

FINAL

RECYCLED WATER EXPANSION
HYDRAULIC AND PRELIMINARY
ENGINEERING ANALYSIS:
PHASE 1 REPORT APPENDICES -
MILLIKEN-SARCO-TULOCAY AREA

Prepared for
Napa Sanitation District, Napa, California
May 22, 2007

APPENDIX A

List of Parcels

APPENDIX B

Phase 1 Southern MST Benefit District Demand Data by Parcel

Benefit District Model - Parcel Database Field Summary

FIELD	DESCRIPTION	FORMULA	UNITS	SOURCE	SORT
Assessment Number	Parcel number				3
Owner	Parcel owner			Databases	
Street Number				Databases	
Street Direction				Databases	
Street				Databases	
Street Type				Databases	
Space/ Apartment				Databases	
Community				Databases	
Zip Code				Databases	
Total Acres	Total Parcel Area			Databases	
Land Use Type	From the county			Databases	
User Type	The majority user type of the parcel (some parcels have more than one user type)			BC	2
Notes	Additional Parcel Info			Databases	
Phase	Strategic Plan Phase			Strategic Plan	
Building/Paved Area (acres)	For MST_BD (for parcels not from the Strategic Plan, Source "NSD"): 0.1 ac are designated for house and driveway, see further explanation below under Effective Landscape Acres.				
Pasture Acres	Area of parcel that is pasture		acres	Databases	
Pasture Coverage	The percent of land per parcel that is being irrigated.		percentage	District	
Pasture Ft per yr	Feet of water used by pastures per year	Annual Rate(Pasture). See "Factors" worksheet	feet	Strategic Plan	
Pasture Annual Volume (ac-ft)		Pasture Acres*Coverage*Ft per yr	acre-feet		
Pasture Participation	A percentage used to account for the fact that not all potential customers will participate.			District	
Pasture Effective Annual Volume (ac-ft)		Pasture Annual Vol*Participation			
Pasture Effective Peak Month Vol (mg)		Eff Ann. Vol*((43560.17*7.48)/(10^6))*PeakMonthFactor(Pasture)			
Vineyard Acres	Area of parcel that is vineyard			Databases	
Vineyard Coverage	The percent of land per parcel that is being irrigated.			District	
Vineyard Ft per yr	Feet of water used by vineyards per year	Annual Rate(Vineyard). See "Factors" worksheet		Strategic Plan	
Vineyard Annual Volume (ac-ft)		Vineyard Acres*Coverage*Ft per yr			
Vineyard Participation	A percentage used to account for the fact that not all potential customers will participate.			District	
Vineyard Effective Annual Volume (ac-ft)		Vineyard Annual Vol*Participation			
Vineyard Effective Peak Month Vol (mg)		Eff Ann. Vol*((43560.17*7.48)/(10^6))*PeakMonthFactor(Vineyard)			
Landscape Acres	Area of parcel that is landscaping			Databases	
Landscape Coverage	The percent of land per parcel that is being irrigated (applies only to parcel information from LWA).			District/LWA	
Effective Landscape Acres	- For MST_BD (for parcels not from the Strategic Plan, Source "MA"): The additional parcels in the Southern MST area designated as "Landscape" have been divided into two categories: less than or equal to 0.5 acres and greater than 0.5 acres. - For parcels greater than 0.5 ac, 0.1 ac are designated for house and driveway, 0.4 ac for landscape irrigation, and the rest will be assigned as vineyard with the anticipation that all large residential parcels in this area will become vineyards. - For the parcels less than or equal to 0.5 acres, 0.1 ac are designated for house and driveway and the rest is landscape irrigation. - For parcels that are not additional southern MST, effective acres = landscape acres. - For Infill and 2006 parcels from LWA, the effective Landscape Acres is Landscape Acres*Landscape Coverage	Landscape Acres*Landscape Coverage		Calculated	
Landscape Ft per yr	Feet of water used by landscaping per year	Annual Rate(Landscape). See "Factors" worksheet		Strategic Plan	
Landscape Annual Volume (ac-ft)		Effective Landscape Acres*Ft per yr		Calculated	
Landscape Participation	A percentage used to account for the fact that not all potential customers will participate.			District	
Landscape Effective Annual Volume (ac-ft)		Landscape Annual Vol*Participation			
Landscape Effective Peak Month Vol (mg)		Eff Ann. Vol*((43560.17*7.48)/(10^6))*PeakMonthFactor(Landscape)			
G/C Acres	Area of parcel that is irrigated Golf course/Cemetery (G/C)			Databases	
G/C Coverage	The percent of land per parcel that is being irrigated.			District	
G/C Ft per yr	Feet of water used by golf courses/cemeteries per year	Annual Rate(G/C). See "Factors" worksheet		Strategic Plan	
G/C Annual Volume (ac-ft)		G/C Acres*Coverage*Ft per yr			
G/C Participation	A percentage used to account for the fact that not all potential customers will participate.			District	
G/C Effective Annual Volume (ac-ft)		G/C Annual Vol*Participation			
G/C Effective Peak Month Vol (mg)		Eff Ann. Vol*((43560.17*7.48)/(10^6))*PeakMonthFactor(G/C)			
Total Effective Annual Volume (ac-ft)		Pasture+Vineyard+Landscape+G/C Effective Annual Volumes			
Total Effective Peak Month Vol (mg)		Pasture+Vineyard+Landscape+G/C Effective Peak Month Vol			
Source	Sources of data included Larry Walker Associates ("LWA"), the Strategic Plan ("Strat"), and Napa Sanitation District ("NSD"). LWA did analysis for the Strategic Plan to determine the potential irrigation area per parcel, then submitted updated information for 2006 and Infill parcels. The NSD parcels include the additional parcels in the potential southern MST Benefit District that were not in the Strategic Plan.			BC	
Area	Parcels are grouped by Existing (Exist), Other, 2006, Infill, and MST_BD. - Existing parcels are currently customers and information was taken directly from the Strategic Plan. - "Other" parcels are future parcels from the Strategic Plan. - 2006 and Infill parcels were included in updated post-Strategic plan information from LWA and are adjacent to the existing system. - MST_BD parcels are all parcels in the potential southern MST Benefit District.			BC	1

APPENDIX C

Demand Data by Junction

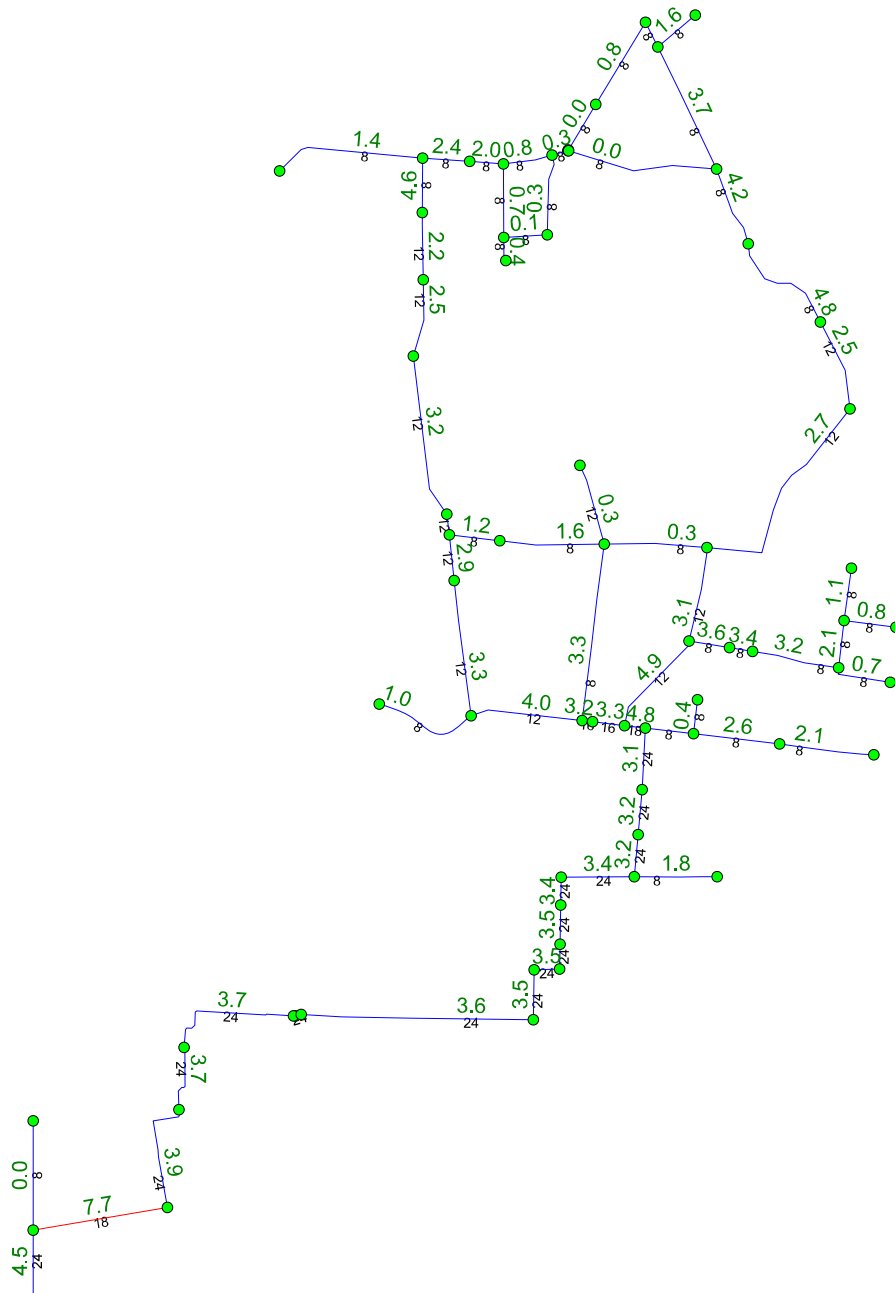
APPENDIX D

Southern MST Parcel to Node Assignments

APPENDIX E

Hydraulic Model Results – Velocities and Pressures

NSD-MST_27MAR07 50/40 percent Vine/Land Velocities and Diam. 06:00



JUNCTION (MOTYPE)

- Active
- Domain
- Inactive

☐ Inactive Reservoir

PIPE (VALUE)

- Less than 5
- Greater than 5

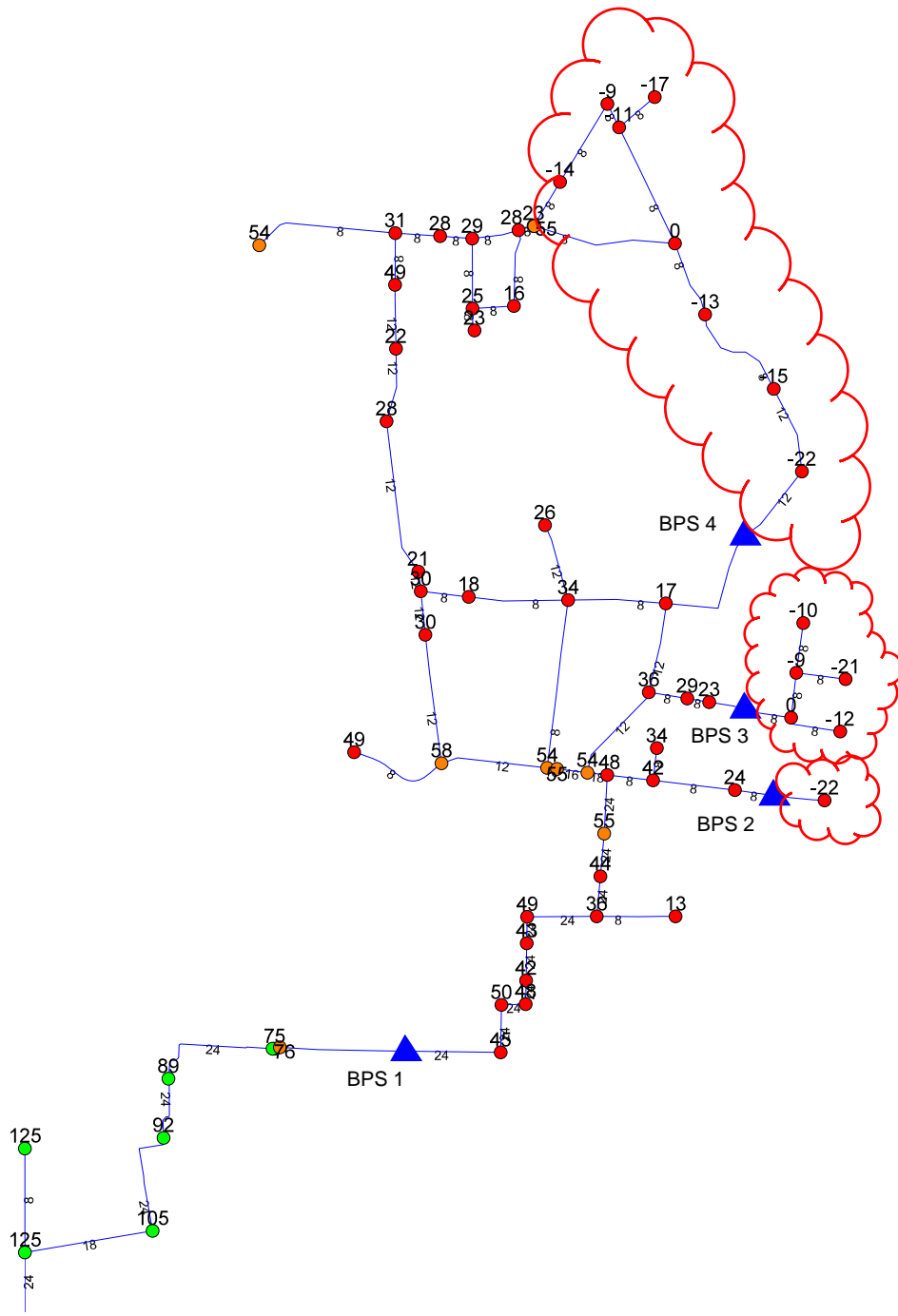
TANK (MOTYPE)

- ☒ Active Tank
- ☒ Domain Tank
- ☒ Inactive Tank
- ☒ Active Reservoir
- ☒ Domain Reservoir

PIPEDIA

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NSD-MST_27MAR07 50/40 percent Vine/Land Pressures 06:00



Junction Pressures, psi

- Less than 50
- 50~75
- 75~150
- Greater than 150



Small Booster Pump Station Pressure Zones

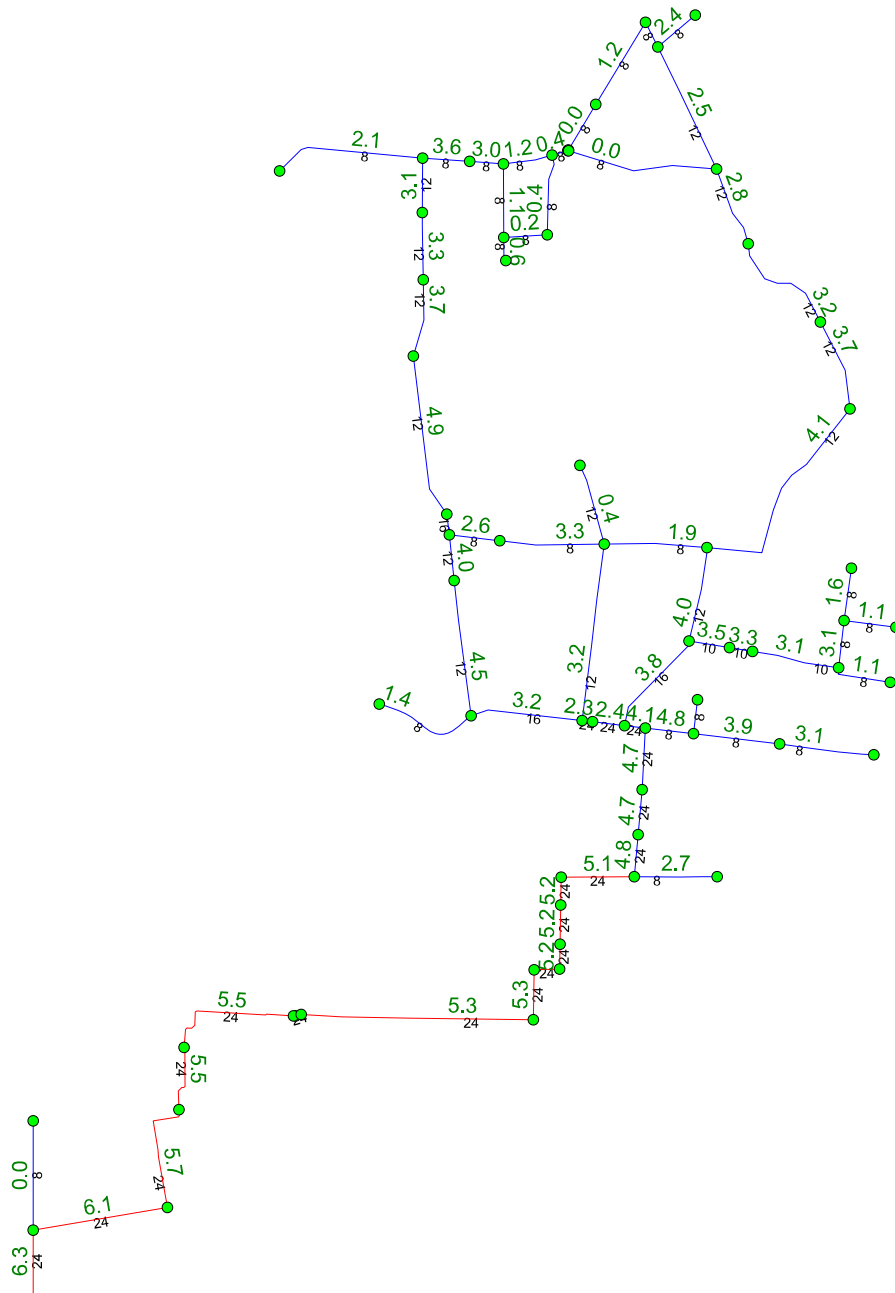


Modeled Pipe with Optimized Diameter



Booster Pump Station

NSD-MST_27MAR07 75/60 percent Vine/Land Velocities and Diam. 06:00



JUNCTION (MOTYPE)

- Active
- Domain
- Inactive

☐ Inactive Reservoir

PIPE (VALUE)

- ▬ Less than 5
- ▬ Greater than 5

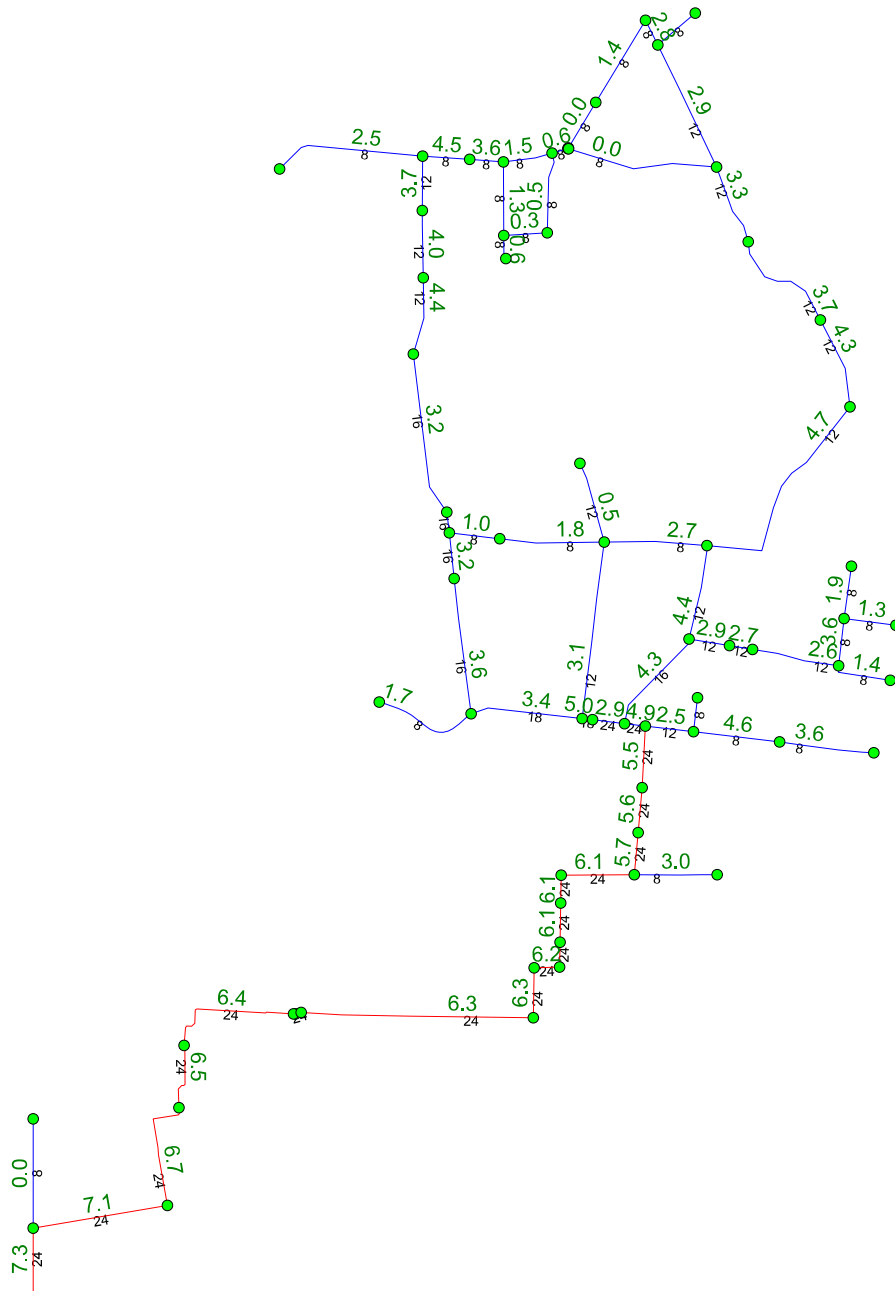
TANK (MOTYPE)

- ☑ Active Tank
- ☑ Domain Tank
- ☐ Inactive Tank
- ☑ Active Reservoir
- ☑ Domain Reservoir

PIPEDIA

N

NSD-MST_27MAR07 80/83 percent Vine/Land Velocities and Diam. 06:00



JUNCTION (MOTYPE)

- Active
- Domain
- Inactive

☐ Inactive Reservoir

PIPE (VALUE)

- Less than 5
- Greater than 5

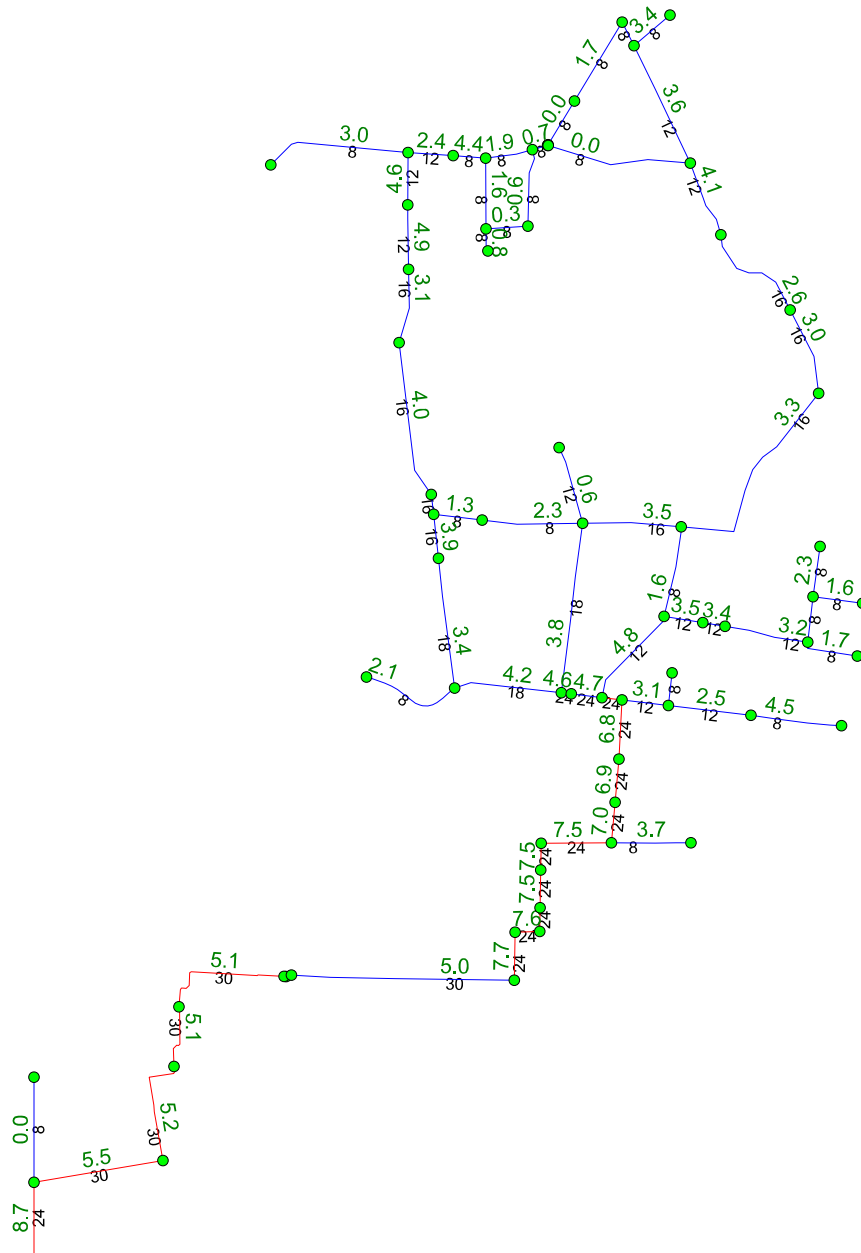
TANK (MOTYPE)

- ☒ Active Tank
- ☒ Domain Tank
- ☒ Inactive Tank
- ☒ Active Reservoir
- ☒ Domain Reservoir

PIPEDIA

N

NSD-MST_17May07 100/100 percent Vine/Land Velocities and Diam 06:00



JUNCTION (MOTYPE)

- Active
- Domain
- Inactive

☐ Inactive Reservoir

PIPE (VALUE)

- Less than 5
- Greater than 5

TANK (MOTYPE)

- ☒ Active Tank
- ☒ Domain Tank
- ☒ Inactive Tank
- ☒ Active Reservoir
- ☒ Domain Reservoir

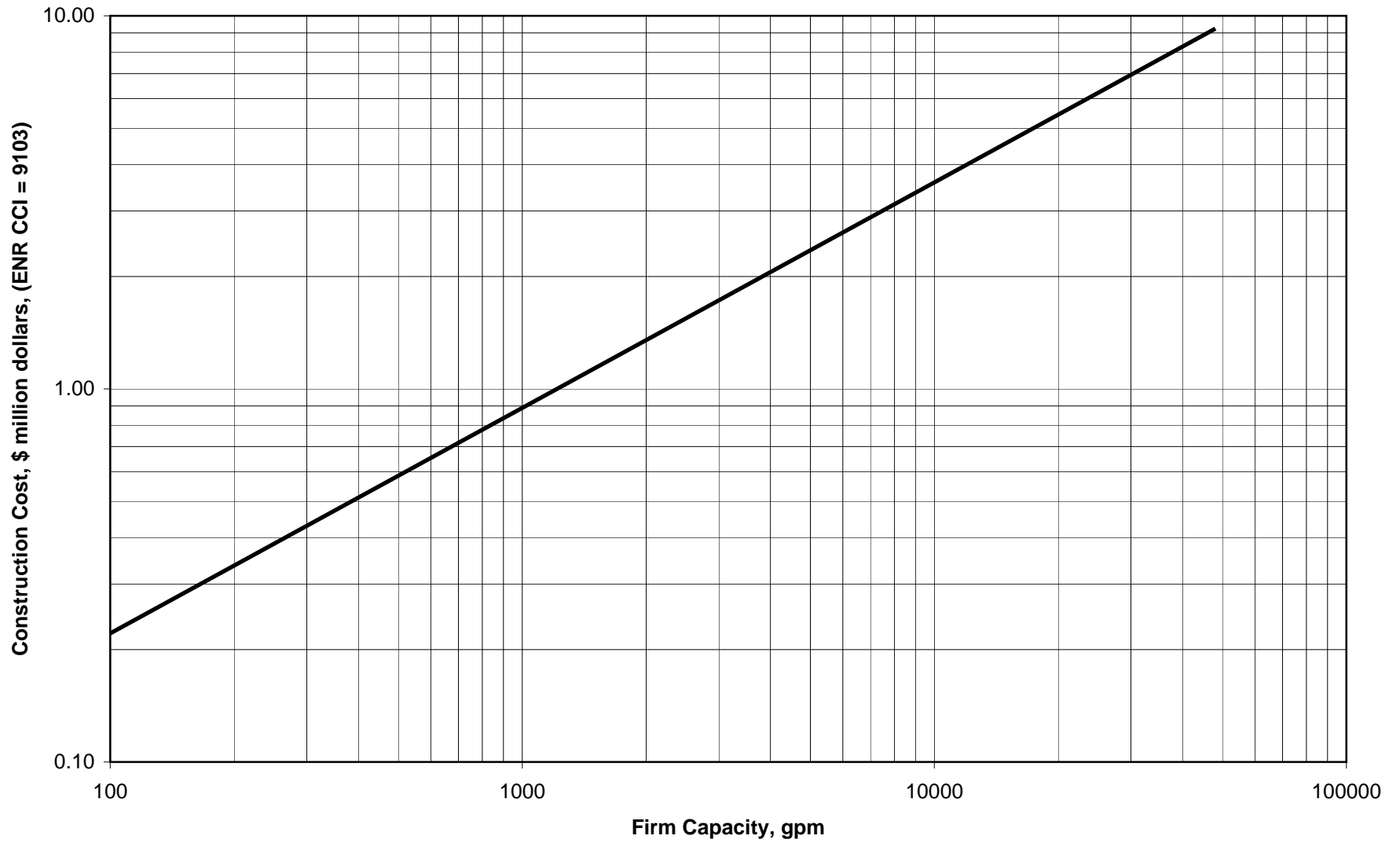
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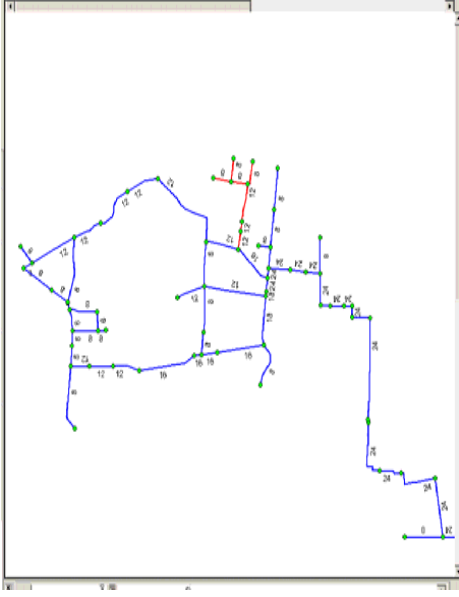
APPENDIX F

Additional Cost Information

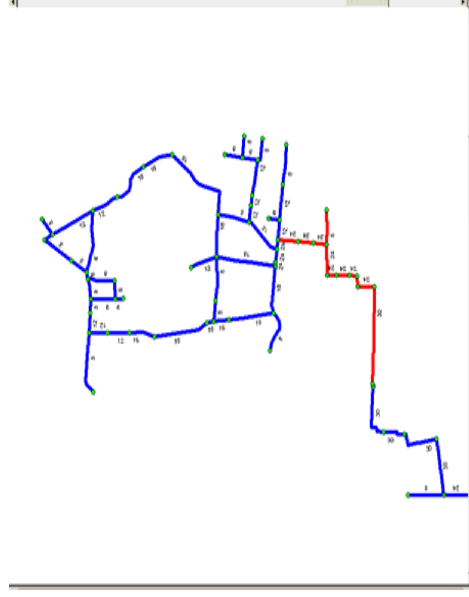
Pump Station Construction Costs



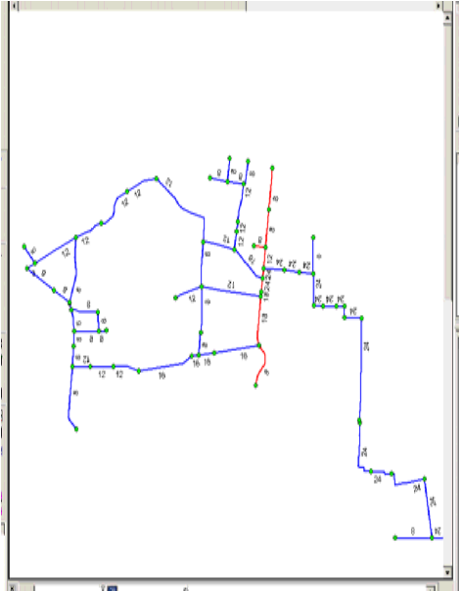
Napa Sanitary District							
MST Benefit District Hydraulic Analysis Cost Estimate & Scenario evaluation							
Booster Pump Station Costs							
A. Park 5/17/07							
Scenario	Location	Pump Flow (gpm)	Pressure (psi)	Cost from Curve	Percentage of Curve Cost	Cost Estimate/March 2007 (\$million)	With Allowances for Design, Construction Contingencies and Professional Services (\$million)
50/40 percent Vine/Land	Imola	5,023	35	2.4	75%	1.80	2.81
	Wild Horse Valley Rd	326	40	0.46	60%	0.28	0.43
	E. 3rd Ave	508	40	0.59	60%	0.35	0.55
	3rd Ave	965	40	0.88	60%	0.53	0.82
	TOTAL					2.96	4.61
75/60 percent Vine/Land	Imola	7,534	70	3.1	75%	2.29	3.58
	Wild Horse Valley Rd	488	40	0.55	60%	0.33	0.52
	E. 3rd Ave	763	25	0.75	60%	0.45	0.70
	3rd Ave	1,447	35	1.0	60%	0.62	0.97
	TOTAL					3.70	5.77
80/83 percent Vine/Land	Imola	9,074	90	3.5	75%	2.66	4.15
	Wild Horse Valley Rd	569	45	0.61	60%	0.37	0.57
	E. 3rd Ave	906	30	0.82	60%	0.49	0.77
	3rd Ave	1,665	45	1.2	60%	0.70	1.09
	TOTAL					4.21	6.57
100/100 percent Vine/Land	Imola	11,130	100	3.8	75%	2.85	4.45
	Wild Horse Valley Rd	702	25	0.70	60%	0.42	0.65
	E. 3rd Ave	1,114	30	0.90	60%	0.54	0.85
	3rd Ave	2,058	30	1.4	60%	0.82	1.28
	TOTAL					4.63	7.23
NOTES:							
1. Construction costs are based on a Pump Station Construction Cost curve created using San Francisco Bay Area pump station costs with an ENR CCI of 7445 for December 2000. These costs were updated to March 2007 (ENR CCI beginning of March 2007 = 9103).							
2. The curve costs include site preparation, masonry block building, vertical centrifugal pumps with one standby unit, piping manifold and valves, electrical power switchgear, transformer and motor control center, instrumentation, lighting, ventilation, painting, and fencing.							
3. The three smaller pump stations for each scenario are pre-fabricated stations. The cost for these were estimated to be approximately 60% of the costs derived from the curve to account for no building construction or standby power.							
4. The allowance for design and construction contingencies is 30 percent. The allowance for professional services and overhead is 20 percent of the total including construction cost plus the design and construction contingency cost.							



East 3rd Ave



4th Ave



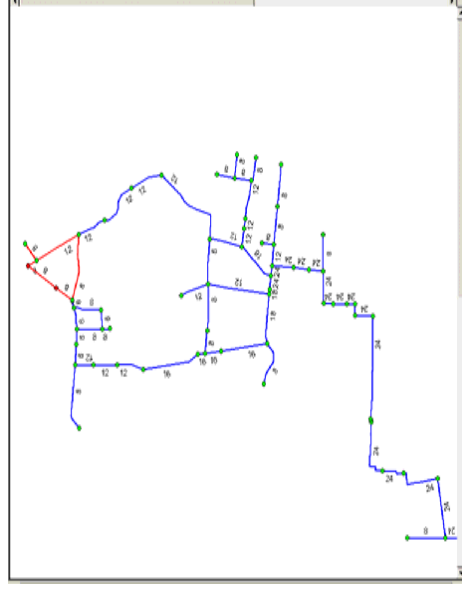
Coombsville Rd



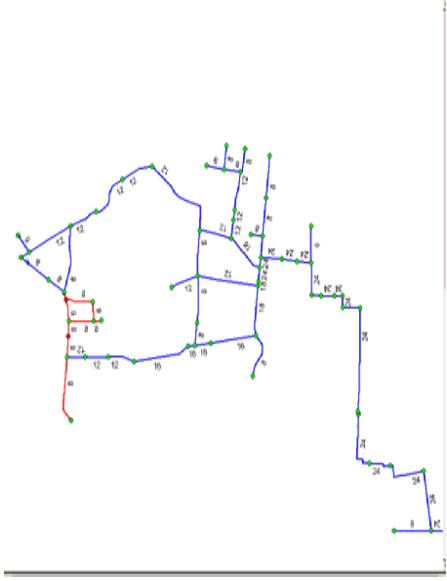
1st Ave



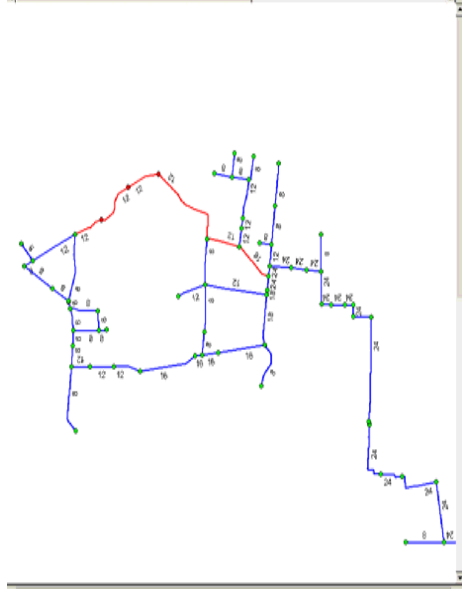
North Ave



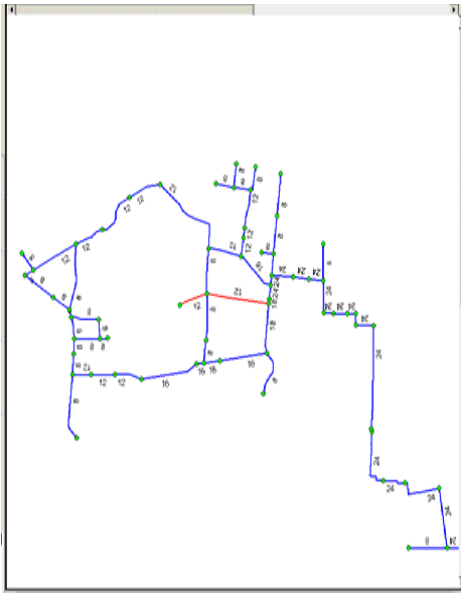
Olive Hill Ln



Hagen Rd



North 3rd Ave



2nd Ave

50_40 Scenario Pipeline Costs by Reach

50/40 percent					
Coombsville	ID	Length (ft)	Diameter (in)	Unit Cost \$/lf	Pipeline Cost
	MST_P-12	595	16	\$242	\$144,311
	MST_P-1	387	18	\$273	\$105,597
	MST_P-45	896	8	\$121	\$108,540
	MST_P-50	631	8	\$121	\$76,430
	MST_P-48	1,954	8	\$121	\$236,734
	MST_P-13	2,078	12	\$182	\$377,819
	MST_P-14	191	16	\$242	\$46,391
	MST_P-46	1,598	8	\$121	\$193,671
	MST_P-47	1,753	8	\$121	\$212,438
East 3rd	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost \$/lf	Pipeline Cost
	MST_P-51	755	8	\$121	\$91,511
	MST_P-55	878	8	\$121	\$106,399
	MST_P-57	975	8	\$121	\$118,141
	MST_P-52	433	8	\$121	\$52,473
	MST_P-53	1,619	8	\$121	\$196,176
	MST_P-54	1,088	8	\$121	\$131,811
	MST_P-56	963	8	\$121	\$116,700
1st Ave	ID	Length (ft)	Diameter (in)	Unit Cost \$/lf	Pipeline Cost
	MST_P-23	3,034	12	\$182	\$551,471
	MST_P-15	848	12	\$182	\$154,143
	MST_P-20	1,006	8	\$121	\$121,912
	MST_P-21	1,436	12	\$182	\$260,986
	MST_P-22	1,240	12	\$182	\$225,368
	MST_P-24	385	12	\$182	\$69,996
	MST_P-16	2,515	12	\$182	\$457,077
4th Ave	ID	Length (ft)	Diameter (in)	Unit Cost \$/lf	Pipeline Cost
	MST_P-6	514	24	\$364	\$186,690
	MST_P-49	1,528	8	\$121	\$185,191
	MST_P-2	1,139	24	\$364	\$413,941
	MST_P-3	833	24	\$364	\$303,013
	MST_P-4	1,351	24	\$364	\$490,980
	MST_P-5	781	24	\$364	\$284,026
	MST_P-7	472	24	\$364	\$171,459
	MST_P-8	923	24	\$364	\$335,493
	MST_P-9	4,285	24	\$364	\$1,557,639
	MST_P-10	456	24	\$364	\$165,802
	MST_P-11	726	24	\$364	\$263,836

50_40 Scenario Pipeline Costs by Reach

50/40 percent					
				Unit Cost	
Hagen Rd	ID (Char)	LENGTH (Num)	DIAMETER (Num)	\$/lf	Pipeline Cost
	MST_P-34	625	8	\$121	\$75,766
	MST_P-19	870	8	\$121	\$105,442
	MST_P-59	1,359	8	\$121	\$164,639
	MST_P-61	805	8	\$121	\$97,567
	MST_P-39	2,815	8	\$121	\$341,186
	MST_P-36	914	8	\$121	\$110,724
	MST_P-37	305	8	\$121	\$37,021
	MST_P-60	431	8	\$121	\$52,280
	MST_P-62	1,493	8	\$121	\$180,975
North Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-25	1,898	8	\$121	\$230,020
	MST_P-26	1,934	8	\$121	\$234,416
	MST_P-27	937	8	\$121	\$113,570
North 3rd	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-28	1,511	8	\$121	\$183,155
	MST_P-31	4,206	12	\$182	\$764,580
	MST_P-17	1,757	12	\$182	\$319,430
	MST_P-29	1,721	12	\$182	\$312,756
	MST_P-30	2,152	8	\$121	\$260,807
	MST_P-18	2,020	12	\$182	\$367,254
Olive Hill Ln	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-42	2,501	8	\$121	\$303,073
	MST_P-44	907	8	\$121	\$109,944
	MST_P-41	1,771	8	\$121	\$214,559
	MST_P-43	507	8	\$121	\$61,462
	MST_P-63	995	8	\$121	\$120,542
	MST_P-64	2,808	8	\$121	\$340,284
2nd Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-38	3,282	8	\$121	\$397,761
	MST_P-58	1,525	12	\$182	\$277,134
					\$14,290,511

75_60 Scenario Pipeline Costs by Reach

75/60 percent					
				Unit Cost	
Coombsville	ID (Char)	LENGTH (Num)	DIAMETER (Num)	\$/lf	Pipeline Cost
	MST_P-12	595	24	\$363.55	\$216,467
	MST_P-1	387	24	\$363.55	\$140,796
	MST_P-45	896	8	\$121.18	\$108,540
	MST_P-50	631	8	\$121.18	\$76,430
	MST_P-48	1,954	8	\$121.18	\$236,734
	MST_P-13	2,078	16	\$242.37	\$503,759
	MST_P-14	191	24	\$363.55	\$69,586
	MST_P-46	1,598	8	\$121.18	\$193,671
	MST_P-47	1,753	8	\$121.18	\$212,438
East 3rd	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-51	755	10	\$121	\$91,511
	MST_P-55	878	8	\$121	\$106,399
	MST_P-57	975	8	\$121	\$118,141
	MST_P-52	433	10	\$121	\$52,473
	MST_P-53	1,619	10	\$121	\$196,176
	MST_P-54	1,088	8	\$121	\$131,811
	MST_P-56	963	8	\$121	\$116,700
1st Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-23	3,034	12	\$182	\$551,471
	MST_P-15	848	12	\$182	\$154,143
	MST_P-20	1,006	12	\$182	\$182,867
	MST_P-21	1,436	12	\$182	\$260,986
	MST_P-22	1,240	12	\$182	\$225,368
	MST_P-24	385	16	\$242	\$93,328
	MST_P-16	2,515	12	\$182	\$457,077
4th Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-6	514	24	\$364	\$186,690
	MST_P-49	1,528	8	\$121	\$185,191
	MST_P-2	1,139	24	\$364	\$413,941
	MST_P-3	833	24	\$364	\$303,013
	MST_P-4	1,351	24	\$364	\$490,980
	MST_P-5	781	24	\$364	\$284,026
	MST_P-7	472	24	\$364	\$171,459
	MST_P-8	923	24	\$364	\$335,493
	MST_P-9	4,285	24	\$364	\$1,557,639
	MST_P-10	456	24	\$364	\$165,802
	MST_P-11	726	24	\$364	\$263,836

75_60 Scenario Pipeline Costs by Reach

75/60 percent					
				Unit Cost	
Hagen Rd	ID (Char)	LENGTH (Num)	DIAMETER (Num)	\$/lf	Pipeline Cost
	MST_P-34	625	8	\$121	\$75,766
	MST_P-19	870	8	\$121	\$105,442
	MST_P-59	1,359	8	\$121	\$164,639
	MST_P-61	805	8	\$121	\$97,567
	MST_P-39	2,815	8	\$121	\$341,186
	MST_P-36	914	8	\$121	\$110,724
	MST_P-37	305	8	\$121	\$37,021
	MST_P-60	431	8	\$121	\$52,280
	MST_P-62	1,493	8	\$121	\$180,975
North Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-25	1,898	8	\$121	\$230,020
	MST_P-26	1,934	8	\$121	\$234,416
	MST_P-27	937	8	\$121	\$113,570
North 3rd	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-28	1,511	12	\$182	\$274,733
	MST_P-31	4,206	12	\$182	\$764,580
	MST_P-17	1,757	12	\$182	\$319,430
	MST_P-29	1,721	12	\$182	\$312,756
	MST_P-30	2,152	12	\$182	\$391,210
	MST_P-18	2,020	16	\$242	\$489,671
Olive Hill Ln	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-42	2,501	12	\$182	\$454,610
	MST_P-44	907	8	\$121	\$109,944
	MST_P-41	1,771	8	\$121	\$214,559
	MST_P-43	507	8	\$121	\$61,462
	MST_P-63	995	8	\$121	\$120,542
	MST_P-64	2,808	8	\$121	\$340,284
2nd Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-38	3,282	12	\$182	\$596,642
	MST_P-58	1,525	12	\$182	\$277,134
Streblow	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	OTH_P-2	2,512	18	\$273	\$684,932
					\$15,326,105

80_83 Scenario Pipeline Costs by Reach

80/83 percent					
				Unit Cost	
Coombsville	ID (Char)	LENGTH (Num)	DIAMETER (Num)	\$/lf	Pipeline Cost
	MST_P-12	595	24	\$364	\$216,467
	MST_P-1	387	24	\$364	\$140,796
	MST_P-45	896	12	\$182	\$162,810
	MST_P-50	631	8	\$121	\$76,430
	MST_P-48	1,954	8	\$121	\$236,734
	MST_P-13	2,078	18	\$273	\$566,729
	MST_P-14	191	18	\$273	\$52,189
	MST_P-46	1,598	8	\$121	\$193,671
	MST_P-47	1,753	8	\$121	\$212,438
East 3rd	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-51	755	12	\$182	\$137,267
	MST_P-55	878	8	\$121	\$106,399
	MST_P-57	975	8	\$121	\$118,141
	MST_P-52	433	12	\$182	\$78,709
	MST_P-53	1,619	12	\$182	\$294,264
	MST_P-54	1,088	8	\$121	\$131,811
	MST_P-56	963	8	\$121	\$116,700
1st Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-23	3,034	16	\$242	\$735,294
	MST_P-15	848	16	\$242	\$205,524
	MST_P-20	1,006	12	\$182	\$182,867
	MST_P-21	1,436	12	\$182	\$260,986
	MST_P-22	1,240	12	\$182	\$225,368
	MST_P-24	385	16	\$242	\$93,328
	MST_P-16	2,515	16	\$242	\$609,436
4th Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-6	514	24	\$364	\$186,690
	MST_P-49	1,528	8	\$121	\$185,191
	MST_P-2	1,139	24	\$364	\$413,941
	MST_P-3	833	24	\$364	\$303,013
	MST_P-4	1,351	24	\$364	\$490,980
	MST_P-5	781	24	\$364	\$284,026
	MST_P-7	472	24	\$364	\$171,459
	MST_P-8	923	24	\$364	\$335,493
	MST_P-9	4,285	24	\$364	\$1,557,639
	MST_P-10	456	24	\$364	\$165,802
	MST_P-11	726	24	\$364	\$263,836

80_83 Scenario Pipeline Costs by Reach

80/83 percent					
Hagen Rd	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost \$/lf	Pipeline Cost
	MST_P-34	625	8	\$121	\$75,766
	MST_P-19	870	8	\$121	\$105,442
	MST_P-59	1,359	8	\$121	\$164,639
	MST_P-61	805	8	\$121	\$97,567
	MST_P-39	2,815	8	\$121	\$341,186
	MST_P-36	914	8	\$121	\$110,724
	MST_P-37	305	8	\$121	\$37,021
	MST_P-60	431	8	\$121	\$52,280
	MST_P-62	1,493	8	\$121	\$180,975
North Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost \$/lf	Pipeline Cost
	MST_P-25	1,898	8	\$121	\$230,020
	MST_P-26	1,934	8	\$121	\$234,416
	MST_P-27	937	8	\$121	\$113,570
North 3rd	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost \$/lf	Pipeline Cost
	MST_P-28	1,511	12	\$182	\$274,733
	MST_P-31	4,206	12	\$182	\$764,580
	MST_P-17	1,757	12	\$182	\$319,430
	MST_P-29	1,721	12	\$182	\$312,756
	MST_P-30	2,152	12	\$182	\$391,210
	MST_P-18	2,020	16	\$242	\$489,671
Olive Hill Ln	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost \$/lf	Pipeline Cost
	MST_P-42	2,501	12	\$182	\$454,610
	MST_P-44	907	8	\$121	\$109,944
	MST_P-41	1,771	8	\$121	\$214,559
	MST_P-43	507	8	\$121	\$61,462
	MST_P-63	995	8	\$121	\$120,542
	MST_P-64	2,808	8	\$121	\$340,284
2nd Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost \$/lf	Pipeline Cost
	MST_P-38	3,282	12	\$182	\$596,642
	MST_P-58	1,525	12	\$182	\$277,134
Streblow	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost \$/lf	Pipeline Cost
	OTH_P-2	2,512	18	\$273	\$684,932
					\$15,983,592

100_100 Scenario Pipeline Costs by Reach

100/100 percent					
				Unit Cost	
Coombsville	ID (Char)	LENGTH (Num)	DIAMETER (Num)	\$/lf	Pipeline Cost
	MST_P-12	595	24	\$364	\$216,467
	MST_P-1	387	24	\$364	\$140,796
	MST_P-45	896	12	\$182	\$162,810
	MST_P-50	631	8	\$121	\$76,430
	MST_P-48	1,954	8	\$121	\$236,734
	MST_P-13	2,078	18	\$273	\$566,729
	MST_P-14	191	24	\$364	\$69,586
	MST_P-46	1,598	12	\$182	\$290,507
	MST_P-47	1,753	8	\$121	\$212,438
East 3rd	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-51	755	12	\$182	\$137,267
	MST_P-55	878	8	\$121	\$106,399
	MST_P-57	975	8	\$121	\$118,141
	MST_P-52	433	12	\$182	\$78,709
	MST_P-53	1,619	12	\$182	\$294,264
	MST_P-54	1,088	8	\$121	\$131,811
	MST_P-56	963	8	\$121	\$116,700
1st Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-23	3,034	16	\$242	\$735,294
	MST_P-15	848	16	\$242	\$205,524
	MST_P-20	1,006	12	\$182	\$182,867
	MST_P-21	1,436	16	\$242	\$347,982
	MST_P-22	1,240	12	\$182	\$225,368
	MST_P-24	385	16	\$242	\$93,328
	MST_P-16	2,515	18	\$273	\$685,616
4th Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost	Pipeline Cost
	MST_P-6	514	24	\$364	\$186,690
	MST_P-49	1,528	8	\$121	\$185,191
	MST_P-2	1,139	24	\$364	\$413,941
	MST_P-3	833	24	\$364	\$303,013
	MST_P-4	1,351	24	\$364	\$490,980
	MST_P-5	781	24	\$364	\$284,026
	MST_P-7	472	24	\$364	\$171,459
	MST_P-8	923	24	\$364	\$335,493
	MST_P-9	4,285	30	\$454	\$1,947,049
	MST_P-10	456	24	\$364	\$165,802
	MST_P-11	726	24	\$364	\$263,836

100_100 Scenario Pipeline Costs by Reach

100/100 percent					
Hagen Rd	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost \$/lf	Pipeline Cost
	MST_P-34	625	8	\$121	\$75,766
	MST_P-19	870	12	\$182	\$158,162
	MST_P-59	1,359	8	\$121	\$164,639
	MST_P-61	805	8	\$121	\$97,567
	MST_P-39	2,815	8	\$121	\$341,186
	MST_P-36	914	8	\$121	\$110,724
	MST_P-37	305	8	\$121	\$37,021
	MST_P-60	431	8	\$121	\$52,280
	MST_P-62	1,493	8	\$121	\$180,975
North Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost \$/lf	Pipeline Cost
	MST_P-25	1,898	16	\$242	\$460,040
	MST_P-26	1,934	8	\$121	\$234,416
	MST_P-27	937	8	\$121	\$113,570
North 3rd	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost \$/lf	Pipeline Cost
	MST_P-28	1,511	12	\$182	\$274,733
	MST_P-31	4,206	16	\$242	\$1,019,440
	MST_P-17	1,757	8	\$121	\$212,953
	MST_P-29	1,721	16	\$242	\$417,008
	MST_P-30	2,152	16	\$242	\$521,613
	MST_P-18	2,020	12	\$182	\$367,254
Olive Hill Ln	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost \$/lf	Pipeline Cost
	MST_P-42	2,501	12	\$182	\$454,610
	MST_P-44	907	8	\$121	\$109,944
	MST_P-41	1,771	8	\$121	\$214,559
	MST_P-43	507	8	\$121	\$61,462
	MST_P-63	995	8	\$121	\$120,542
	MST_P-64	2,808	8	\$121	\$340,284
2nd Ave	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost \$/lf	Pipeline Cost
	MST_P-38	3,282	18	\$273	\$894,962
	MST_P-58	1,525	12	\$182	\$277,134
Streblow	ID (Char)	LENGTH (Num)	DIAMETER (Num)	Unit Cost \$/lf	Pipeline Cost
	OTH_P-2	2,512	24	\$364	\$913,243
					\$17,492,091

Soscol Recycled Water Treatment Facility Expansion Costs

	Scenario		50/40 (10.7 mgd)		75/60 (12.4 mgd)		80/83 (13.3 mgd)		100/100 (14.6 mgd)	
	No. of units	Cost	No. of units	Cost	No. of units	Cost	No. of units	Cost		
Structures										
Dynasand Filters – Concrete	1	\$240,000	2	\$480,000	2	\$480,000	3	\$720,000		
Dynasand Filters – Grout	1	\$15,100	2	\$30,200	2	\$30,200	3	\$45,300		
Misc. Metals (grating and handrails)	1	\$14,000	2	\$28,000	2	\$28,000	3	\$42,000		
Demolition of Knockout Wall	1	\$3,950	2	\$7,900	2	\$7,900	2	\$7,900		
Subtotal		\$273,050		\$546,100		\$546,100		\$815,200		
Mechanical										
Dynasand Filter Equipmenta	1	\$332,500	2	\$665,000	2	\$665,000	3	\$997,500		
Compressors	0	\$0	2	\$24,000	2	\$24,000	2	\$24,000		
Chemical Metering Pump	1	\$5,800	1	\$5,800	1	\$5,800	1	\$5,800		
Gates	1	\$15,000	2	\$30,000	2	\$30,000	3	\$45,000		
Monitoring Equipment	1	\$2,500	2	\$5,000	2	\$5,000	3	\$7,500		
Subtotal		\$355,800		\$729,800		\$729,800		\$1,079,800		
Misc. Piping (30% of subtotal)		\$106,740		\$218,940		\$218,940		\$323,940		
Equipment Installation Cost (30% of subtotal)		\$106,740		\$218,940		\$218,940		\$323,940		
Subtotal		\$569,280		\$1,167,680		\$1,167,680		\$1,727,680		
Other										
Site Development (10% of Struct + Mechl)		\$84,233		\$171,378		\$171,378		\$254,288		
Electrical (15% of Struct + Mech)		\$126,350		\$257,067		\$257,067		\$381,432		
Instrumentation (10% of Struct + Mech)		\$84,233		\$171,378		\$171,378		\$254,288		
Start Up and Training		\$30,000		\$30,000		\$30,000		\$30,000		
Subtotal		\$324,816		\$629,823		\$629,823		\$920,008		
Subtotal		\$1,167,146		\$2,343,603		\$2,343,603		\$3,462,888		
Contingency (30% of subtotal)		\$350,144		\$703,081		\$703,081		\$1,038,866		
Construction Cost		\$1,517,289		\$3,046,684		\$3,046,684		\$4,501,754		
Engineering, Legal and Administration (30% of subtotal)		\$455,187		\$914,005		\$914,005		\$1,350,526		
Tracer Study to Re-rate Chlorine Contact Chamber		\$30,000		\$30,000		\$30,000		\$30,000		
Capital Costs		\$2,002,476		\$3,990,689		\$3,990,689		\$5,882,281		

Costs are provided by vendor unless otherwise indicated

The following information is necessary to ensure that the above cost estimate is including all required equipment:

- *Historic data should be evaluated to determine if the existing filtration system can sustain a filter loading rate of 3.4 gpm/ft²
- *The capacity of the existing compressors should be field verified
- *Historic polymer use should be evaluated to determine if the existing chemical storage and metering pumps need to be upgraded
- *The maximum flow rates of the existing liquid chlorine pumps and sodium bisulfite pumps should be field verified to determine if additional metering pumps are required.
- *It is assumed that existing chlorine contact chamber can provide a 90-minute modal contact time. If not, additional disinfection will be necessary which will significantly increase costs.