streambed and the normal and extreme high and low water levels; **N/A**
b. profiles having a horizontal scale of not more than 100 feet to the inch and a vertical scale of not more than 10 feet to the inch, with both scales clearly indicated; **Done**
c. location and size of the property to be used for the ground water development with respect to known references such as roads, streams, section lines, or streets; **N/A**

Hydraulic Modeling Results:

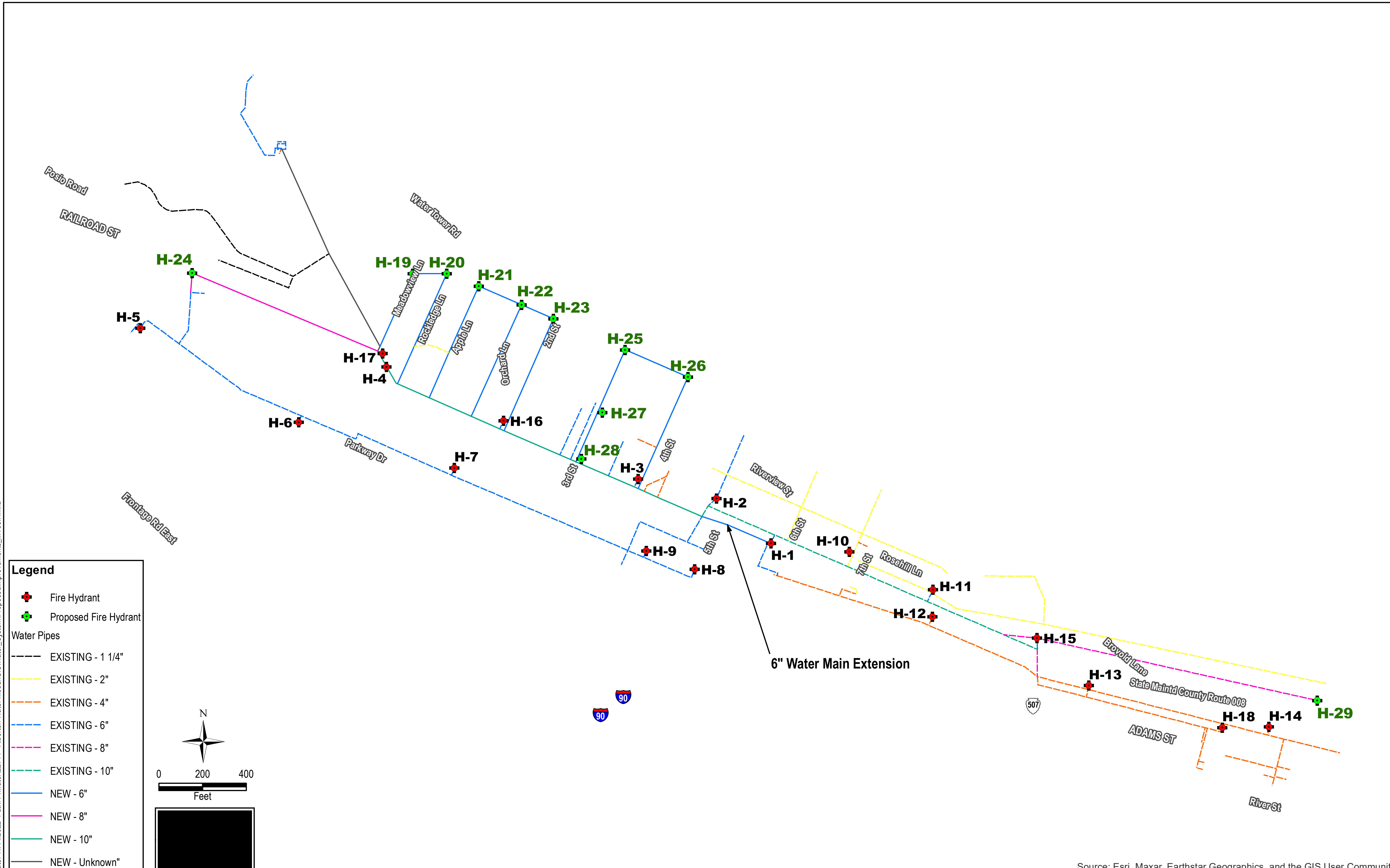
An hydraulic model of Alberton's water supply/storage/distribution system was constructed and subjected to a number of demand scenarios in order to demonstrate compliance with Circular DEQ-1 section 8.2.1:

All water mains, including those not designed to provide fire protection, must be sized after a hydraulic analysis based on flow demands and pressure requirements. The system must be designed to maintain a ***minimum normal working pressure of 35 psi***. Minimum pressure under all conditions of flow (e.g. fire flows, hydrant testing, and water main flushing) ***must be 20 psi***. Water main pressures must be sufficient to provide the required minimum pressures at ground level at the highest building sites served by the proposed water mains excluding service line head losses (i.e. water main pressure must be equal to or greater than the required minimum pressure plus the elevation difference between the highest building site and ground level at the service connection). ***Maximum normal working pressure should be approximately 60 to 80 psi***. Transmission mains and water lines directly serving reservoirs are exempt from the minimum pressure requirements where the line pressures are controlled by the reservoir water surface elevation**.**

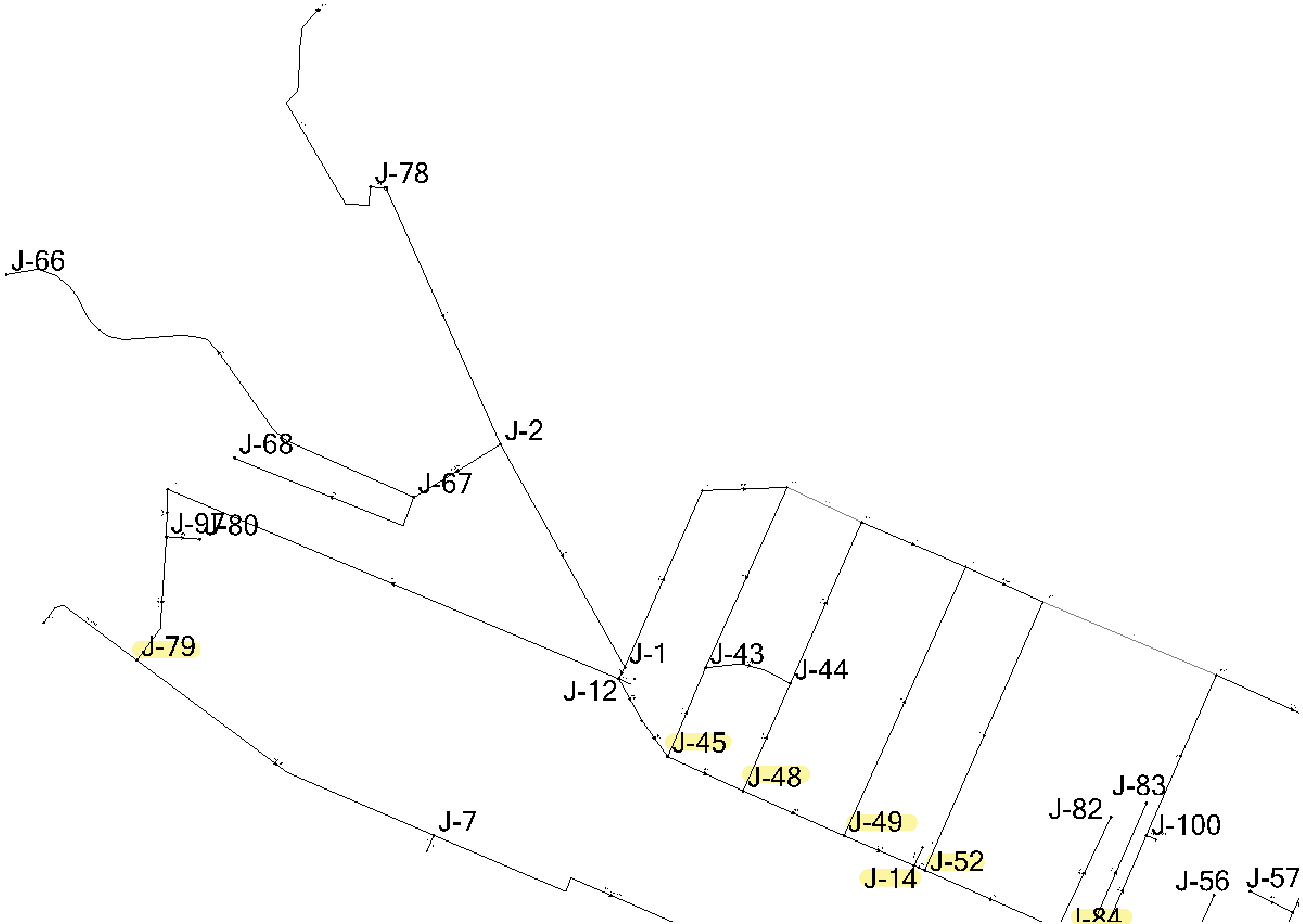
And DEQ-1 Section 8.2.2:

The ***minimum size of water main for providing fire protection and serving fire hydrants must be six-inches in diameter***. Larger size mains will be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified in Section 8.2.1.

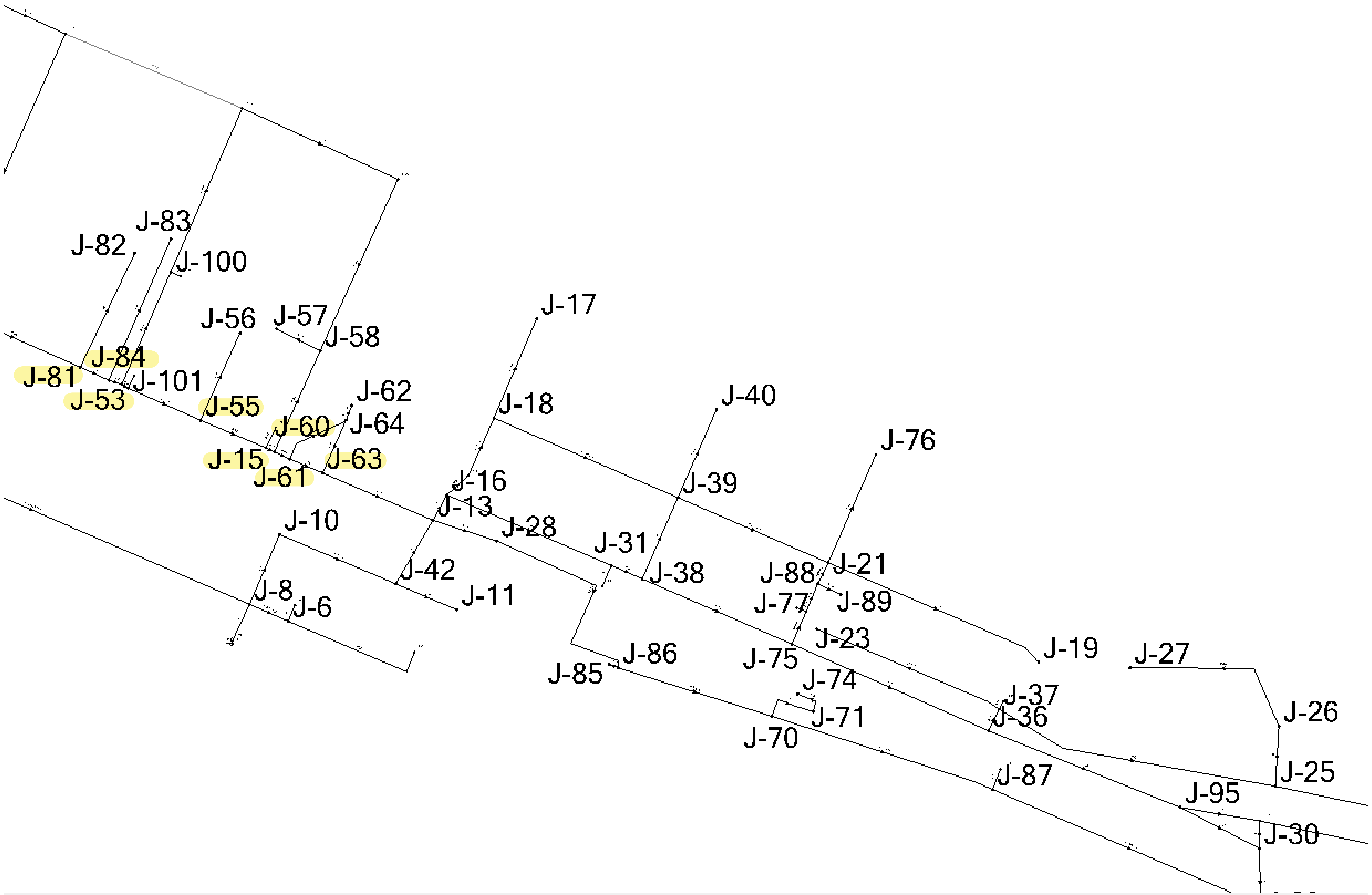
<u>The results of Alberton's hydraulic modeling and water-hammer calculations are included herewith:</u>



Date: 11/14/2022 Path: F:\water\22714 - Alberton Water Model\GIS\Water_System\ProposedImprovements_MT83IF.mxd



J-78
J-66
J-2
J-68
J-67
J-97
J-80
J-79
J-1
J-43
J-44
J-12
J-45
J-48
J-7
J-49
J-52
J-14
J-83
J-82
J-100
J-56
J-57


J-83
J-82
J-100
J-56
J-57
J-58
J-17
J-84
J-81
J-101
J-53
J-62
J-55
J-18
J-40
J-60
J-64
J-76
J-15
J-63
J-61
J-16
J-39
J-13
J-10
J-28
J-31
J-21
J-88
J-38
J-42
J-11
J-8
J-77
J-89
J-6
J-23
J-19
J-27
J-86
J-75
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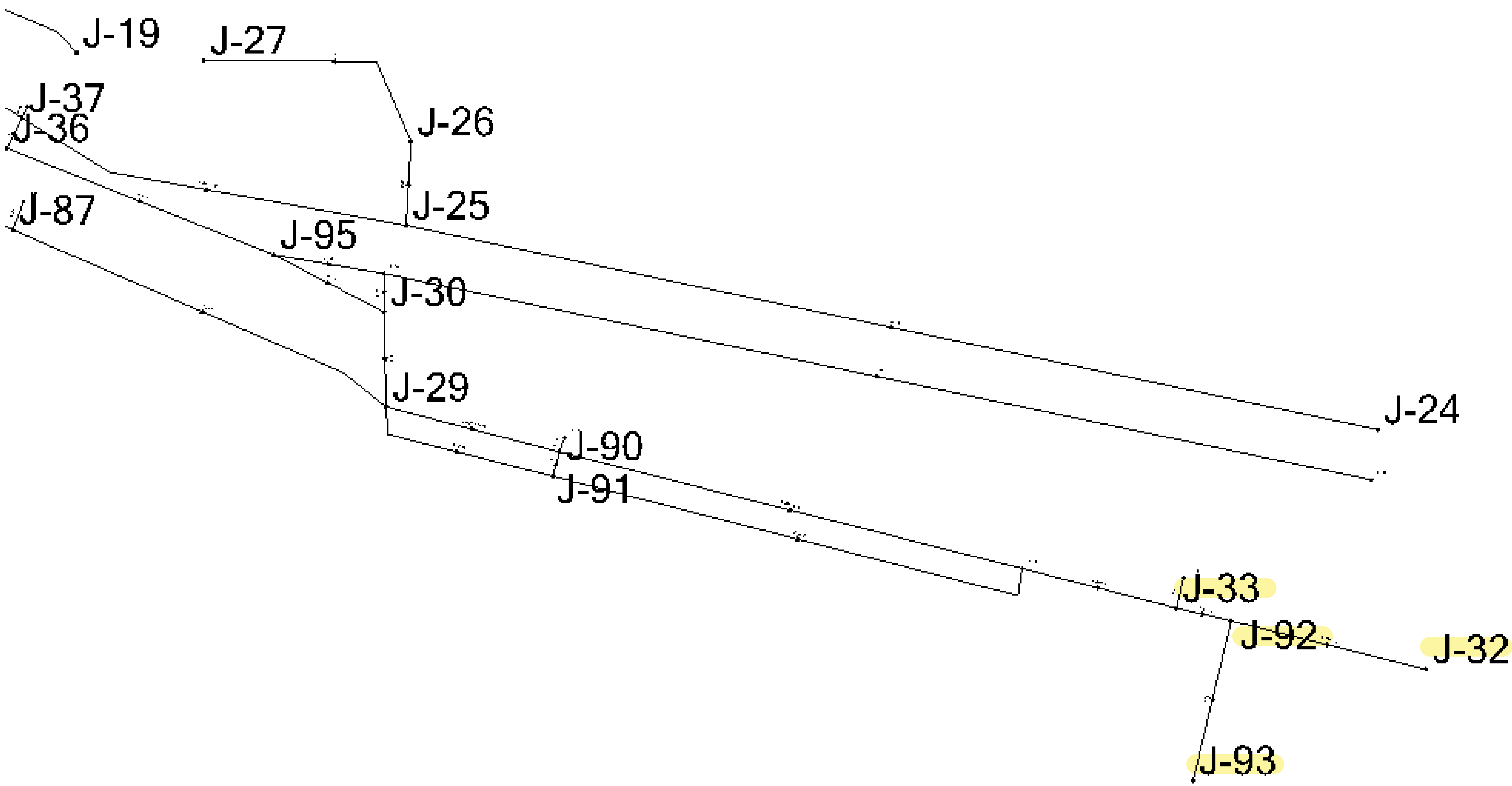
J-37
J-26
J-71
J-36
J-70
J-87
J-25
J-95
J-30


J-19
J-27
J-37
J-36
J-26
J-25
J-87
J-95
J-30
J-29
J-24
J-90
J-91
J-33
J-92
J-32
J-93

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)
J-1	3,043.00	3	83
J-2	3,133.00	3	44
J-6	3,038.00	3	85
J-7	3,031.00	3	88
J-8	3,038.00	3	85
J-10	3,034.00	3	87
J-11	3,040.00	3	84
J-12	3,043.00	3	83
J-13	3,040.00	3	84
J-14	3,035.00	3	86
J-15	3,034.00	3	87
J-16	3,043.00	3	83
J-17	3,107.00	3	55
J-18	3,048.00	3	81
J-19	3,092.00	3	61
J-21	3,056.00	6	77
J-23	3,046.00	6	81
J-24	3,066.00	6	67
J-25	3,061.00	6	70
J-26	3,095.00	6	55
J-27	3,082.00	6	61
J-28	3,046.00	6	81
J-29	3,041.00	6	84
J-30	3,052.00	6	79
J-31	3,044.00	6	82
J-32	3,005.00	6	99
J-33	3,004.00	6	100
J-36	3,048.00	6	81
J-37	3,058.00	6	76
J-38	3,043.00	6	83
J-39	3,052.00	6	79
J-40	3,080.00	6	67
J-42	3,040.00	6	84
J-43	3,052.00	6	79
J-44	3,050.00	6	80
J-45	3,037.00	6	86
J-48	3,036.00	6	86
J-49	3,034.00	6	87
J-52	3,035.00	6	86
J-53	3,034.00	6	87
J-55	3,033.00	6	87
J-56	3,042.00	6	83

J-57	3,039.00	6	84
J-58	3,044.00	6	82
J-60	3,034.00	3	87
J-61	3,036.00	3	86
J-62	3,043.00	3	83
J-63	3,036.00	3	86
J-64	3,043.00	3	83
J-66	3,077.00	3	65
J-67	3,062.00	3	73
J-68	3,052.00	3	77
J-70	3,044.00	3	82
J-71	3,046.00	3	81
J-74	3,046.00	3	81
J-75	3,045.00	3	82
J-76	3,106.00	3	55
J-77	3,050.00	3	80
J-78	3,203.00	0	20
J-79	3,023.00	3	92
J-80	3,040.00	3	84
J-81	3,033.00	3	87
J-82	3,045.00	3	82
J-83	3,043.00	3	83
J-84	3,034.00	3	87
J-85	3,042.00	3	83
J-86	3,042.00	3	83
J-87	3,046.00	3	81
J-88	3,054.00	3	78
J-89	3,054.00	3	78
J-90	3,040.00	3	84
J-91	3,033.00	3	87
J-92	3,005.00	3	99
J-93	2,995.00	3	103
J-94	3,038.00	3	85
J-95	3,050.00	0	80
J-97	3,036.49	0	86
J-100	3,053.12	0	78
J-101	3,033.92	0	87
		309	gpm
		444,960	gpd

Label	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)
H-1	2,921	36	20	J-26
H-2	2,634	47	20	J-17
H-3	3,523	41	20	J-17
H-4	5,000	61	20	J-78
H-5	2,397	20	20	J-78
H-6	2,364	20	20	J-78
H-7	2,211	20	20	J-78
H-8	1,886	20	20	J-78
H-9	2,307	20	20	J-78
H-10	2,251	42	20	J-76
H-11	2,191	41	20	J-26
H-12	604	20	20	J-78
H-13	2,188	20	20	J-78
H-14	1,548	20	20	J-78
H-15	2,461	36	20	J-26
H-16	4,417	31	20	J-17
H-17	5,000	50	20	J-78
H-18	1,738	20	20	J-78

Available fire flows at nodes within the project area *after* implementation of distribution improvements (upsizing, looping). Local Fire Officials (Frenchtown) indicate their equipment capacity is 1,500 gpm.

Home
Mobile
Irrigation Calculators
Popular
Irrigation Management Calculators
Drip
Sprinkler
Center Pivot
Residential
General Design Calculators
Field Area
Irrigatable Area
Irrigation Frequency
Irrig Set Run Time
Season Operating Hours
Required Water Pump Horsepower
Irrigation Water Costs
System Pumping Requirements
NPSHA
Total Dynamic Head
Pipe Size Estimate
Pipe Velocity and Diameter
Pipeline Pressure Loss
Pressure Loss with Outlets
Fitting Pressure Loss
Pipeline Pressure Rating
Required Maximum Flow Rate
Water Application Rate
Water Depth
Water Hammer
Irrigation System Capacity

Water Hammer

Calculates the total surge pressure due to a sudden shutting of a valve, or water hitting the end of a pipe. Learn more about the units used on this page.

Operating Pressure:

84 psi

Water Velocity:

27.6 ft/sec

Strait Pipe Length:

440 ft

Valve Shutdown Time:

6 sec

Calculate

Total Developed Pressure:

226 psi

This is the "worst case" scenario at the lowest hydrant (H-1), longest stretch of pipe with highest velocities. Total developed pressure well within C900 DR25 sustained operating pressure with safety factor of 2.5.

Water Hammer

Calculates the total surge pressure due to a sudden shutting of a valve, or water hitting the end of a pipe. Learn more about the units used on this page.

Operating Pressure:

100 psi

Water Velocity:

8 ft/sec

Strait Pipe Length:

1765 ft

Valve Shutdown Time:

10 sec

Calculate

Total Developed Pressure:

199 psi

This is the "actual" scenario within Railroad Ave: longest stretch of pipe with typical valve closing time. Total developed pressure well within C900 DR25 sustained operating pressure with safety factor of 2.5.

Irrigation in the Pacific Northwest

Home
Mobile
Irrigation Calculators
Popular
Irrigation Management Calculators
Drip
Sprinkler
Center Pivot
Residential
General Design Calculators
Field Area
Irrigatable Area
Irrigation Frequency
Irrig Set Run Time
Season Operating Hours
Required Water Pump Horsepower
Irrigation Water Costs
System Pumping Requirements
NPSHA
Total Dynamic Head
Pipe Size Estimate
Pipe Velocity and Diameter
Pipeline Pressure Loss
Pressure Loss with Outlets
Fitting Pressure Loss
Pipeline Pressure Rating
Required Maximum Flow Rate
Water Application Rate
Water Depth
Water Hammer
Irrigation System Capacity

Water Hammer

Calculates the total surge pressure due to a sudden shutting of a valve, or water hitting the end of a pipe. Learn more about the units used on this page.

Operating Pressure:

90 psi

Water Velocity:

2 ft/sec

Strait Pipe Length:

1735 ft

Valve Shutdown Time:

4 sec

Calculate

Total Developed Pressure:

151 psi