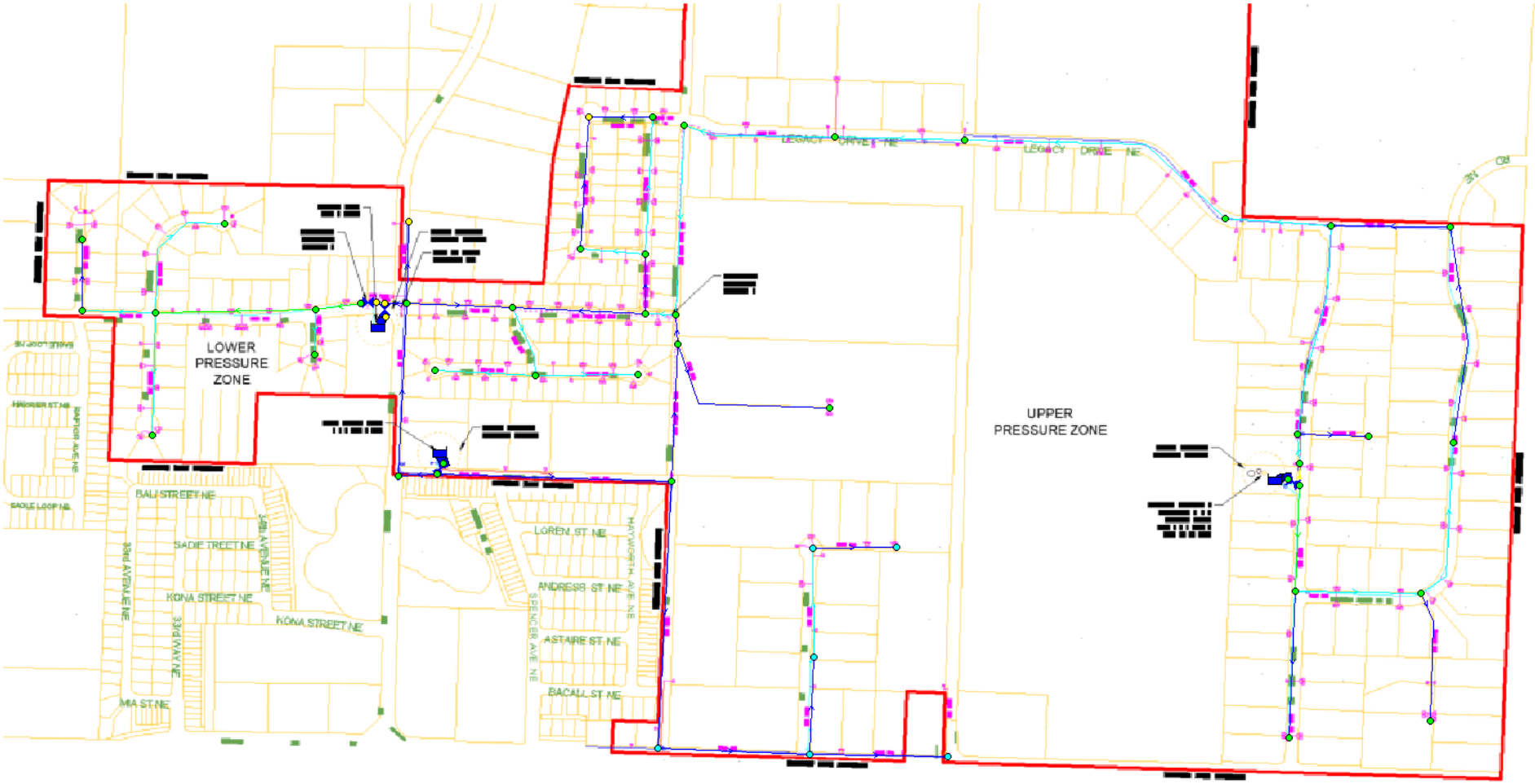
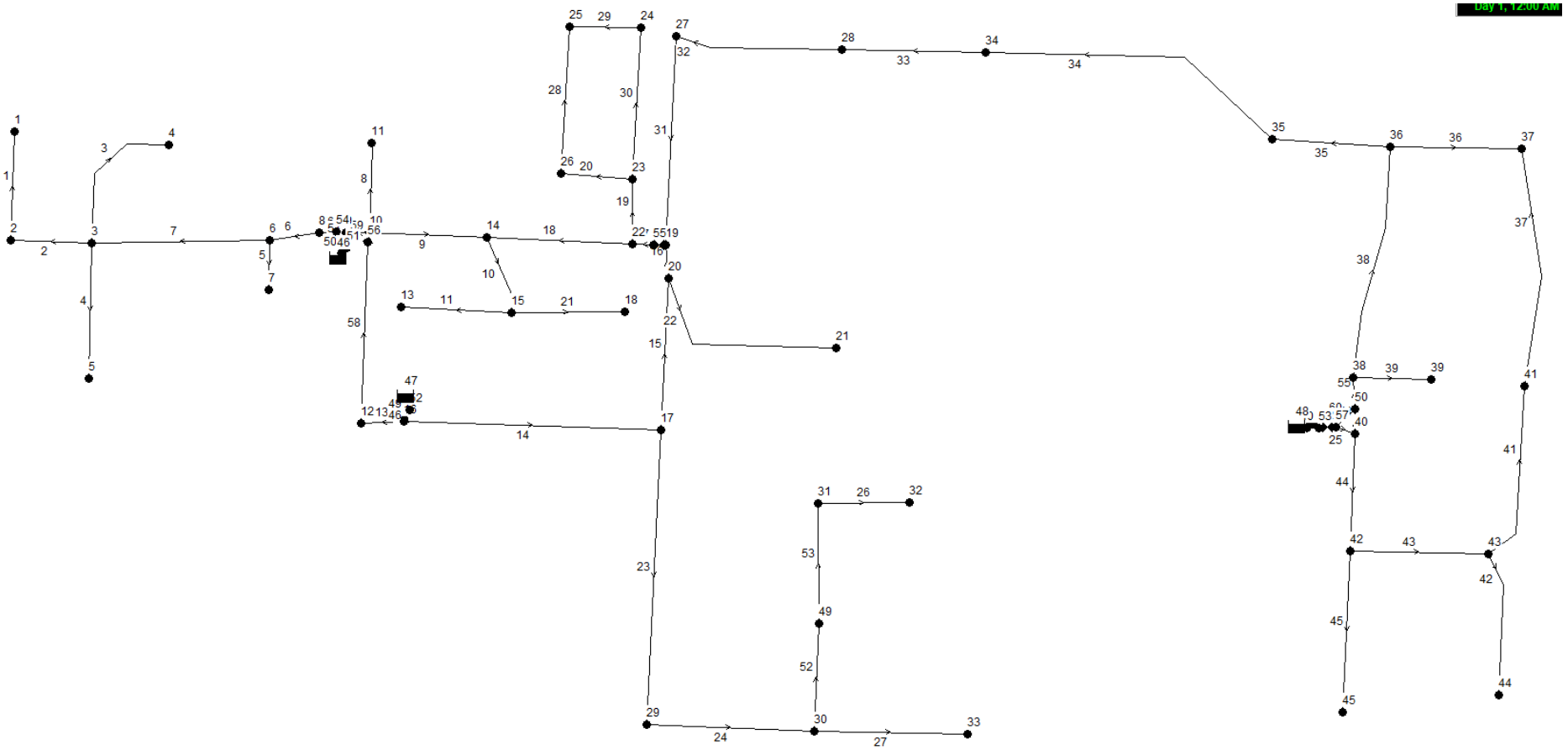
Hydraulic Analysis

A hydraulic analysis was performed for the buildout condition of the consolidated Prairie Ridge water system using EPANET 2. Services were modeled as nodes with a base flow according to the number of service connections represented by the node; a universal demand multiplier was used to modify flow rate for differing scenarios. A Hazen-Williams friction coefficient of 150 was used to represent PVC pipe. Direct to distribution well pumps were modeled as a pump with a curve based on the installed submersible pump, with supply from a reservoir with a level representing the elevation of the well pumping water level. Booster pumps were modeled similarly, but with reservoir level representative of reservoir water level with equalizing storage depleted. For all pumps PRV valves on the pump outlet model use of a VFD to reduce pump speed as necessary to maintain constant setpoint pressure.

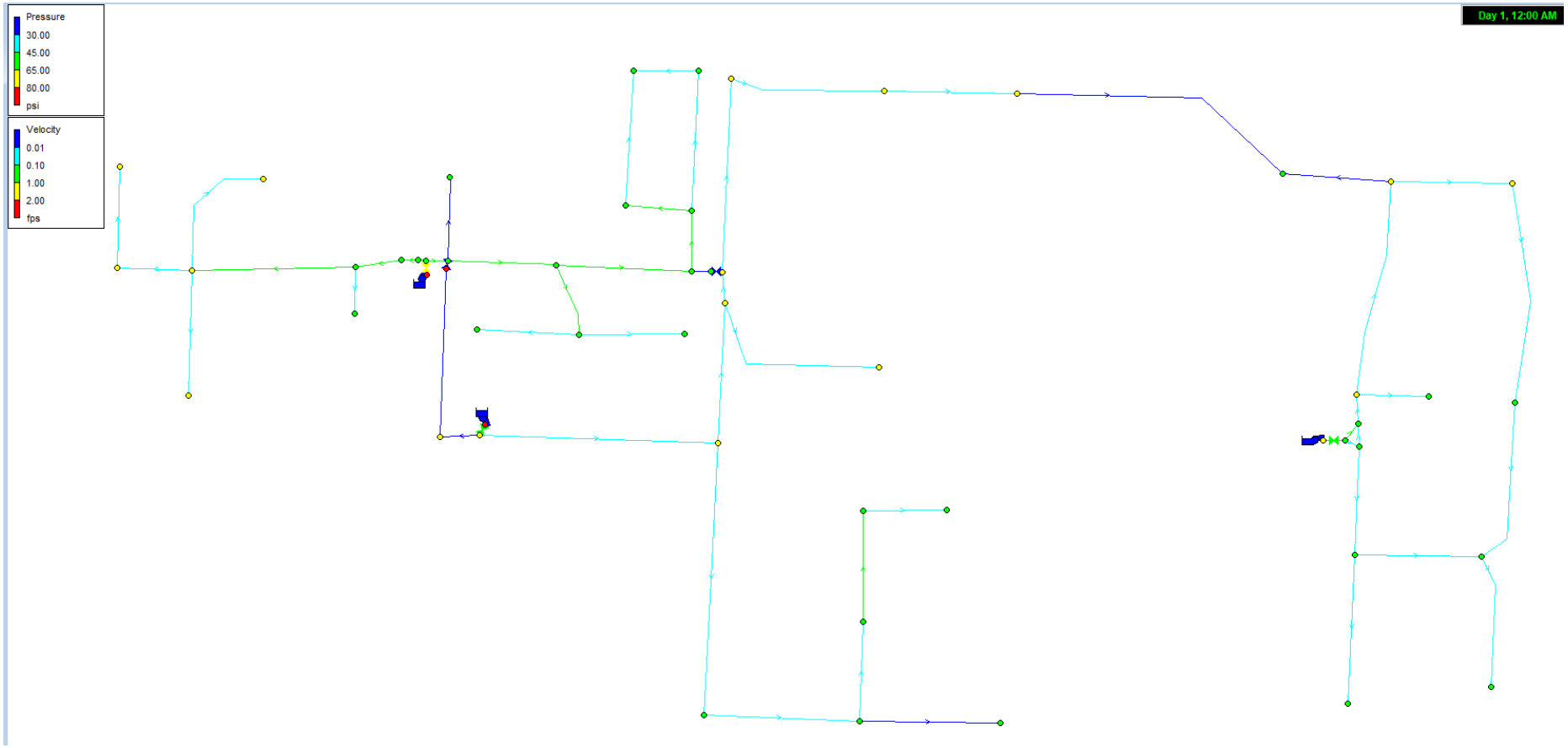


Node and Pipe Numbering



Maximum pressure, no demand (pump shutoff pressure)

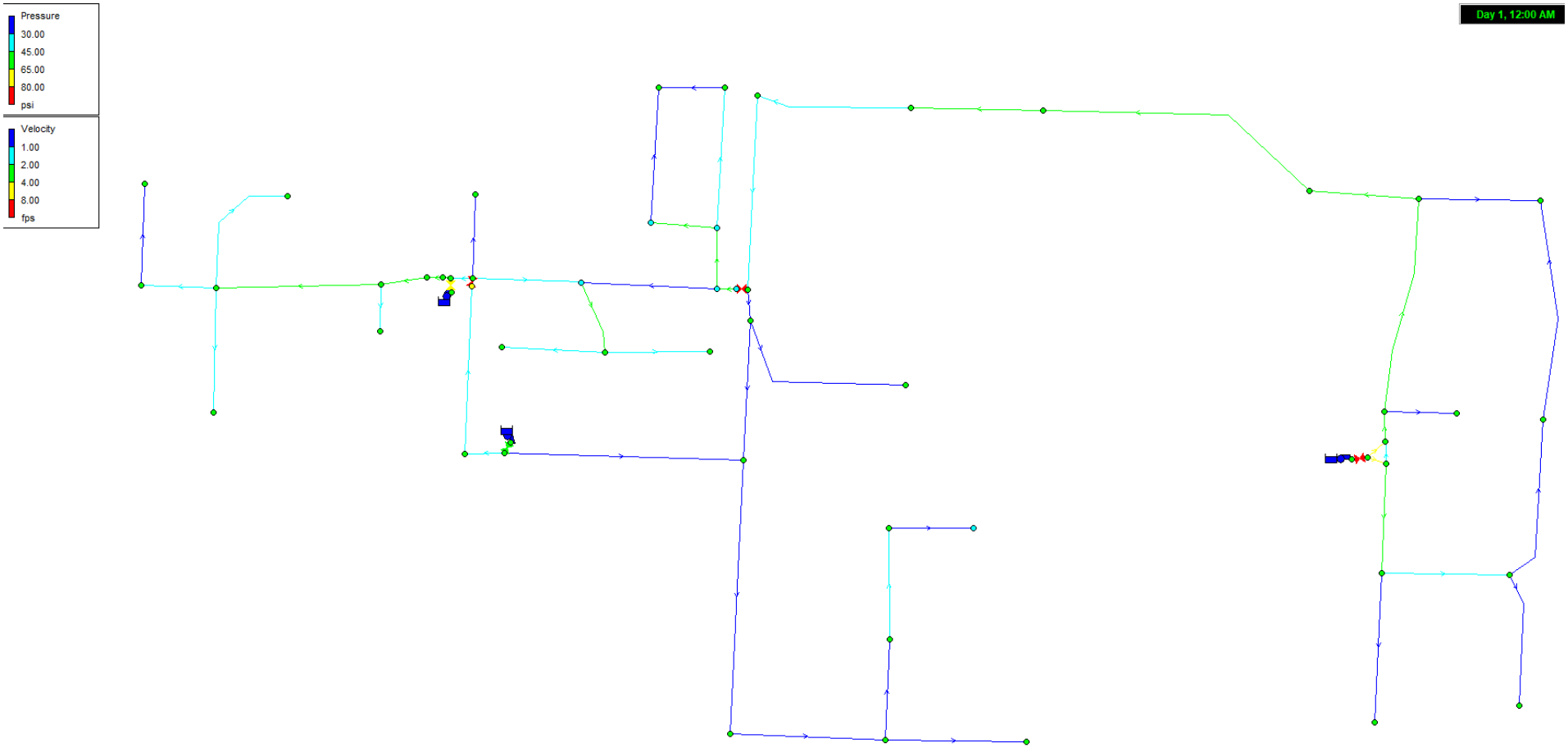
All upper pressure zone services below 242-ft elevation and lower zone services below 190-ft elevation require individual pressure reducing valves. There are no existing services at elevations requiring individual pressure reducing valves.



Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Resvr 46	0	-16.90	0.00	0.00
Resvr 47	130	-5.49	130.00	0.00
Resvr 48	291	-7.91	291.00	0.00
Junc 23	262	1.10	374.80	48.88
Junc 22	260	1.20	374.81	49.75
Junc 55	260	0.00	374.81	49.75
Junc 14	255	1.30	374.84	51.93
Junc 26	250	1.00	374.80	54.07
Junc 18	240	1.10	374.82	58.42
Junc 32	290	0.40	426.06	58.96
Junc 43	290	1.20	426.08	58.96
Junc 42	290	1.20	426.08	58.96
Junc 24	238	1.20	374.79	59.27
Junc 13	237	1.10	374.82	59.72
Junc 15	235	1.00	374.83	60.59
Junc 10	234	0.70	374.91	61.06
Junc 30	285	0.20	426.09	61.13
Junc 9	233	0.00	374.93	61.50
Junc 8	232	0.10	374.93	61.93
Junc 54	232	0.00	374.93	61.93
Junc 33	283	0.20	426.09	62.00
Junc 50	283	0.30	426.09	62.00
Junc 40	283	0.00	426.09	62.00
Junc 57	283	0.00	426.09	62.00
Junc 25	230	1.10	374.79	62.74
Junc 7	230	0.60	374.90	62.78
Junc 11	230	0.10	374.91	62.79
Junc 31	280	0.60	426.07	63.29
Junc 44	280	0.70	426.08	63.30
Junc 45	280	0.70	426.08	63.30
Junc 35	280	0.90	426.08	63.30
Junc 49	280	0.30	426.08	63.30
Junc 39	280	0.20	426.09	63.30
Junc 29	280	0.30	426.09	63.30
Junc 6	228	0.80	374.90	63.65
Junc 41	278	1.00	426.08	64.16
Junc 53	283	0.00	434.99	65.86
Junc 4	220	1.20	374.83	67.09
Junc 5	220	1.00	374.83	67.09
Junc 36	270	0.90	426.08	67.63
Junc 38	270	0.70	426.09	67.63
Junc 34	268	0.90	426.08	68.50
Junc 28	265	0.60	426.08	69.80
Junc 3	213	1.30	374.84	70.13
Junc 37	262	0.80	426.08	71.10
Junc 20	262	0.00	426.09	71.10
Junc 21	260	0.40	426.08	71.96
Junc 19	260	0.00	426.09	71.96
Junc 16	253	0.20	426.09	75.00
Junc 1	200	0.60	374.84	75.76
Junc 2	200	0.40	374.84	75.76
Junc 27	250	0.50	426.08	76.30
Junc 17	250	0.00	426.09	76.30
Junc 12	250	0.20	426.09	76.30
Junc 56	234	0.00	426.09	83.23
Junc 52	253	0.00	489.83	102.62
Junc 51	233	0.00	519.25	124.03

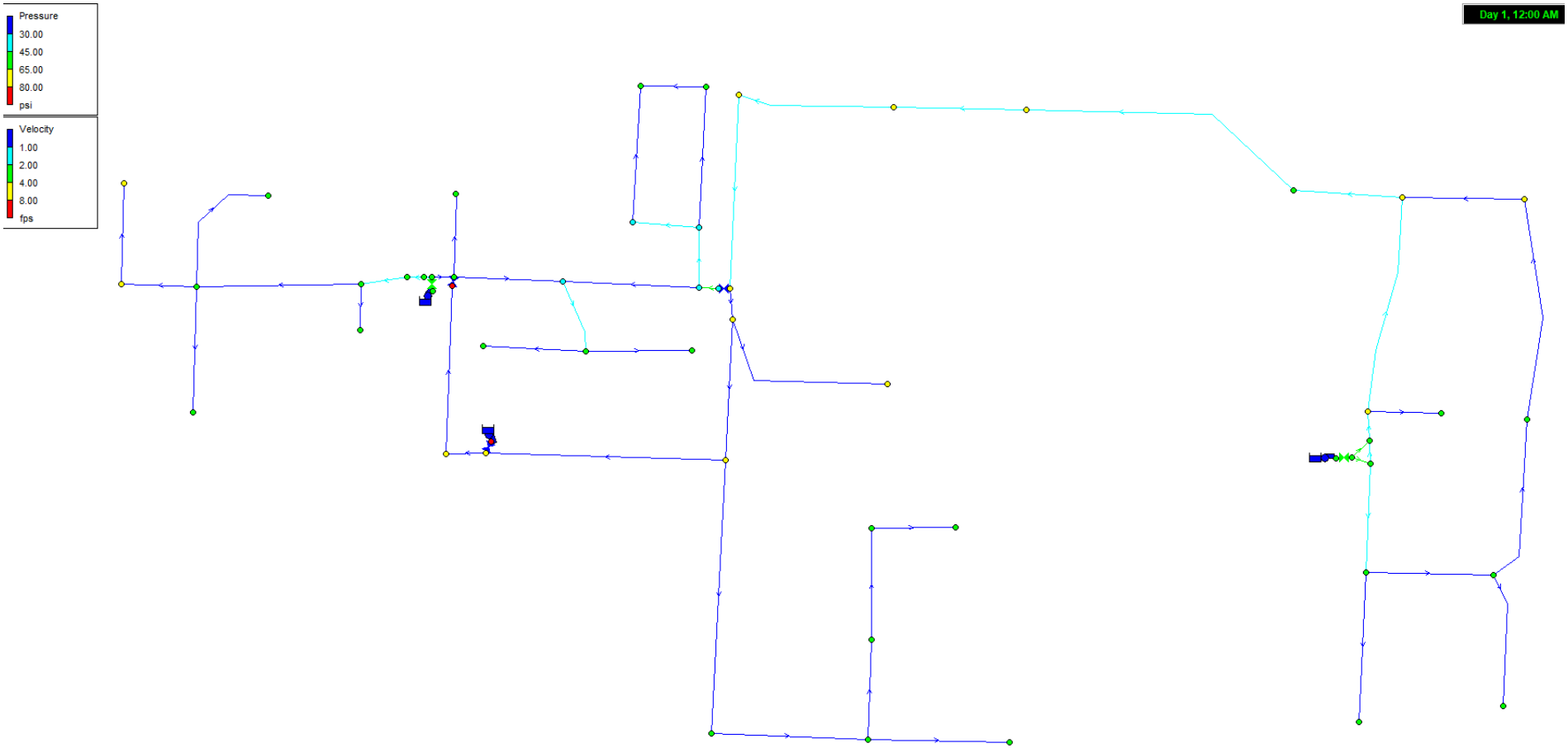
*Junc. 51, 52, and 56 are not service connections, these are upstream nodes for PRV Valves

Peak Hourly Demand: 530 Connections (520 gpm)



Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Resvr 46	0	-60.75	0.00	0.00
Resvr 47	130	-129.53	130.00	0.00
Resvr 48	291	-344.12	291.00	0.00
Junc 23	262	19.40	348.79	37.61
Junc 22	260	21.16	350.60	39.26
Junc 55	260	0.00	352.31	40.00
Junc 14	255	22.93	350.15	41.23
Junc 26	250	17.64	346.95	42.01
Junc 32	290	7.05	388.84	42.83
Junc 18	240	19.40	345.67	45.79
Junc 24	238	21.16	346.01	46.80
Junc 30	285	3.53	393.14	46.86
Junc 13	237	19.40	345.67	47.09
Junc 31	280	10.58	389.31	47.36
Junc 33	283	3.53	393.14	47.72
Junc 15	235	17.64	347.31	48.66
Junc 49	280	5.29	392.97	48.95
Junc 29	280	5.29	393.20	49.05
Junc 43	290	21.16	403.69	49.26
Junc 42	290	21.16	405.15	49.90
Junc 25	230	19.40	345.96	50.25
Junc 10	234	12.35	351.70	51.00
Junc 9	233	0.00	351.37	51.29
Junc 51	233	0.00	351.37	51.29
Junc 7	230	10.58	348.96	51.55
Junc 8	232	1.76	351.24	51.67
Junc 54	232	0.00	351.31	51.70
Junc 6	228	14.11	349.57	52.68
Junc 11	230	1.76	351.70	52.73
Junc 11	230	1.76	351.70	52.73
Junc 35	280	15.87	401.71	52.74
Junc 44	280	12.35	402.98	53.29
Junc 4	220	21.16	344.47	53.93
Junc 50	283	5.29	407.52	53.96
Junc 40	283	0.00	407.85	54.10
Junc 45	280	12.35	405.07	54.19
Junc 41	278	17.64	403.33	54.31
Junc 5	220	17.64	345.41	54.34
Junc 53	283	0.00	409.26	54.71
Junc 57	283	0.00	409.26	54.71
Junc 39	280	3.53	406.89	54.98
Junc 34	268	15.87	397.94	56.30
Junc 20	262	0.00	393.40	56.94
Junc 28	265	10.58	396.57	57.01
Junc 21	260	7.05	393.20	57.72
Junc 36	270	15.87	403.27	57.74
Junc 19	260	0.00	393.41	57.81
Junc 3	213	22.93	346.71	57.94
Junc 38	270	12.35	406.91	59.32
Junc 16	253	3.53	393.36	60.82
Junc 52	253	0.00	393.36	60.82
Junc 37	262	14.11	403.27	61.21
Junc 12	250	3.53	393.25	62.07
Junc 17	250	0.00	393.35	62.11
Junc 27	250	8.82	395.07	62.86
Junc 1	200	10.58	345.51	63.05
Junc 2	200	7.05	345.91	63.22
Junc 56	234	0.00	392.44	68.65

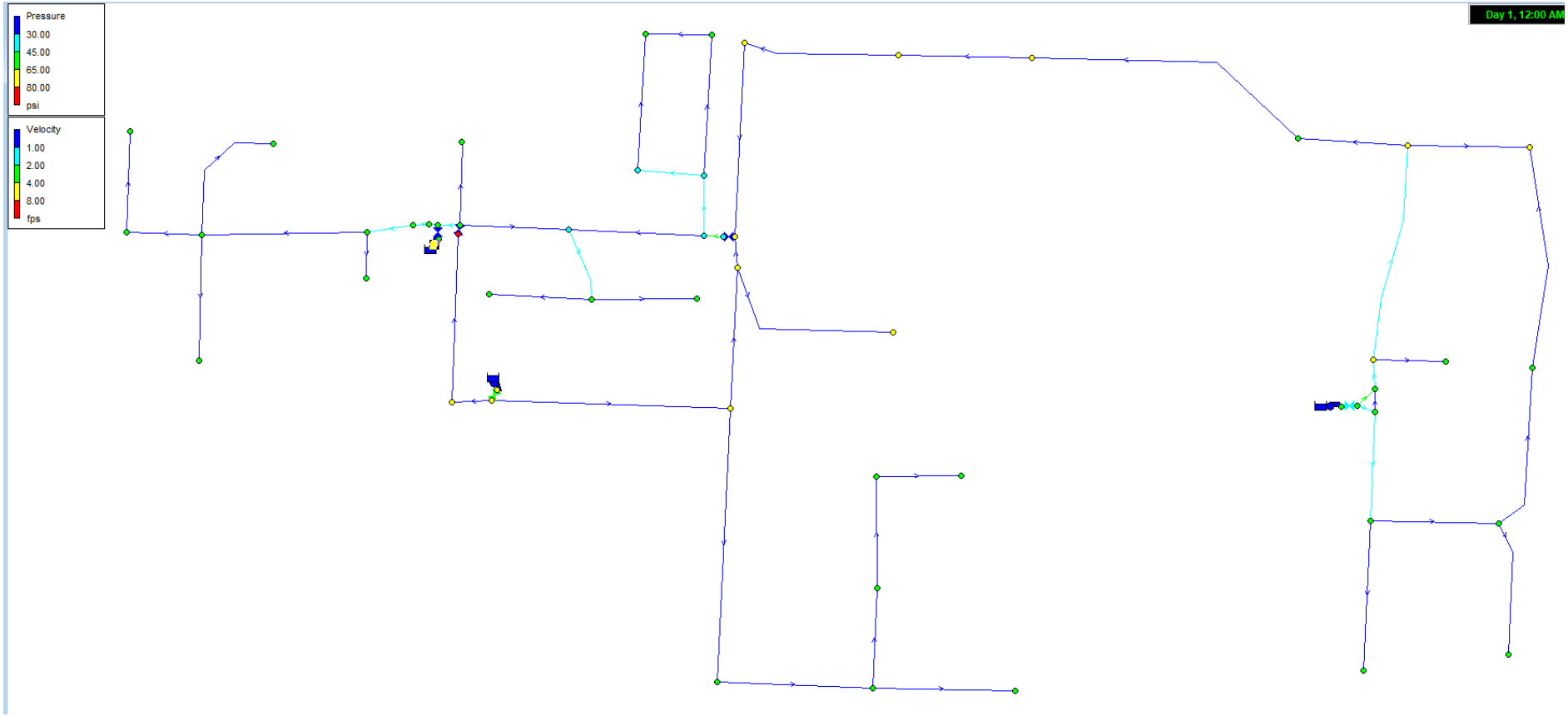
MDD FOR 530 Connections (247 gpm) With both Hawk Acres Wells Offline



Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Resvr 46	0	-60.69	0.00	0.00
Resvr 47	130	0.00	130.00	0.00
Resvr 48	291	-196.86	291.00	0.00
Junc 23	262	9.35	351.30	38.69
Junc 22	260	10.20	351.76	39.76
Junc 55	260	0.00	352.31	40.00
Junc 14	255	11.05	351.48	41.81
Junc 26	250	8.50	350.82	43.69
Junc 18	240	9.35	350.32	47.80
Junc 24	238	10.20	350.58	48.78
Junc 13	237	9.35	350.32	49.10
Junc 15	235	8.50	350.75	50.15
Junc 10	234	5.95	351.70	51.00
Junc 51	233	0.00	351.72	51.44
Junc 9	233	0.00	351.72	51.44
Junc 8	232	0.85	351.69	51.86
Junc 54	232	0.00	351.70	51.87
Junc 25	230	9.35	350.56	52.24
Junc 7	230	5.10	351.10	52.47
Junc 11	230	0.85	351.70	52.73
Junc 6	228	6.80	351.25	53.41
Junc 32	290	3.40	418.11	55.51
Junc 4	220	10.20	349.93	56.30
Junc 5	220	8.50	350.18	56.41
Junc 43	290	10.20	424.14	58.12
Junc 30	285	1.70	419.23	58.16
Junc 42	290	10.20	424.69	58.36
Junc 33	283	1.70	419.23	59.03
Junc 3	213	11.05	350.51	59.59
Junc 31	280	5.10	418.24	59.90
Junc 31	280	5.10	418.24	59.90
Junc 49	280	2.55	419.18	60.31
Junc 29	280	2.55	419.24	60.33
Junc 50	283	2.55	425.46	61.73
Junc 40	283	0.00	425.59	61.78
Junc 57	283	0.00	426.09	62.00
Junc 35	280	7.65	423.21	62.05
Junc 53	283	0.00	426.58	62.21
Junc 44	280	5.95	423.96	62.38
Junc 45	280	5.95	424.67	62.69
Junc 39	280	1.70	425.23	62.93
Junc 41	278	8.50	423.95	63.24
Junc 1	200	5.10	350.20	65.08
Junc 2	200	3.40	350.31	65.13
Junc 34	268	7.65	421.55	66.53
Junc 36	270	7.65	423.87	66.67
Junc 38	270	5.95	425.24	67.26
Junc 28	265	5.10	420.91	67.56
Junc 20	262	0.00	419.38	68.19
Junc 21	260	3.40	419.33	69.04
Junc 19	260	0.00	419.39	69.06
Junc 37	262	6.80	423.87	70.14
Junc 16	253	1.70	419.23	72.03
Junc 12	250	1.70	419.23	73.33
Junc 17	250	0.00	419.28	73.35
Junc 27	250	4.25	420.21	73.75
Junc 56	234	0.00	419.21	80.25
Junc 52	253	0.00	490.00	102.69

*Junc. 52 and 56 are not service connections, these are upstream nodes for PRV Valves

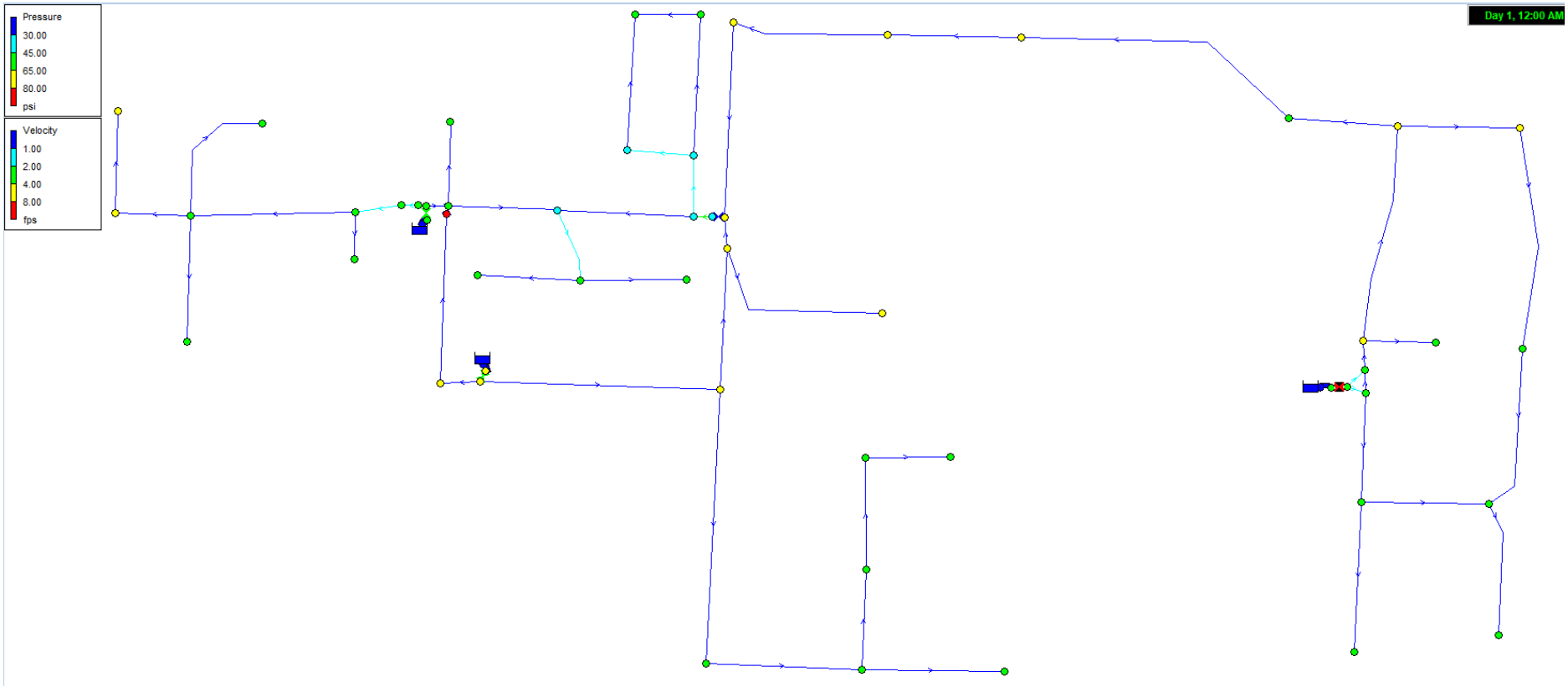
MDD FOR 530 Connections (247 gpm) With Tolmie Park Well Offline



Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Resvr 46	0	0.00	0.00	0.00
Resvr 47	130	-107.71	130.00	0.00
Resvr 48	291	-149.84	291.00	0.00
Junc 23	262	9.35	351.30	38.69
Junc 22	260	10.20	351.76	39.76
Junc 55	260	0.00	352.31	40.00
Junc 14	255	11.05	351.48	41.81
Junc 26	250	8.50	350.82	43.69
Junc 18	240	9.35	350.32	47.80
Junc 24	238	10.20	350.58	48.78
Junc 13	237	9.35	350.32	49.10
Junc 15	235	8.50	350.75	50.15
Junc 10	234	5.95	351.70	51.00
Junc 51	233	0.00	351.29	51.25
Junc 9	233	0.00	351.29	51.25
Junc 8	232	0.85	351.25	51.67
Junc 54	232	0.00	351.27	51.68
Junc 25	230	9.35	350.56	52.24
Junc 7	230	5.10	350.66	52.28
Junc 11	230	0.85	351.70	52.73
Junc 6	228	6.80	350.82	53.22
Junc 4	220	10.20	349.50	56.11
Junc 5	220	8.50	349.74	56.22
Junc 32	290	3.40	421.92	57.16
Junc 43	290	10.20	424.89	58.45
Junc 42	290	10.20	425.18	58.58
Junc 3	213	11.05	350.08	59.40
Junc 30	285	1.70	423.04	59.81
Junc 33	283	1.70	423.04	60.68
Junc 31	280	5.10	422.05	61.55
Junc 31	280	5.10	422.05	61.55
Junc 50	283	2.55	425.72	61.84
Junc 40	283	0.00	425.78	61.87
Junc 49	280	2.55	422.99	61.96
Junc 29	280	2.55	423.05	61.98
Junc 57	283	0.00	426.09	62.00
Junc 35	280	7.65	424.54	62.63
Junc 44	280	5.95	424.70	62.70
Junc 45	280	5.95	425.16	62.90
Junc 39	280	1.70	425.58	63.08
Junc 41	278	8.50	424.83	63.62
Junc 53	283	0.00	430.12	63.75
Junc 1	200	5.10	349.77	64.90
Junc 2	200	3.40	349.87	64.94
Junc 36	270	7.65	424.83	67.09
Junc 38	270	5.95	425.59	67.42
Junc 34	268	7.65	423.85	67.53
Junc 28	265	5.10	423.61	68.73
Junc 20	262	0.00	423.08	69.80
Junc 37	262	6.80	424.83	70.55
Junc 21	260	3.40	423.03	70.64
Junc 19	260	0.00	423.08	70.66
Junc 52	253	0.00	423.18	73.74
Junc 16	253	1.70	423.18	73.74
Junc 17	250	0.00	423.09	75.00
Junc 12	250	1.70	423.13	75.02
Junc 27	250	4.25	423.36	75.12
Junc 56	234	0.00	422.74	81.78

*Junc. 56 is not a service connection, it is an upstream node for a PRV Valve

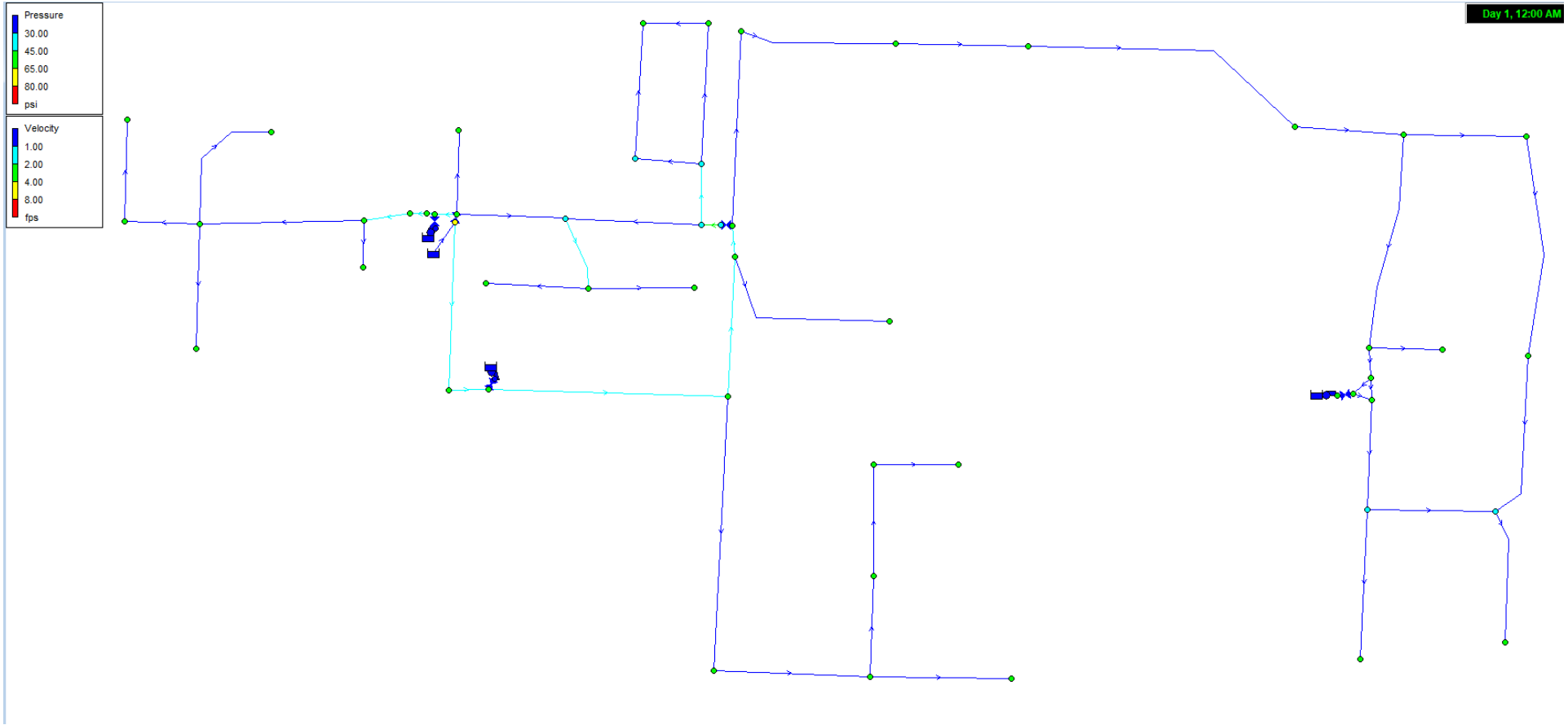
MDD For 530 Connections (247 gpm) With Two Booster Pumps Offline



Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Resvr 46	0	-60.69	0.00	0.00
Resvr 47	130	-102.60	130.00	0.00
Resvr 48	291	-94.27	291.00	0.00
Junc 23	262	9.35	351.30	38.69
Junc 22	260	10.20	351.76	39.76
Junc 55	260	0.00	352.31	40.00
Junc 14	255	11.05	351.48	41.81
Junc 26	250	8.50	350.82	43.69
Junc 18	240	9.35	350.32	47.80
Junc 24	238	10.20	350.58	48.78
Junc 13	237	9.35	350.32	49.10
Junc 15	235	8.50	350.75	50.15
Junc 10	234	5.95	351.70	51.00
Junc 51	233	0.00	351.72	51.44
Junc 9	233	0.00	351.72	51.44
Junc 8	232	0.85	351.69	51.86
Junc 54	232	0.00	351.70	51.87
Junc 25	230	9.35	350.56	52.24
Junc 7	230	5.10	351.10	52.47
Junc 11	230	0.85	351.70	52.73
Junc 6	228	6.80	351.25	53.41
Junc 4	220	10.20	349.93	56.30
Junc 5	220	8.50	350.18	56.41
Junc 32	290	3.40	424.24	58.17
Junc 43	290	10.20	425.12	58.55
Junc 42	290	10.20	425.21	58.59
Junc 3	213	11.05	350.51	59.59
Junc 30	285	1.70	425.35	60.81
Junc 33	283	1.70	425.35	61.68
Junc 50	283	2.55	425.50	61.75
Junc 40	283	0.00	425.52	61.75
Junc 53	283	0.00	425.65	61.81
Junc 57	283	0.00	425.65	61.81
Junc 31	280	5.10	424.36	62.55
Junc 44	280	5.95	424.93	62.80
Junc 35	280	7.65	425.16	62.90
Junc 45	280	5.95	425.19	62.91
Junc 49	280	2.55	425.31	62.96
Junc 29	280	2.55	425.37	62.99
Junc 39	280	1.70	425.45	63.02
Junc 41	278	8.50	425.12	63.75
Junc 1	200	5.10	350.20	65.08
Junc 2	200	3.40	350.31	65.13
Junc 36	270	7.65	425.20	67.25
Junc 38	270	5.95	425.45	67.36
Junc 34	268	7.65	425.09	68.07
Junc 28	265	5.10	425.08	69.36
Junc 20	262	0.00	425.11	70.67
Junc 37	262	6.80	425.18	70.70
Junc 21	260	3.40	425.06	71.52
Junc 19	260	0.00	425.07	71.53
Junc 16	253	1.70	426.09	75.00
Junc 27	250	4.25	425.07	75.86
Junc 17	250	0.00	425.41	76.00
Junc 12	250	1.70	426.09	76.30
Junc 52	253	0.00	429.37	76.42
Junc 56	234	0.00	426.07	83.22

*Junc. 56 is not a service connection, it is an upstream node for a PRV Valve

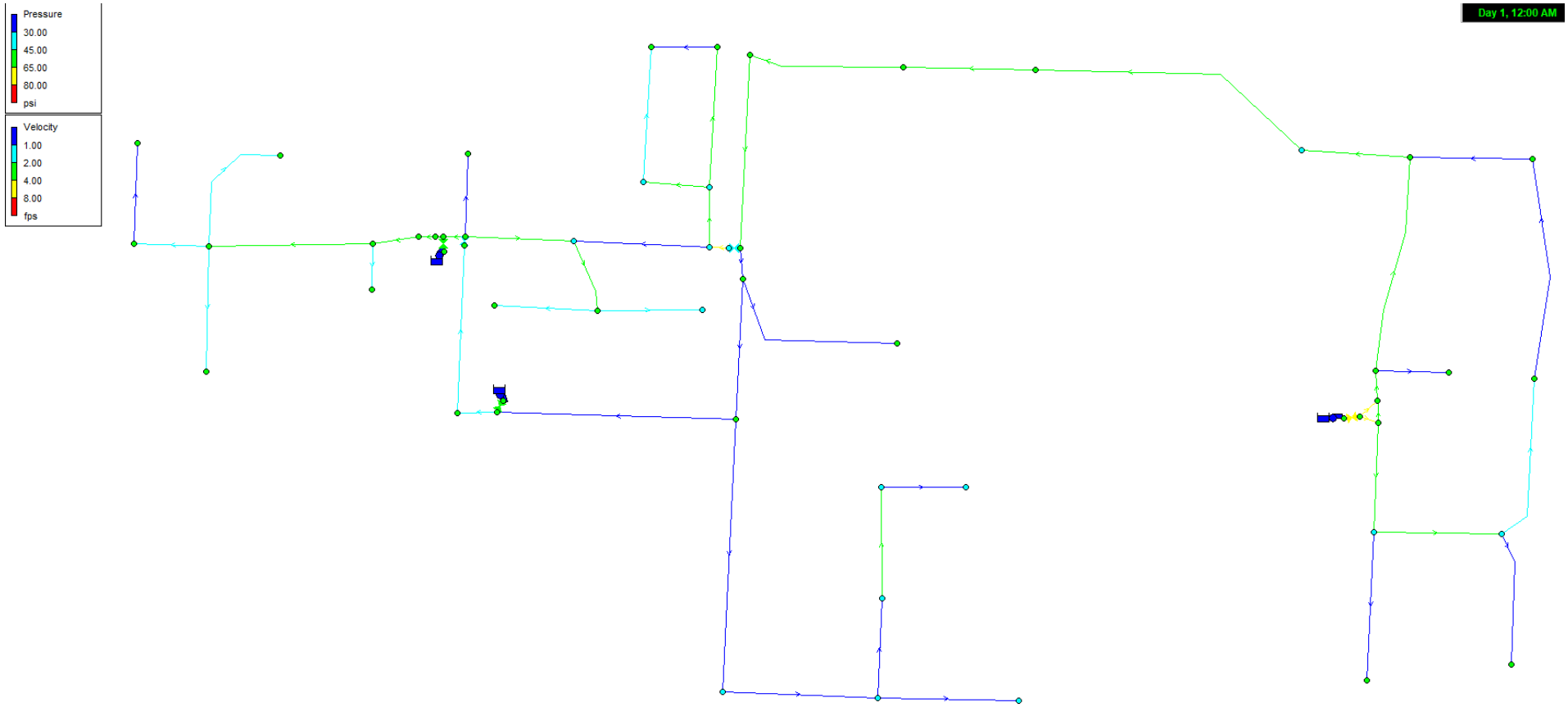
MDD For 530 Connections (247 gpm) With All Sources Offline and Intertie 1 Open



Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Resvr 46	0	0.00	0.00	0.00
Resvr 47	130	0.00	130.00	0.00
Resvr 48	291	0.00	291.00	0.00
Resvr 58	400	-247.00	400.00	0.00
Junc 23	262	8.97	351.36	38.72
Junc 22	260	9.78	351.79	39.77
Junc 55	260	0.00	352.31	40.00
Junc 14	255	10.60	351.52	41.82
Junc 26	250	8.15	350.92	43.73
Junc 43	290	9.78	391.37	43.92
Junc 42	290	9.78	391.38	43.93
Junc 32	290	3.26	394.17	45.14
Junc 40	283	0.00	391.53	47.03
Junc 53	283	0.00	391.54	47.03
Junc 57	283	0.00	391.54	47.03
Junc 50	283	2.45	391.54	47.03
Junc 30	285	1.63	395.20	47.75
Junc 18	240	8.97	350.44	47.85
Junc 44	280	5.71	391.20	48.18
Junc 45	280	5.71	391.36	48.25
Junc 39	280	1.63	391.55	48.33
Junc 35	280	7.34	391.80	48.44
Junc 33	283	1.63	395.20	48.62
Junc 24	238	9.78	350.70	48.83
Junc 41	278	8.15	391.43	49.15
Junc 13	237	8.97	350.44	49.15
Junc 31	280	4.89	394.28	49.52
Junc 49	280	2.45	395.16	49.90
Junc 29	280	2.45	395.21	49.92
Junc 15	235	8.15	350.83	50.19

Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 29	280	2.45	395.21	49.92
Junc 15	235	8.15	350.83	50.19
Junc 10	234	5.71	351.70	51.00
Junc 9	233	0.00	351.32	51.27
Junc 51	233	0.00	351.32	51.27
Junc 8	232	0.82	351.29	51.69
Junc 54	232	0.00	351.30	51.69
Junc 25	230	8.97	350.68	52.29
Junc 7	230	4.89	350.74	52.32
Junc 38	270	5.71	391.55	52.67
Junc 36	270	7.34	391.63	52.70
Junc 11	230	0.82	351.70	52.73
Junc 6	228	6.52	350.89	53.25
Junc 34	268	7.34	392.38	53.90
Junc 28	265	4.89	392.68	55.32
Junc 37	262	6.52	391.60	56.15
Junc 4	220	9.78	349.66	56.18
Junc 5	220	8.15	349.89	56.28
Junc 20	262	0.00	393.81	57.11
Junc 19	260	0.00	393.64	57.91
Junc 21	260	3.26	393.76	57.96
Junc 3	213	10.60	350.20	59.45
Junc 27	250	4.08	393.09	62.00
Junc 16	253	1.63	397.84	62.76
Junc 52	253	0.00	397.84	62.76
Junc 17	250	0.00	395.25	62.94
Junc 12	250	1.63	398.06	64.16
Junc 1	200	4.89	349.91	64.96
Junc 2	200	3.26	350.01	65.00
Junc 56	234	0.00	399.85	71.86

Distribution System Limiting Factor (636 gpm)



Node ID	Elevation ft	Demand GPM	Head ft	Pressure psi
Junc 1	200	12.60	342.95	61.94
Junc 2	200	8.40	343.50	62.18
Junc 3	213	27.30	344.61	57.03
Junc 4	220	25.20	341.51	52.65
Junc 5	220	21.00	342.81	53.21
Junc 6	228	16.80	348.55	52.24
Junc 7	230	12.60	347.72	51.01
Junc 8	232	2.10	350.87	51.51
Junc 9	233	0.00	351.05	51.15
Junc 10	234	14.70	351.70	51.00
Junc 11	230	2.10	351.70	52.73
Junc 12	250	4.20	368.92	51.53
Junc 13	237	23.10	343.26	46.04
Junc 14	255	27.30	349.44	40.92
Junc 15	235	21.00	345.52	47.89
Junc 16	253	4.20	369.10	50.30
Junc 17	250	0.00	369.12	51.61
Junc 18	240	23.10	343.26	44.74
Junc 19	260	0.00	369.35	47.38
Junc 20	262	0.00	369.32	46.50
Junc 21	260	8.40	369.05	47.25
Junc 22	260	25.20	349.99	38.99
Junc 23	262	23.10	347.50	37.05
Junc 24	238	25.20	343.66	45.78
Junc 25	230	23.10	343.59	49.22
Junc 26	250	21.00	344.96	41.15
Junc 27	250	10.50	372.15	52.93
Junc 28	265	12.60	374.63	47.50
Junc 29	280	6.30	368.91	38.53
Junc 30	285	4.20	368.83	36.32
Junc 31	280	12.60	363.54	36.20
Junc 32	290	8.40	362.89	31.58
Junc 33	283	4.20	368.83	37.19
Junc 34	268	18.90	376.90	47.19
Junc 35	280	18.90	383.01	44.63
Junc 36	270	18.90	385.51	50.05
Junc 37	262	16.80	385.51	53.52
Junc 38	270	14.70	391.11	52.48
Junc 39	280	4.20	391.09	48.13
Junc 40	283	0.00	392.56	47.47
Junc 41	278	21.00	385.67	46.65
Junc 42	290	25.20	388.55	42.70
Junc 43	290	25.20	386.29	41.72
Junc 44	280	14.70	385.31	45.63
Junc 45	280	14.70	388.44	46.99
Junc 49	280	6.30	368.60	38.39
Junc 50	283	6.30	392.06	47.26
Junc 51	233	0.00	351.05	51.15
Junc 52	253	0.00	369.10	50.30
Junc 53	283	0.00	394.70	48.40
Junc 54	232	0.00	350.96	51.54
Junc 55	260	0.00	352.31	40.00
Junc 56	234	0.00	367.59	57.89
Junc 57	283	0.00	394.70	48.40
Resvr 46	0	-60.80	0.00	0.00
Resvr 47	130	-144.88	130.00	0.00
Resvr 48	291	-430.62	291.00	0.00

Link ID	Length ft	Flow GPM	Velocity fps
Pump 40	#N/A	430.62	0.00
Pump 46	#N/A	144.88	0.00
Pump 50	#N/A	60.80	0.00
Pipe 36	570	-1.80	0.02
Pipe 8	400	2.10	0.02
Pipe 27	680	4.20	0.05
Pipe 14	1200	-11.93	0.14
Pipe 39	150	4.20	0.27
Pipe 29	260	-5.51	0.36
Pipe 45	670	14.70	0.38
Pipe 22	1150	8.40	0.38
Pipe 24	680	35.70	0.41
Pipe 37	620	-18.60	0.47
Pipe 23	1270	42.00	0.48
Pipe 15	800	-53.93	0.61
Pipe 52	440	27.30	0.70
Pipe 16	100	-62.33	0.71
Pipe 1	450	-12.60	0.82
Pipe 26	380	8.40	0.86
Pipe 18	600	28.08	0.89
Pipe 42	600	14.70	0.96
Pipe 41	600	-39.60	1.01
Pipe 28	600	17.59	1.15
Pipe 5	230	12.60	1.29
Pipe 4	570	21.00	1.37
Pipe 2	350	-21.00	1.37
Pipe 11	600	23.10	1.51
Pipe 21	600	23.10	1.51

Link ID	Length ft	Flow GPM	Velocity fps
Pipe 21	600	23.10	1.51
Pipe 3	700	25.20	1.65
Valve 57	#N/A	145.68	1.65
Pipe 58	800	148.41	1.68
Valve 59	#N/A	148.41	1.68
Pipe 13	100	-152.61	1.73
Pipe 30	600	-30.71	2.01
Pipe 43	600	-79.50	2.03
Pipe 47	150	-65.20	2.06
Pipe 9	500	66.42	2.09
Pipe 54	120	83.77	2.14
Pipe 53	540	21.00	2.14
Pipe 31	900	-208.02	2.36
Pipe 7	760	94.50	2.41
Pipe 32	730	-218.52	2.48
Pipe 20	260	38.59	2.52
Pipe 33	600	-231.12	2.62
Valve 51	#N/A	60.80	2.76
Pipe 34	1400	-250.02	2.84
Pipe 19	300	92.40	2.91
Pipe 44	500	119.40	3.05
Pipe 10	350	67.20	3.05
Pipe 35	500	-268.92	3.05
Pipe 6	270	123.90	3.16
Pipe 48	10	126.00	3.22
Pipe 56	10	126.00	3.22
Pipe 38	1000	-286.02	3.25
Pipe 55	150	304.92	3.46
Valve 49	#N/A	144.88	3.70
Pipe 17	120	145.68	4.59
Valve 12	#N/A	430.62	4.89
Pipe 25	100	203.17	5.19
Pipe 60	100	227.45	5.81