APPENDIX C – Outputs and Results

1. **Demand Projections, Water and Wastewater (2 pages)**
2. **Water Model Results (6 pages)**
3. **Storage Capacity Analysis (10 pages)**
4. **Force Main Size Determination – Primary Line (2 pages)**
5. **Cost Estimates, Initial Water and Sewer Phases (4 pages)**

Zion Crossroad Service Area - Water and Wastewater Demand Projections (1/12/15) - Normal Demands

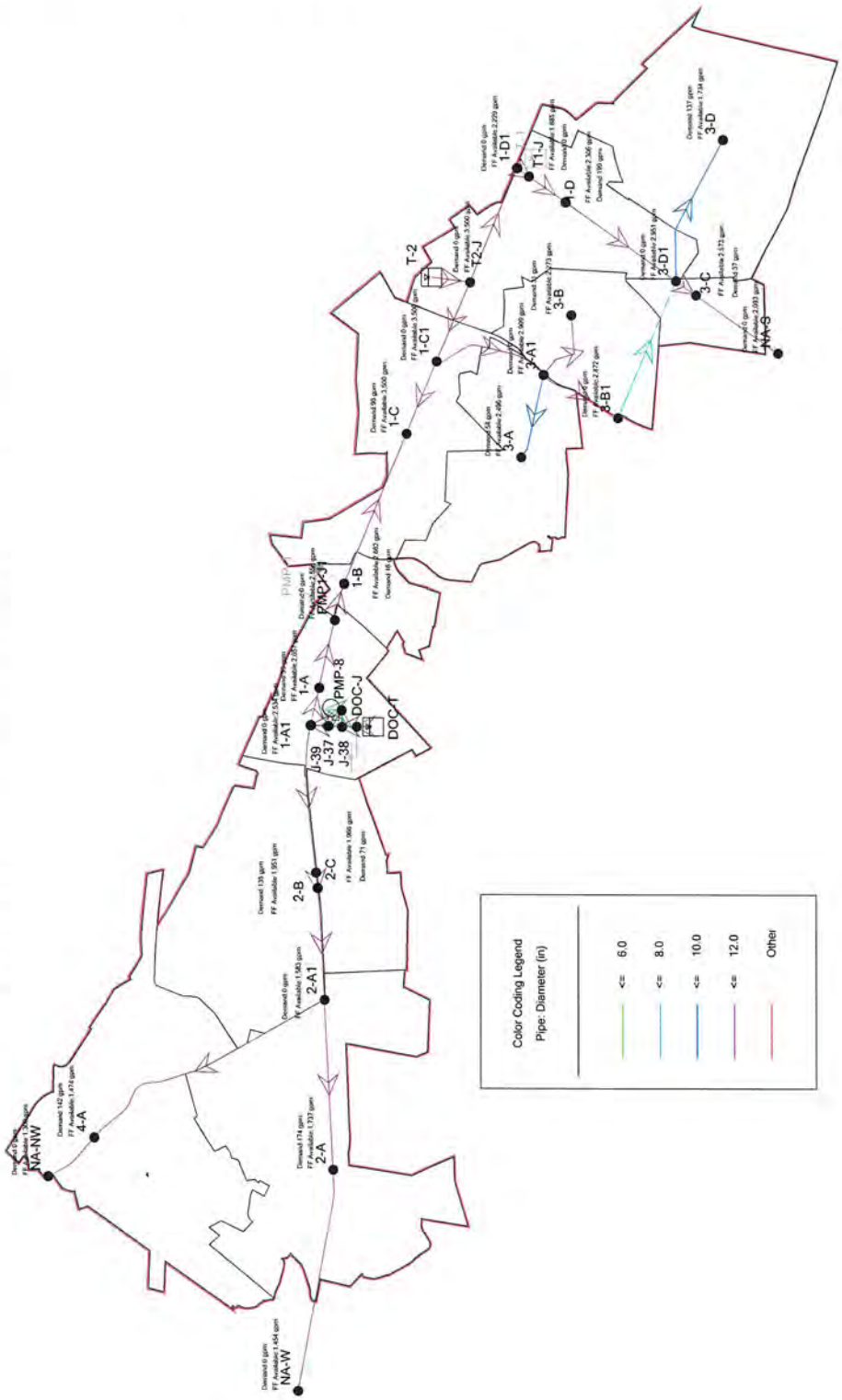
Service Area	Total Area (acres)	ROW	Total Area (minus ROW)	Undevelopable Area (C)	Developable Land (acres)	Assumed Land Use	Developable (acres)	Unit Flow (gpd/ac)	Total Avg. Flow (GPD) - Full Buildout	Total Avg. Flow (GPD) - 50% Buildout
1-A	273	17	256	12	244	Existing DOC	130	0	0	0
						R-1	20	500	10,247	5,123
						I/OI	93	800	74,369	37,184
Sub-Area 1-A Subtotal							244		84,616	42,308
1-B	111	7	103	22	81	Existing	49	100	4,875	2,437
						R-1	19	500	9,728	4,864
						I/OI	13	800	10,383	5,191
Sub-Area 1-B Subtotal							81		24,985	12,493
1-C	433	36	397	98	299	Existing	33	100	3,266	1,633
						R-1	246	500	123,107	61,554
						RC	5	1000	5,210	2,605
						OS	15	800	12,162	6,081
Sub-Area 1-C Subtotal							299		143,745	71,872
1-D	395	45	350	41	309	Existing	49	100	4,875	2,438
						RM1	149	1500	223,748	111,874
						OS	111	800	89,055	44,527
Sub-Area 1-D Subtotal							309		317,677	158,839
Service Area 1 Total	**1212**	**106**	**1106**	**173**	**933**		**933**		**571,023**	**285,512**
2-A	732	22	710	235	475	Existing	42	100	4,203	2,102
						OS	30	800	24,304	12,152
						RC	15	1000	14,623	7,312
						I/OI	135	800	108,263	54,131
						R-1	253	500	126,426	63,213
Sub-Area 2-A Subtotal							475		277,820	138,910
2-B	494	17	476	73	403	Existing	50	100	5,003	2,502
						OS	43	800	34,192	17,096
						RC	36	1000	36,339	18,170
						I/OI	9	800	6,871	3,435
						R-1	266	500	133,111	66,555
Sub-Area 2-B Subtotal							404		215,517	107,758
2-C	218	8	210	10	199	Existing	22	100	2,163	1,082
						R-1	108	500	54,005	27,003
						I/OI	71	800	56,995	28,498
Sub-Area 2-C Subtotal							201		113,164	56,582
Service Area 2 Total	**1444**	**47**	**1396**	**319**	**1077**		1,080		**606,501**	**303,250**
3-A	357	11	346	113	233	Existing	58	100	5,759	2,880
						R-1	176	500	87,793	43,896
						I-1	0	800	0	0
Sub-Area 3-A Subtotal							233		93,552	46,776
3-B	261	14	247	45	202	Existing	28	100	2,758	1,379
						OS	13	800	10,524	5,262
						I/OI	166	800	132,451	66,225
Sub-Area 3-B Subtotal							206		145,732	72,866
3-C	118	11	107	26	80	Existing	0	100	0	0
						OS	37	800	29,730	14,865
						I/OI	25	800	19,752	9,876
						R-1	19	500	9,354	4,677
Sub-Area 3-C Subtotal							81		58,836	29,418
3-D	597	2	595	157	438	Existing	12	100	1,178	589
						OS	17	800	13,378	6,689
						R-1	409	500	204,744	102,372
Sub-Area 3-D Subtotal							438		219,300	109,650
Service Area 3 Total	**1333**	**38**	**1295**	**342**	**953**		958		517,420	258,710
4-A	682	125	557	200	357	Existing	82	100	8,241	4,120
						OS	31	800	24,651	12,325
						RC	40	1000	40,318	20,159
						I/OI	176	800	140,859	70,430
						R-1	27	500	13,598	6,799
Service Area 4 Total	**682**	**125**	**557**	**200**	**357**		357		227,667	113,834
Total, SA (1 thru 4)	**4670**	**316**	**4354**	**1034**	**3321**		**3,328**		**1,922,611**	**961,306**

Zion Crossroad Service Area - Water and Wastewater Demand Projections (1/12/15) - Upper Demands

Service Area	Total Area (acres)	ROW	Total Area (minus ROW)	Undevelopable Area (C)	Developable Land (acres)	Assumed Land Use	Developable (acres)	Unit Flow (gpd/ac)	Total Avg. Flow (GPD) - Full Buildout	Total Avg. Flow (GPD) - 50% Buildout
1-A	273	17	256	12	244	Existing DOC	130	0	0	0
						R-2	20	800	16,395	8,197
						I/OI2	93	1200	111,553	55,777
Sub-Area 1-A Subtotal							244		127,948	63,974
1-B	111	7	103	22	81	Existing	49	100	4,875	2,437
						R-2	19	800	15,565	7,782
						I/OI2	13	1200	15,574	7,787
Sub-Area 1-B Subtotal							81		36,014	18,007
1-C	433	36	397	98	299	Existing	33	100	3,266	1,633
						R-2	246	800	196,972	98,486
						RC	5	1000	5,210	2,605
						OS	15	800	12,162	6,081
Sub-Area 1-C Subtotal							299		217,609	108,805
1-D	395	45	350	41	309	Existing	49	100	4,875	2,438
						RM2	149	2000	298,330	149,165
						OS	111	800	89,055	44,527
Sub-Area 1-D Subtotal							309		392,260	196,130
Service Area 1 Total	**1212**	**106**	**1106**	**173**	**933**		**933**		**773,831**	**386,915**
2-A	732	22	710	235	475	Existing	42	100	4,203	2,102
						OS	30	800	24,304	12,152
						RC	15	1000	14,623	7,312
						I/OI2	135	1200	162,394	81,197
						R-2	253	800	202,281	101,141
Sub-Area 2-A Subtotal							475		407,807	203,903
2-B	494	17	476	73	403	Existing	50	100	5,003	2,502
						OS	43	800	34,192	17,096
						RC	36	1000	36,339	18,170
						I/OI2	9	1200	10,306	5,153
						R-2	266	800	212,977	106,489
Sub-Area 2-B Subtotal							404		298,819	149,409
2-C	218	8	210	10	199	Existing	22	100	2,163	1,082
						R-2	108	800	86,409	43,204
						I/OI2	71	1200	85,493	42,746
Sub-Area 2-C Subtotal							201		174,065	87,033
Service Area 2 Total	**1444**	**47**	**1396**	**319**	**1077**		**1,080**		**880,690**	**440,345**
3-A	357	11	346	113	233	Existing	58	100	5,759	2,880
						R-2	176	800	140,468	70,234
						I-1	0	800	0	0
Sub-Area 3-A Subtotal							233		146,227	73,114
3-B	261	14	247	45	202	Existing	28	100	2,758	1,379
						OS	13	800	10,524	5,262
						I/OI2	166	1200	198,676	99,338
Sub-Area 3-B Subtotal							206		211,957	105,979
3-C	118	11	107	26	80	Existing	0	100	0	0
						OS	37	800	29,730	14,865
						I/OI2	25	1200	29,627	14,814
						R-2	19	800	14,967	7,484
Sub-Area 3-C Subtotal							81		74,325	37,162
3-D	597	2	595	157	438	Existing	12	100	1,178	589
						OS	17	800	13,378	6,689
						R-2	409	800	327,591	163,795
Sub-Area 3-D Subtotal							438		342,146	171,073
Service Area 3 Total	**1333**	**38**	**1295**	**342**	**953**		**958**		**774,656**	**387,328**
4-A	682	125	557	200	357	Existing	82	100	8,241	4,120
						OS	31	800	24,651	12,325
						RC	40	1000	40,318	20,159
						I/OI2	176	1200	211,289	105,645
						R-2	27	800	21,758	10,879
Service Area 4 Total	**682**	**125**	**557**	**200**	**357**		**357**		**306,256**	**153,128**
Total, SA (1 thru 4)	**4670**	**316**	**4354**	**1034**	**3321**		**3,328**		**2,735,433**	**1,367,717**

2. Water Model Results

Scenario: 50% Buildout + Fireflow + DOC Booster Sta



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Bentley WaterCAD V8i (SELECTseries 2)
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50% Buildout + Fire Flow + Zones Connected+ DOC with Booster Sta Scenario: Pipe Table

Label	Diameter (in)	Length (ft)	Hazen-Williams C	Start Node	Stop Node	Material	Flow (gpm)	Velocity (ft/s)	Travel Time (hrs)
250.6	12	392	120	2-B	2-C	PVC	-451	1.28	0.085
250.9	12	5,724	120	2-A	NA-W	PVC	0	0	(N/A)
15.2	12	639	120	3-C	3-D1	PVC	-37	0.1	1.691
250.4	12	983	120	1-A1	1-A	PVC	74	0.21	1.298
15.1	12	3,488	120	1-D	3-D1	PVC	96	0.27	3.562
799.1	12	1,554	120	NA-NW	4-A	PVC	0	0	(N/A)
15.3	12	2,583	120	NA-S	3-C	PVC	0	0	(N/A)
631	12	3,084	120	3-A1	1-C1	PVC	-167	0.47	1.807
631E	12	1,992	120	3-A1	3-B	PVC	31	0.09	6.291
799	12	7,079	120	4-A	2-A1	PVC	-142	0.4	4.881
250.1	12	2,004	120	1-C	1-C1	PVC	-85	0.24	2.313
631W	10	2,197	120	3-A1	3-A	PVC	58	0.24	2.575
631.1	12	2,228	120	3-B1	3-A1	PVC	-78	0.22	2.793
250.7	12	2,862	120	2-A1	2-B	PVC	-316	0.9	0.887
250.5	12	3,794	120	2-C	1-A1	PVC	-522	1.48	0.712
15E	10	3,905	120	3-D1	3-D	PVC	137	0.56	1.938
15W	8	3,805	120	3-B1	3-D1	PVC	78	0.5	2.12
250.2	12	4,165	120	1-B	1-C	PVC	5	0.01	78.708
250.8	12	4,333	120	2-A	2-A1	PVC	-174	0.49	2.438
P-20	12	1,778	120	1-A	PMP1-J1	PVC	21	0.06	8.218
P-21	12	964	120	PMP1-J1	1-B	PVC	21	0.06	4.457
P-22	8	757	120	PMP1-J1	PMP-1	PVC	(N/A)	(N/A)	(N/A)
P-23	8	987	120	PMP-1	PMP1-J2	PVC	(N/A)	(N/A)	(N/A)
P-24	12	3,298	120	1-D1	T2-J	PVC	-295	0.84	1.095
P-25	12	2,193	120	T2-J	1-C1	PVC	252	0.71	0.852
P-26	12	1,008	120	T2-J	T-2	PVC	-547	1.55	0.18
P-27	12	1,149	120	T1-J	1-D	PVC	295	0.84	0.381
P-28	12	366	120	1-D1	T1-J	PVC	295	0.84	0.121
P-29	8	490	120	T1-J	T-1	PVC	(N/A)	(N/A)	(N/A)
P-31	8	774	120	PMP1-J2	1-B	PVC	(N/A)	(N/A)	(N/A)
P-34	12	796	120	DOC-R	DOC-J	PVC	(N/A)	(N/A)	(N/A)
P-36	12	423	120	DOC-J	DOC-T	PVC	-596	1.69	0.002
P-40	12	450	120	J-37	1-A1	PVC	596	1.69	0.074
P-41	12	378	120	DOC-J	J-38	PVC	596	1.69	0.062
P-42	12	356	120	J-38	J-37	PVC	(N/A)	(N/A)	(N/A)
P-43	6	426	130	J-38	J-39	Ductile Iron	596	6.76	0.018
P-44	6	320	130	J-39	PMP-8	Ductile Iron	596	6.76	0.013
P-45	6	427	130	PMP-8	J-37	Ductile Iron	596	6.76	0.018

(N/A) = inactive
neg sign (-) = flow going in the opposite direction than the pipe was drawn

50% Buildout + Fire Flow + Zones Connected+ DOC with Booster Sta Scenario: Junctions Table

Label	Zone	Elevation (ft)	Demand (gpm)	Pressure (psi)	Hydarulic Grade (ft)
3-D	East	452	137	82.3	642.22
3-B1	East	488	0	67.3	643.64
1-D1	East	544	0	43.1	643.52
1-C1	East	476	0	72.7	644.03
2-A1	West	456	0	79.3	639.39
NA-W	West	408	0	99.9	638.89
NA-NW	West	444	0	84.3	638.83
1-D	East	528	199	49.8	643.06
3-B	East	508	31	58.7	643.69
3-A	East	436	58	89.8	643.62
3-A1	East	504	0	60.4	643.7
1-C	East	476	90	72.7	643.97
1-B	East	476	16	72.7	643.97
1-A	West	452	53	83.1	643.98
1-A1	West	456	0	81.3	644
2-C	West	444	71	85.1	640.65
2-B	West	440	135	86.7	640.39
2-A	West	392	174	106.8	638.89
4-A	West	420	142	94.7	638.83
3-C	East	480	37	70.5	642.92
3-D1	East	464	0	77.4	642.92
NA-S	East	484	0	68.8	642.92
PMP1-J1	West	476	0	72.7	643.97
PMP1-J2	West	500	(N/A)	(N/A)	(N/A)
T2-J	East	508	0	59.1	644.53
T1-J	East	554	0	38.7	643.41
DOC-J	West	550.52	0	21.4	599.99
J-37	<None>	491.97	0	66	644.51
J-38	<None>	520.35	0	34.3	599.56
J-39	<None>	450	0	59.5	587.43

50% Buildout + Fire Flow + Zones Connected+ DOC with Booster Sta Scenario: Fire Flow Table

Label	Zone	Elevation (ft)	Demand (gpm)	Satisfies Fire Flow Constraints?	Fire Flow (Needed, gpm)	Fire Flow (Available, gpm)	Junction w/ Minimum Pressure (System)	Presure (Calculated System Lower Limit, psi)
3-D	East	452	137	TRUE	1,000	1,734	DOC-J	21.4
3-B1	East	488	0	TRUE	1,000	2,872	DOC-J	21.4
1-D1	East	544	0	TRUE	1,000	2,229	T1-J	15.7
1-C1	East	476	0	TRUE	1,000	3,500	T1-J	21.1
2-A1	West	456	0	TRUE	1,000	1,583	DOC-J	21.4
NA-W	West	408	0	TRUE	1,000	1,454	DOC-J	21.4
NA-NW	West	444	0	TRUE	1,000	1,300	DOC-J	21.4
1-D	East	528	199	TRUE	1,000	2,306	T1-J	14.1
3-B	East	508	31	TRUE	1,000	2,273	DOC-J	21.4
3-A	East	436	58	TRUE	1,000	2,496	DOC-J	21.4
3-A1	East	504	0	TRUE	1,000	2,909	3-B	18.3
1-C	East	476	90	TRUE	1,000	3,500	J-37	16.6
1-B	East	476	16	TRUE	1,000	2,662	J-37	15
1-A	West	452	53	TRUE	1,000	2,657	J-37	3.9
1-A1	West	456	0	TRUE	1,000	2,534	J-37	5.2
2-C	West	444	71	TRUE	1,000	1,966	2-A1	14.3
2-B	West	440	135	TRUE	1,000	1,951	2-A1	12.6
2-A	West	392	174	TRUE	1,000	1,737	2-A1	10.6
4-A	West	420	142	TRUE	1,000	1,474	NA-NW	9.6
3-C	East	480	37	TRUE	1,000	2,573	T1-J	12.2
3-D1	East	464	0	TRUE	1,000	2,951	T1-J	5.6
NA-S	East	484	0	TRUE	1,000	2,093	T1-J	19.6
PMP1-J1	West	476	0	TRUE	1,000	2,550	J-37	14.7
PMP1-J2	West	500	(N/A)	(N/A)	1,000	(N/A)	(N/A)	(N/A)
T2-J	East	508	0	TRUE	1,000	3,500	DOC-J	21.4
T1-J	East	554	0	TRUE	1,000	1,885	DOC-J	21.4
DOC-J	West	550.52	0	TRUE	1,000	3,500	J-38	34.1
J-37	<None>	491.97	0	TRUE	1,000	2,111	DOC-J	21.4
J-38	<None>	520.35	0	TRUE	1,000	3,500	DOC-J	21.2
J-39	<None>	450	0	TRUE	1,000	2,142	DOC-J	21.4

50% Buildout + Fire Flow + Zones Connected+ DOC with Booster Sta Scenario: Tanks Table								
Label	Zone	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Diameter (ft)	Flow (Out Net) (gpm)	Hydraulic Grade (ft)
T-2	East	508	628	645.5	663	50	547	645.5

50% Buildout + Fire Flow + Zones Connected+ DOC with Booster Sta Scenario: Pumps Table						
Label	Elevation (ft)	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
PMP-8	491.97	On	578.32	656.65	596	78.33

Pump Curve: PMP-8 (Booster Station)

	Flow (gpm)	Head (ft)
Shuroff:	0	104
Design:	600	78
Max. Operating:	1,200	0

3. STORAGE CAPACITY ANALYSIS

REQUIRED STORAGE CAPACITY (NORMAL DEMANDS)

	10% Build-Out	50% Build-Out	100% Build-Out
1. FIRE FLOW (Industrial or Domestic/Commercial) Domestic/Commercial: 1,500 gpm @ 2 hours	180,000 gallons	180,000 gallons	180,000 gallons
2. EQUALIZATION Peak Hour Storage Analysis	80,000 gallons	420,000 gallons	840,000 gallons
3. EMERGENCY 15% (Future) Peak Day Flow	50,000 gallons	260,000 gallons	520,000 gallons
TOTAL REQUIRED STORAGE	310,000 gallons	860,000 gallons	1,540,000 gallons

Zion Crossroad Service Area - Water Storage Capacity Analysis - Normal Demands (3/16/15)

Service Area	Total Area (acres)	Developable (acres)	Unit Flow (gpd/ac)	Total Avg. Flow (GPD) - Full Buildout	Total Max Day Flow (GPD) (Full Bldout)	Total Max Day Flow (gpm) (Full Bldout)	Total Avg. Flow (GPD) - 50% Buildout	Total Max Day Flow 50% (GPD)	Total Max Day Flow 50% (gpm)	Total Avg. Flow (GPD) - 10% Buildout	Total Max Day Flow 10% (GPD)	Total Max Day Flow 10% (gpm)
1-A	273	130	0	0	0	0	0	0	0	0	0	0
		20	500	10,247	18,444	13	5,123	9,222	6	1,025	1,844	1
		93	800	74,369	133,864	93	37,184	66,932	46	7,437	13,386	9
		244		84,616	152,309	106	42,308	76,154	53	8,462	15,231	11
1-B	111	49	100	4,875	8,774	6	2,437	4,387	3	487	877	1
		19	500	9,728	17,511	12	4,864	8,755	6	973	1,751	1
		13	800	10,383	18,689	13	5,191	9,344	6	1,038	1,869	1
		81		24,985	44,974	31	12,493	22,487	16	2,499	4,497	3
1-C	433	33	100	3,266	5,878	4	1,633	2,939	2	327	588	0
		246	500	123,107	221,593	154	61,554	110,797	77	12,311	22,159	15
		5	1000	5,210	9,378	7	2,605	4,689	3	521	938	1
		15	800	12,162	21,891	15	6,081	10,945	8	1,216	2,189	2
		299		143,745	258,740	180	71,872	129,370	90	14,374	25,874	18
1-D	395	49	100	4,875	8,775	6	2,438	4,388	3	488	878	1
		149	1500	223,748	402,746	280	111,874	201,373	140	22,375	40,275	28
		111	800	89,055	160,299	111	44,527	80,149	56	8,905	16,030	11
		309		317,677	571,819	397	158,839	285,910	199	31,768	57,182	40
Service Area 1 Total	**1212**	**933**		571,023	1,027,842	714	285,512	513,921	357	57,102	102,784	71
2-A	732	42	100	4,203	7,566	5	2,102	3,783	3	420	757	1
		30	800	24,304	43,748	30	12,152	21,874	15	2,430	4,375	3
		15	1000	14,623	26,322	18	7,312	13,161	9	1,462	2,632	2
		135	800	108,263	194,873	135	54,131	97,437	68	10,826	19,487	14
		253	500	126,426	227,567	158	63,213	113,783	79	12,643	22,757	16
		475		277,820	500,075	347	138,910	250,038	174	27,782	50,008	35
2-B	494	50	100	5,003	9,006	6	2,502	4,503	3	500	901	1
		43	800	34,192	61,546	43	17,096	30,773	21	3,419	6,155	4
		36	1000	36,339	65,411	45	18,170	32,705	23	3,634	6,541	5
		9	800	6,871	12,367	9	3,435	6,184	4	687	1,237	1
		266	500	133,111	239,600	166	66,555	119,800	83	13,311	23,960	17
		404		215,517	387,930	269	107,758	193,965	135	21,552	38,793	27
2-C	218	22	100	2,163	3,894	3	1,082	1,947	1	216	389	0
		108	500	54,005	97,210	68	27,003	48,605	34	5,401	9,721	7
		71	800	56,995	102,591	71	28,498	51,296	36	5,700	10,259	7
		201		113,164	203,696	141	56,582	101,848	71	11,316	20,370	14
Service Area 2 Total	**1444**	1,080		606,501	1,091,701	758	303,250	545,851	379	60,650	109,170	76
3-A	357	58	100	5,759	10,367	7	2,880	5,183	4	576	1,037	1
		176	500	87,793	158,027	110	43,896	79,013	55	8,779	15,803	11
		0	800	0	0	0	0	0	0	0	0	0
		233		93,552	168,393	117	46,776	84,197	58	9,355	16,839	12
3-B	261	28	100	2,758	4,964	3	1,379	2,482	2	276	496	0
		13	800	10,524	18,942	13	5,262	9,471	7	1,052	1,894	1
		166	800	132,451	238,411	166	66,225	119,206	83	13,245	23,841	17
		206		145,732	262,318	182	72,866	131,159	91	14,573	26,232	18
3-C	118	0	100	0	0	0	0	0	0	0	0	0
		37	800	29,730	53,515	37	14,865	26,757	19	2,973	5,351	4
		25	800	19,752	35,553	25	9,876	17,776	12	1,975	3,555	2
		19	500	9,354	16,838	12	4,677	8,419	6	935	1,684	1
		81		58,836	105,905	74	29,418	52,953	37	5,884	10,591	7
3-D	597	12	100	1,178	2,120	1	589	1,060	1	118	212	0
		17	800	13,378	24,080	17	6,689	12,040	8	1,338	2,408	2
		409	500	204,744	368,539	256	102,372	184,270	128	20,474	36,854	26
		438		219,300	394,740	274	109,650	197,370	137	21,930	39,474	27
Service Area 3 Total	**1333**	958		517,420	931,356	647	258,710	465,678	323	51,742	93,136	65
4-A	682	82	100	8,241	14,833	10	4,120	7,416	5	824	1,483	1
		31	800	24,651	44,371	31	12,325	22,186	15	2,465	4,437	3
		40	1000	40,318	72,573	50	20,159	36,286	25	4,032	7,257	5
		176	800	140,859	253,547	176	70,430	126,774	88	14,086	25,355	18
		27	500	13,598	24,477	17	6,799	12,239	8	1,360	2,448	2
Service Area 4 Total		357		227,667	409,801	285	113,834	204,901	142	22,767	40,980	28
Total, SA (1 thru 4)	**4670**	**3,328**		**1,922,611**	**3,460,700**	**2,403**	**961,306**	**1,730,350**	**1,202**	**192,261**	**346,070**	**240**

ZION CROSSROADS SERVICE AREA - FLUVANNA COUNTY (10% BUILDOUT NORMAL)

DETERMINE REQUIRED PEAK HOUR STORAGE

Use Typical Diurnal Demand Curve

Time	Water Use/ Dwelling	Normalized Demand	Gallons/ Hour	Cumulative Use (gal)	Cumulative Average (gal)	Difference (gal)
12 AM	160	0.23	3,311	3,311	14,420	11,109
1 AM	50	0.07	1,035	4,345	28,839	24,494
2 AM	55	0.08	1,138	5,483	43,259	37,775
3 AM	50	0.07	1,035	6,518	57,678	51,160
4 AM	60	0.09	1,242	7,759	72,098	64,338
5 AM	200	0.29	4,138	11,898	86,517	74,620
6 AM	340	0.49	7,035	18,933	100,937	82,004
7 AM	580	0.83	12,001	30,934	115,357	84,422
8 AM	750	1.08	15,519	46,453	129,776	83,323
9 AM	960	1.38	19,864	66,317	144,196	77,879
10 AM	700	1.00	14,484	80,801	158,615	77,814
11 AM	1,170	1.68	24,209	105,011	173,035	68,024
12 PM	740	1.06	15,312	120,323	187,455	67,132
1 PM	660	0.95	13,657	133,979	201,874	67,895
2 PM	730	1.05	15,105	149,084	216,294	67,209
3 PM	630	0.90	13,036	162,120	230,713	68,593
4 PM	1,240	1.78	25,658	187,778	245,133	57,355
5 PM	1,340	1.92	27,727	215,505	259,552	44,048
6 PM	1,560	2.24	32,279	247,784	273,972	26,188
7 PM	1,470	2.11	30,417	278,201	288,392	10,191
8 PM	1,470	2.11	30,417	308,618	302,811	5,807
9 PM	1,110	1.59	22,968	331,586	317,231	14,355
10 PM	410	0.59	8,484	340,069	331,650	8,419
11 PM	290	0.42	6,001	346,070	346,070	0
Average	696.875	1.00			Maximum =	84,422

(50% Buildout) Peak Day Flow =	240	gpm	(average flow on a peak day)
Equalization Storage Req'd =	84,422	gallons	
say	80,000	gallons	

ZION CROSSROADS SERVICE AREA - FLUVANNA COUNTY (50% BUILDOUT NORMAL)

Use Typical Diurnal Demand Curve

Time	Water Use/ Dwelling	Normalized Demand	Gallons/ Hour	Cumulative Use (gal)	Cumulative Average (gal)	Difference (gal)
12 AM	160	0.23	16,553	16,553	72,098	55,544
1 AM	50	0.07	5,173	21,726	144,196	122,469
2 AM	55	0.08	5,690	27,417	216,294	188,877
3 AM	50	0.07	5,173	32,590	288,392	255,802
4 AM	60	0.09	6,208	38,797	360,490	321,692
5 AM	200	0.29	20,692	59,489	432,587	373,099
6 AM	340	0.49	35,176	94,665	504,685	410,021
7 AM	580	0.83	60,006	154,671	576,783	422,112
8 AM	750	1.08	77,594	232,265	648,881	416,616
9 AM	960	1.38	99,321	331,586	720,979	389,393
10 AM	700	1.00	72,421	404,007	793,077	389,070
11 AM	1,170	1.68	121,047	525,054	865,175	340,121
12 PM	740	1.06	76,560	601,613	937,273	335,659
1 PM	660	0.95	68,283	669,896	1,009,371	339,474
2 PM	730	1.05	75,525	745,421	1,081,469	336,047
3 PM	630	0.90	65,179	810,600	1,153,567	342,966
4 PM	1,240	1.78	128,289	938,889	1,225,665	286,775
5 PM	1,340	1.92	138,635	1,077,524	1,297,762	220,238
6 PM	1,560	2.24	161,396	1,238,920	1,369,860	130,940
7 PM	1,470	2.11	152,085	1,391,005	1,441,958	50,954
8 PM	1,470	2.11	152,085	1,543,089	1,514,056	29,033
9 PM	1,110	1.59	114,839	1,657,929	1,586,154	71,775
10 PM	410	0.59	42,418	1,700,347	1,658,252	42,095
11 PM	290	0.42	30,003	1,730,350	1,730,350	0
Average	696.875	1.00			Maximum =	422,112

(50% Buildout) Peak Day Flow = 1,202 gpm (average flow on a peak day)

Equalization Storage Req'd = 422,112 gallons

say 420,000 gallons

ZION CROSSROADS SERVICE AREA - FLUVANNA COUNTY (100% BUILDOUT NORMAL)

Use Typical Diurnal Demand Curve

Time	Water Use/ D\	Normalized Demand	Gallons/ Hour	Cumulative (gal)	Cumulative Average (gal)	Difference (gal)
12 AM	160	0.23	33,107	33,107	144,196	111,089
1 AM	50	0.07	10,346	43,453	288,392	244,939
2 AM	55	0.08	11,380	54,833	432,587	377,754
3 AM	50	0.07	10,346	65,179	576,783	511,604
4 AM	60	0.09	12,415	77,594	720,979	643,385
5 AM	200	0.29	41,384	118,978	865,175	746,197
6 AM	340	0.49	70,352	189,330	1,009,371	820,041
7 AM	580	0.83	120,012	309,342	1,153,567	844,225
8 AM	750	1.08	155,188	464,530	1,297,762	833,232
9 AM	960	1.38	198,641	663,171	1,441,958	778,787
10 AM	700	1.00	144,842	808,014	1,586,154	778,140
11 AM	1,170	1.68	242,094	1,050,108	1,730,350	680,242
12 PM	740	1.06	153,119	1,203,227	1,874,546	671,319
1 PM	660	0.95	136,566	1,339,793	2,018,742	678,949
2 PM	730	1.05	151,050	1,490,843	2,162,937	672,095
3 PM	630	0.90	130,358	1,621,201	2,307,133	685,932
4 PM	1,240	1.78	256,578	1,877,779	2,451,329	573,550
5 PM	1,340	1.92	277,270	2,155,049	2,595,525	440,476
6 PM	1,560	2.24	322,792	2,477,840	2,739,721	261,880
7 PM	1,470	2.11	304,169	2,782,010	2,883,917	101,907
8 PM	1,470	2.11	304,169	3,086,179	3,028,112	58,066
9 PM	1,110	1.59	229,679	3,315,857	3,172,308	143,549
10 PM	410	0.59	84,836	3,400,694	3,316,504	84,190
11 PM	290	0.42	60,006	3,460,700	3,460,700	0
Average	696.875	1.00			Maximum =	844,225

(Future) Peak Day Flow =	2,403	gpm
Equalization Storage Req'd =	844,225	gallons
say	840,000	gallons

REQUIRED STORAGE CAPACITY (UPPER DEMANDS)

	10% Build-Out	50% Build-Out	100% Build-Out
1. FIRE FLOW (Industrial or Domestic/Commercial) Domestic/Commercial: 1,500 gpm @ 2 hours	180,000 gallons	180,000 gallons	180,000 gallons
2. EQUALIZATION Peak Hour Storage Analysis	120,000 gallons	600,000 gallons	1,200,000 gallons
3. EMERGENCY 15% (Future) Peak Day Flow	70,000 gallons	370,000 gallons	740,000 gallons
TOTAL REQUIRED STORAGE	370,000 gallons	1,150,000 gallons	2,120,000 gallons

Zion Crossroad Service Area - Water Storage Capacity Analysis - Upper Demands (3/16/15)

Service Area	Total Area (acres)	Developable (acres)	Unit Flow (gpd/ac)	Total Avg. Flow (GPD) - Full Buildout	Total Max Day Flow (GPD) (Full Bldout)	Total Max Day Flow (gpm) (Full Bldout)	Total Avg. Flow (GPD) - 50% Buildout	Total Max Day Flow 50% (GPD)	Total Max Day Flow 50% (gpm)	Total Avg. Flow (GPD) - 10% Buildout	Total Max Day Flow 10% (GPD)	Total Max Day Flow 10% (gpm)
1-A	273	130	0	0	0	0	0	0	0	0	0	0
		20	800	16,395	29,511	20	8,197	14,755	10	1,639	2,951	2
		93	1200	111,553	200,796	139	55,777	100,398	70	11,155	20,080	14
		244		127,948	230,307	160	63,974	115,154	80	12,795	23,031	16
1-B	111	49	100	4,875	8,774	6	2,437	4,387	3	487	877	1
		19	800	15,565	28,017	19	7,782	14,008	10	1,556	2,802	2
		13	1200	15,574	28,033	19	7,787	14,017	10	1,557	2,803	2
		81		36,014	64,824	45	18,007	32,412	23	3,601	6,482	5
1-C	433	33	100	3,266	5,878	4	1,633	2,939	2	327	588	0
		246	800	196,972	354,549	246	98,486	177,275	123	19,697	35,455	25
		5	1000	5,210	9,378	7	2,605	4,689	3	521	938	1
		15	800	12,162	21,891	15	6,081	10,945	8	1,216	2,189	2
		299		217,609	391,696	272	108,805	195,848	136	21,761	39,170	27
1-D	395	49	100	4,875	8,775	6	2,438	4,388	3	488	878	1
		149	2000	298,330	536,994	373	149,165	268,497	186	29,833	53,699	37
		111	800	89,055	160,299	111	44,527	80,149	56	8,905	16,030	11
		309		392,260	706,068	490	196,130	353,034	245	39,226	70,607	49
Service Area 1 Total	**1212**	**933**		773,831	1,392,896	967	386,915	696,448	484	77,383	139,290	97
2-A	732	42	100	4,203	7,566	5	2,102	3,783	3	420	757	1
		30	800	24,304	43,748	30	12,152	21,874	15	2,430	4,375	3
		15	1000	14,623	26,322	18	7,312	13,161	9	1,462	2,632	2
		135	1200	162,394	292,310	203	81,197	146,155	101	16,239	29,231	20
		253	800	202,281	364,107	253	101,141	182,053	126	20,228	36,411	25
		475		407,807	734,052	510	203,903	367,026	255	40,781	73,405	51
2-B	494	50	100	5,003	9,006	6	2,502	4,503	3	500	901	1
		43	800	34,192	61,546	43	17,096	30,773	21	3,419	6,155	4
		36	1000	36,339	65,411	45	18,170	32,705	23	3,634	6,541	5
		9	1200	10,306	18,551	13	5,153	9,275	6	1,031	1,855	1
		266	800	212,977	383,359	266	106,489	191,680	133	21,298	38,336	27
		404		298,819	537,874	374	149,409	268,937	187	29,882	53,787	37
2-C	218	22	100	2,163	3,894	3	1,082	1,947	1	216	389	0
		108	800	86,409	155,536	108	43,204	77,768	54	8,641	15,554	11
		71	1200	85,493	153,887	107	42,746	76,944	53	8,549	15,389	11
		201		174,065	313,317	218	87,033	156,659	109	17,407	31,332	22
Service Area 2 Total	**1444**	1,080		880,690	1,585,243	1,101	440,345	792,621	550	88,069	158,524	110
3-A	357	58	100	5,759	10,367	7	2,880	5,183	4	576	1,037	1
		176	800	140,468	252,843	176	70,234	126,421	88	14,047	25,284	18
		0	800	0	0	0	0	0	0	0	0	0
		233		146,227	263,209	183	73,114	131,605	91	14,623	26,321	18
3-B	261	28	100	2,758	4,964	3	1,379	2,482	2	276	496	0
		13	800	10,524	18,942	13	5,262	9,471	7	1,052	1,894	1
		166	1200	198,676	357,617	248	99,338	178,809	124	19,868	35,762	25
		206		211,957	381,523	265	105,979	190,762	132	21,196	38,152	26
3-C	118	0	100	0	0	0	0	0	0	0	0	0
		37	800	29,730	53,515	37	14,865	26,757	19	2,973	5,351	4
		25	1200	29,627	53,329	37	14,814	26,665	19	2,963	5,333	4
		19	800	14,967	26,941	19	7,484	13,470	9	1,497	2,694	2
		81		74,325	133,784	93	37,162	66,892	46	7,432	13,378	9
3-D	597	12	100	1,178	2,120	1	589	1,060	1	118	212	0
		17	800	13,378	24,080	17	6,689	12,040	8	1,338	2,408	2
		409	800	327,591	589,663	409	163,795	294,832	205	32,759	58,966	41
		438		342,146	615,863	428	171,073	307,932	214	34,215	61,586	43
Service Area 3 Total	**1333**	958		774,656	1,394,380	968	387,328	697,190	484	77,466	139,438	97
4-A	682	82	100	8,241	14,833	10	4,120	7,416	5	824	1,483	1
		31	800	24,651	44,371	31	12,325	22,186	15	2,465	4,437	3
		40	1000	40,318	72,573	50	20,159	36,286	25	4,032	7,257	5
		176	1200	211,289	380,321	264	105,645	190,160	132	21,129	38,032	26
		27	800	21,758	39,164	27	10,879	19,582	14	2,176	3,916	3
Service Area 4 Total		357		306,256	551,261	383	153,128	275,630	191	30,626	55,126	38
Total, SA (1 thru 4)	**4670**	**3,328**		**2,735,433**	**4,923,780**	**3,419**	**1,367,717**	**2,461,890**	**1,710**	**273,543**	**492,378**	**342**

ZION CROSSROADS SERVICE AREA - FLUVANNA COUNTY (10% BUILDOUT UPPER)

Use Typical Diurnal Demand Curve

Time	Water Use/ D\	Normalized Demand	Gallons/ Hour	Cumulative (gal)	Cumulative Average (gal)	Difference (gal)
12 AM	160	0.23	4,710	4,710	20,516	15,805
1 AM	50	0.07	1,472	6,182	41,031	34,849
2 AM	55	0.08	1,619	7,802	61,547	53,746
3 AM	50	0.07	1,472	9,273	82,063	72,790
4 AM	60	0.09	1,766	11,040	102,579	91,539
5 AM	200	0.29	5,888	16,928	123,094	106,167
6 AM	340	0.49	10,009	26,937	143,610	116,673
7 AM	580	0.83	17,075	44,012	164,126	120,114
8 AM	750	1.08	22,080	66,092	184,642	118,550
9 AM	960	1.38	28,262	94,354	205,157	110,803
10 AM	700	1.00	20,608	114,962	225,673	110,711
11 AM	1,170	1.68	34,444	149,406	246,189	96,783
12 PM	740	1.06	21,785	171,192	266,705	95,513
1 PM	660	0.95	19,430	190,622	287,220	96,599
2 PM	730	1.05	21,491	212,113	307,736	95,624
3 PM	630	0.90	18,547	230,660	328,252	97,592
4 PM	1,240	1.78	36,505	267,165	348,768	81,603
5 PM	1,340	1.92	39,449	306,614	369,283	62,670
6 PM	1,560	2.24	45,926	352,540	389,799	37,260
7 PM	1,470	2.11	43,276	395,816	410,315	14,499
8 PM	1,470	2.11	43,276	439,092	430,831	8,261
9 PM	1,110	1.59	32,678	471,770	451,346	20,424
10 PM	410	0.59	12,070	483,840	471,862	11,978
11 PM	290	0.42	8,537	492,378	492,378	0
Average	696.875	1.00			Maximum =	120,114

(Future) Peak Day Flow =	342	gpm
Equalization Storage Req'd =	120,114	gallons
say	120,000	gallons

ZION CROSSROADS SERVICE AREA - FLUVANNA COUNTY (50% BUILDOUT UPPER)

Use Typical Diurnal Demand Curve

Time	Water Use/ D\	Normalized Demand	Gallons/ Hour	Cumulative (gal)	Cumulative Average (gal)	Difference (gal)
12 AM	160	0.23	23,552	23,552	102,579	79,027
1 AM	50	0.07	7,360	30,912	205,157	174,246
2 AM	55	0.08	8,096	39,008	307,736	268,729
3 AM	50	0.07	7,360	46,367	410,315	363,948
4 AM	60	0.09	8,832	55,199	512,894	457,694
5 AM	200	0.29	29,440	84,639	615,472	530,834
6 AM	340	0.49	50,047	134,686	718,051	583,365
7 AM	580	0.83	85,375	220,061	820,630	600,569
8 AM	750	1.08	110,399	330,460	923,209	592,749
9 AM	960	1.38	141,310	471,770	1,025,787	554,017
10 AM	700	1.00	103,039	574,809	1,128,366	553,557
11 AM	1,170	1.68	172,222	747,031	1,230,945	483,914
12 PM	740	1.06	108,927	855,958	1,333,524	477,566
1 PM	660	0.95	97,151	953,108	1,436,102	482,994
2 PM	730	1.05	107,455	1,060,563	1,538,681	478,118
3 PM	630	0.90	92,735	1,153,298	1,641,260	487,962
4 PM	1,240	1.78	182,526	1,335,824	1,743,839	408,015
5 PM	1,340	1.92	197,246	1,533,069	1,846,417	313,348
6 PM	1,560	2.24	229,629	1,762,698	1,948,996	186,298
7 PM	1,470	2.11	216,381	1,979,080	2,051,575	72,495
8 PM	1,470	2.11	216,381	2,195,461	2,154,154	41,307
9 PM	1,110	1.59	163,390	2,358,851	2,256,732	102,119
10 PM	410	0.59	60,351	2,419,202	2,359,311	59,891
11 PM	290	0.42	42,687	2,461,890	2,461,890	0
Average	696.875	1.00			Maximum =	600,569

(Future) Peak Day Flow =	1,710	gpm
Equalization Storage Req'd =	600,569	gallons
say	600,000	gallons

ZION CROSSROADS SERVICE AREA - FLUVANNA COUNTY (100% BUILDOUT UPPER)

Use Typical Diurnal Demand Curve

Time	Water Use/ D\	Normalized Demand	Gallons/ Hour	Cumulative (gal)	Cumulative Average (gal)	Difference (gal)
12 AM	160	0.23	47,103	47,103	205,157	158,054
1 AM	50	0.07	14,720	61,823	410,315	348,492
2 AM	55	0.08	16,192	78,015	615,472	537,457
3 AM	50	0.07	14,720	92,735	820,630	727,895
4 AM	60	0.09	17,664	110,399	1,025,787	915,389
5 AM	200	0.29	58,879	169,278	1,230,945	1,061,667
6 AM	340	0.49	100,095	269,373	1,436,102	1,166,730
7 AM	580	0.83	170,750	440,123	1,641,260	1,201,137
8 AM	750	1.08	220,797	660,920	1,846,417	1,185,498
9 AM	960	1.38	282,621	943,540	2,051,575	1,108,034
10 AM	700	1.00	206,077	1,149,618	2,256,732	1,107,114
11 AM	1,170	1.68	344,444	1,494,062	2,461,890	967,828
12 PM	740	1.06	217,853	1,711,915	2,667,047	955,132
1 PM	660	0.95	194,302	1,906,217	2,872,205	965,988
2 PM	730	1.05	214,909	2,121,126	3,077,362	956,236
3 PM	630	0.90	185,470	2,306,596	3,282,520	975,924
4 PM	1,240	1.78	365,052	2,671,647	3,487,677	816,030
5 PM	1,340	1.92	394,491	3,066,138	3,692,835	626,696
6 PM	1,560	2.24	459,258	3,525,397	3,897,992	372,595
7 PM	1,470	2.11	432,763	3,958,160	4,103,150	144,990
8 PM	1,470	2.11	432,763	4,390,922	4,308,307	82,615
9 PM	1,110	1.59	326,780	4,717,702	4,513,465	204,238
10 PM	410	0.59	120,703	4,838,405	4,718,622	119,783
11 PM	290	0.42	85,375	4,923,780	4,923,780	0
Average	696.875	1.00			Maximum =	1,201,137

(Future) Peak Day Flow =	3,419	gpm
Equalization Storage Req'd =	1,201,137	gallons
say	1,200,000	gallons

4. Force Main Size Determination - Primary Line

Sewer Summary (Flow to DOC)								
Service Area		Pipe Diameter	Full Buildout WW Peak		50% of Buildout WW		50% of Buildout WW Peak	
Upstream Node	Downstream Node		Flow (gpd)	Velocity (fps)	Flow (gpd)	Velocity (fps)	Flow (gpd)	Velocity (fps)
2-A1	G	6	347,274	2.74	69,455	0.55	173,637	1.37
G	H	6	347,274	2.74	69,455	0.55	173,637	1.37
4-A (2-B)	H	6	1,107,960	8.73	221,592	1.75	553,980	4.37
H	I	6	1,455,235	11.47	291,047	2.29	727,617	5.73
2-A2	I	6	347,274	2.74	69,455	0.55	173,637	1.37
I	J	8	1,802,509	7.99	360,502	1.60	901,255	3.99
2-C	J	6	282,910	2.23	56,582	0.45	141,455	1.11
J	1-A	10	2,085,420	5.92	417,084	1.18	1,042,710	2.96
1-A	DOC	10	4,806,528	13.64	1,017,888	2.89	2,403,264	6.82
F	1-A	10	2,509,568	7.12	501,914	1.42	1,254,784	3.56
1-B	F	6	62,464	0.49	12,493	0.10	31,232	0.25
E	F	10	2,447,105	6.94	489,421	1.39	1,223,552	3.47
1-C	E	6	359,361	2.83	71,872	0.57	179,681	1.42
D	E	10	2,087,743	5.92	417,549	1.18	1,043,872	2.96
3-A	D	6	233,880	1.84	46,776	0.37	116,940	0.92
C	D	10	1,853,864	5.26	370,773	1.05	926,932	2.63
B	C	8	1,853,864	8.22	370,773	1.64	926,932	4.11
1-D	B	6	794,193	6.26	158,839	1.25	397,097	3.13
A	B	6	1,059,670	8.35	211,934	1.67	529,835	4.18
3-B	A	6	364,330	2.87	72,866	0.57	182,165	1.44
3-C	A	6	147,091	1.16	29,418	0.23	73,545	0.58
3-D	A	6	548,250	4.32	109,650	0.86	274,125	2.16

Sewer Summary (Flow to Zion Crossroads, Node C)								
Service Area		Pipe Diameter	Full Buildout WW Peak		50% of Buildout WW		50% of Buildout WW Peak	
Upstream Node	Downstream Node		Flow (gpd)	Velocity (fps)	Flow (gpd)	Velocity (fps)	Flow (gpd)	Velocity (fps)
2-A1	G	6	347,274	2.74	69,455	0.55	173,637	1.37
G	H	6	347,274	2.74	69,455	0.55	173,637	1.37
4-A (2-B)	H	6	1,107,960	8.73	221,592	1.75	553,980	4.37
H	I	6	1,455,235	11.47	291,047	2.29	727,617	5.73
2-A2	I	6	347,274	2.74	69,455	0.55	173,637	1.37
I	J	8	1,802,509	7.99	360,502	1.60	901,255	3.99
2-C	J	6	282,910	2.23	56,582	0.45	141,455	1.11
J	1-A	10	2,085,420	5.92	417,084	1.18	1,042,710	2.96
1-A	F	10	2,296,959	6.52	459,392	1.30	1,148,480	3.26
1-B	F	6	62,464	0.49	12,493	0.10	31,232	0.25
F	E	10	2,359,423	6.69	471,885	1.34	1,179,711	3.35
1-C	E	6	359,361	2.83	71,872	0.57	179,681	1.42
E	D	10	2,718,784	7.71	543,757	1.54	1,359,392	3.86
3-A	D	6	233,880	1.84	46,776	0.37	116,940	0.92
D	C	10	2,952,664	8.38	590,533	1.68	1,476,332	4.19
B	C	8	1,853,864	8.22	370,773	1.64	926,932	4.11
1-D	B	6	794,193	6.26	158,839	1.25	397,097	3.13
A	B	6	1,059,670	8.35	211,934	1.67	529,835	4.18
3-C	A	6	147,091	1.16	29,418	0.23	73,545	0.58
3-B	A	6	364,330	2.87	72,866	0.57	182,165	1.44
3-D	A	6	548,250	4.32	109,650	0.86	274,125	2.16

5. Cost Estimates, Initial Water and Sewer Phases

PRELIMINARY CONSTRUCTION COST ESTIMATES FOR WATER SERVICE TO SERVICE - PHASE 1
FLUVANNA COUNTY
15-Jan-15

SERVICE AREA 1

Item	Description	Quantity	Unit	Unit Price	Total
1	12 inch PVC Water Main	21,000	LF	$50	$1,050,000
2	12 inch Gate Valves	15	EA	$2,500	$37,500
3	12 inch Bore and Case (24" Casing)	120	LF	$300	$36,000
4	Fire Hydrant Assemblies	50	EA	$4,000	$200,000
5	Connect to Existing/Meter Vault/DOC	1	EA	$20,000	$20,000
6	Connect to Existing/Meter Vault/LCWA	1	EA	$30,000	$30,000
7	Traffic, EC and Restoration	21,000	LF	$10	$210,000
8	Mob/Demob/Bonds	1	LS	$79,175	$79,175
				Subtotal =	$1,662,675
				20 % Contingency =	$332,535
				Subtotal, Construction Cost =	$1,995,210
				10% Engineering =	$199,521
				10% Inspection/Legal/Administrative =	$199,521
				Total Estimated Project Costs, Option 1 =	**$2,394,252**

PRELIMINARY CONSTRUCTION COST ESTIMATES FOR WATER SERVICE TO SERVICE - PHASE 1
FLUVANNA COUNTY
18-Feb-15

500,000 gallon Elevated Pedestal Tank

Item	Description	Quantity	Unit	Unit Price	Total Price
1	12" Water Main	200	LF	$60	$12,000
2	Altitude Valve and Vault	1	EA	$30,000	$30,000
3	Tank Foundation (assume piles)	1	LS	$250,000	$250,000
4	0.5 MG Elevated Storage Tank	1	EA	$900,000	$900,000
5	Coating Systems for Tank	1	LS	$100,000	$100,000
6	Cathodic Protection System	1	LS	$20,000	$20,000
7	Telemetry System	1	LS	$25,000	$25,000
8	Misc Electrical Work	1	LS	$25,000	$25,000
9	Misc Site Work/Road	1	LS	$40,000	$40,000
10	Mob/Demob/E&S/Bonds	1	LS	$50,000	$50,000
				Subtotal =	$1,452,000
				20 % Contingency =	$290,400
				Subtotal, Construction Cost =	$1,742,400
				10% Engineering =	$174,240
				10% Inspection/Legal/Administrative =	$174,240
				Total Estimated Project Costs, Water Tank =	**$2,090,880**

Water Booster Station

Item	Description	Quantity	Unit	Unit Price	Total Price
1	12" Water Main	30	LF	$60	$1,800
2	Building and Foundation	1	LS	$130,000	$100,000
3	Pumps and Mechanical	1	LS	$125,000	$125,000
4	Electrical/SCADA	1	LS	$40,000	$40,000
5	Emergency Generator	1	LS	$50,000	$50,000
6	Misc Site Work/Road	1	LS	$40,000	$40,000
7	Mob/Demob/E&S/Bonds	1	LS	$25,000	$25,000
				Subtotal =	$381,800
				20 % Contingency =	$76,360
				Subtotal, Construction Cost =	$458,160
				15% Engineering =	$68,724
				10% Inspection/Legal/Administrative =	$45,816
				Total Estimated Project Costs, Booster Station =	**$572,700**

Total Project Costs, Tank and Booster Station = **$2,663,580**

PRELIMINARY CONSTRUCTION COST ESTIMATES FOR WATER SERVICE TO SERVICE - PHASE 1
FLUVANNA COUNTY
18-Feb-15

250,000 gallon Elevated Pedestal Tank

Item	Description	Quantity	Unit	Unit Price	Total Price
1	12" Water Main	200	LF	$60	$12,000
2	Altitude Valve and Vault	1	EA	$30,000	$30,000
3	Tank Foundation (assume piles)	1	LS	$180,000	$180,000
4	0.5 MG Elevated Storage Tank	1	EA	$600,000	$600,000
5	Coating Systems for Tank	1	LS	$65,000	$65,000
6	Cathodic Protection System	1	LS	$17,000	$17,000
7	Telemetry System	1	LS	$25,000	$25,000
8	Misc Electrical Work	1	LS	$25,000	$25,000
9	Misc Site Work/Road	1	LS	$35,000	$35,000
10	Mob/Demob/E&S/Bonds	1	LS	$45,000	$45,000
				Subtotal =	$1,034,000
				20 % Contingency =	$206,800
				Subtotal, Construction Cost =	$1,240,800
				10% Engineering =	$124,080
				10% Inspection/Legal/Administrative =	$124,080
				Total Estimated Project Costs, Water Tank =	**$1,488,960**

Water Booster Station

Item	Description	Quantity	Unit	Unit Price	Total Price
1	12" Water Main	30	LF	$60	$1,800
2	Building and Foundation	1	LS	$130,000	$100,000
3	Pumps and Mechanical	1	LS	$125,000	$125,000
4	Electrical/SCADA	1	LS	$40,000	$40,000
5	Emergency Generator	1	LS	$50,000	$50,000
6	Misc Site Work/Road	1	LS	$40,000	$40,000
7	Mob/Demob/E&S/Bonds	1	LS	$25,000	$25,000
				Subtotal =	$381,800
				20 % Contingency =	$76,360
				Subtotal, Construction Cost =	$458,160
				15% Engineering =	$68,724
				10% Inspection/Legal/Administrative =	$45,816
				Total Estimated Project Costs, Booster Station =	**$572,700**

Total Project Costs, Tank and Booster Station = **$2,061,660**

PRELIMINARY CONSTRUCTION COST ESTIMATES FOR SEWER SERVICE TO SERVICE - PHASE 1
FLUVANNA COUNTY
18-Feb-15

SERVICE AREA 1 (3C to DOC)

Item	Description	Quantity	Unit	Unit Price	Total
1	8 inch force main (see note 1)	23,000	LF	$45	$1,035,000
2	Bore and Case (20" Casing)	120	LF	$200	$24,000
3	8 inch plug valves	8	EA	$2,000	$16,000
4	Connect to Existing	1	EA	$10,000	$10,000
5	Traffic, EC and Restoration	23,000	LF	$10	$230,000
6	Mob/Demob/Bonds (5%)	1	LS	$65,750	$65,750
				Subtotal =	$1,380,750
				20 % Contingency =	$276,150
				Subtotal, Construction Cost =	$1,656,900
				12% Engineering =	$198,828
				10% Inspection/Legal/Administrative =	$165,690
				Total Estimated Project Costs, Option 2 =	**$2,021,418**

Note 1 - this is an average size selected for estimating purposes (actual will be 6", 8" and 10")

SERVICE AREA 1 (Rt 250/15 to DOC)

Item	Description	Quantity	Unit	Unit Price	Total
1	8 inch force main (see note 1)	16,300	LF	$45	$733,500
2	Bore and Case (20" Casing)	120	LF	$200	$24,000
3	8 inch plug valves	6	EA	$2,000	$12,000
4	Connect to Existing	1	EA	$10,000	$10,000
5	Traffic, EC and Restoration	16,300	LF	$10	$163,000
6	Mob/Demob/Bonds (5%)	1	LS	$47,125	$47,125
				Subtotal =	$989,625
				20 % Contingency =	$197,925
				Subtotal, Construction Cost =	$1,187,550
				12% Engineering =	$142,506
				10% Inspection/Legal/Administrative =	$118,755
				Total Estimated Project Costs, Option 2 =	**$1,448,811**

Note 1 - this is an average size selected for estimating purposes (actual will be 6", 8" and 10")