

REQUEST FOR COUNCIL ACTION

SUBJECT: 2016 Drinking Water System Master Plan Update

SUMMARY: City Staff worked with Hansen Allen and Luce, Inc. to prepare an update to the Drinking Water System Master Plan adopted in 2015. The update increases reservoir storage on the west side and the associated impact fees and makes project map revisions.

FISCAL AND/OR ASSET IMPACT: The report addresses recommended future Drinking Water System projects which will impact the Drinking Water budget.

STAFF RECOMMENDATION:

Staff recommends City Council adopt the 2016 Drinking Water System Master Plan Update.

MOTION RECOMMENDED:

I move to adopt Resolution 16-65 to adopt the 2016 Drinking Water System Master Plan Update and to have staff prepare an updated Drinking Water System Capital Facility Plan.

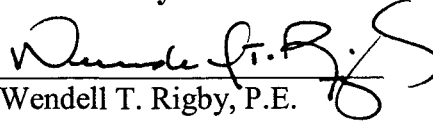
Roll Call vote required.

Prepared by:




Tim Heyrend, P.E.
Utilities Engineer

Reviewed by:



Wendell T. Rigby, P.E.
Director of Public Works

Recommended by:



Mark R. Palesh
City Manager

BACKGROUND DISCUSSION:

The City's Master Drinking Water System Plan (Master Plan) was last updated in November 2015, which included new reservoirs and pumping stations as the City expands to the West. Part of the 2015 Master Plan included a study to build new reservoirs in the Zone 5 pressure zone to save costs from pumping up to Zone 6 and trickling back down to Zone 5 to save the City millions of dollars over a 20-year and 50-year period. Due to the proposed new Zone 5 reservoirs, the proposed Zone 6 reservoirs were reduced in size by 0.5 million gallons (MG) each from 3 MG to 2.5 MG.

However, recently, the City has received requests from several companies to locate large industrial facilities on the west side of the City in the Zone 6 service area. These facilities require millions of gallons of water each day, which also require additional reservoir storage. To accommodate these facilities it is recommended to increase both of the reservoir sizes in Zone 6 back to the original 3 MG size.

In addition to these changes, Figure 5.4 – Master Plan Future System- was edited to show the smaller pipelines required for developers and 2-pressure reducing stations. These projects were included in the model, but not represented on Figure 5.4.

The 2016 Drinking Water System Master Plan Updates are attached. The change in cost is increased from \$117,073,000 to \$120,426,000, a difference of \$3,353,000. The apportioned impact fee allocation to be provided to the impact fee consultant is \$86,234,000. Staff recommends approval of the changes to the Drinking Water Mater Plan.

Attached:
Resolution
Master Plan Edits

**THE CITY OF WEST JORDAN, UTAH
A Municipal Corporation**

RESOLUTION NO. 16-65

**A RESOLUTION REQUESTING THE CITY COUNCIL REVIEW THE DRAFT FINAL DRINKING
WATER SYSTEM MASTER PLAN**

Whereas, the City of West Jordan has received the 2016 Drinking Water System Master Plan Update from Hansen Allen and Luce, Inc.; and

Whereas, the City desires the City Council to adopt the 2016 Drinking Water System Master Plan Update; and

Whereas, the 2016 Drinking Water System Master Plan Update revises necessary reservoir storage increases and associated costs due to future growth projections; and

NOW, THEREFORE, IT IS RESOLVED BY THE CITY COUNCIL OF WEST JORDAN, UTAH:

To adopt the 2016 Drinking Water System Master Plan Update.

Adopted by the City Council of West Jordan, Utah, this 27th day of April 2016.

Kim V. Rolfe
Mayor

ATTEST:

MELANIE S. BRIGGS
City Recorder

Voting by the City Council	"AYE"	"NAY"
Council Member Dirk Burton	_____	_____
Council Member Jeff Haaga	_____	_____
Council Member Zach Jacob	_____	_____
Council Member Chris McConnehey	_____	_____
Council Member Chad Nichols	_____	_____
Council Member Sophie Rice	_____	_____
Mayor Kim V. Rolfe	_____	_____

Zone 1 is projected to have a shortfall of 5.1 MG under build-out conditions. Contributing factors to the storage shortcoming are the inclusion of operational storage and the relatively large fire suppression flow located in the zone. The existing Zone 1 storage volume is 8.5 MG with 2.5 MG at Cemetery Tank and a total of 6.0 MG between the two existing Airport Tanks.

**TABLE 4-4
PLANNED STORAGE TANKS**

ZONE	TANK NAME	SIZE (MG)
1	Airport 2	4.0
2	Old Bingham Highway #2	2.0
3	Zone 3 Old Bingham Highway	3.0
4	Terminal 2	3.0
4	U-111 Tank 2	4.0
6	Bingham Junction #2	3.0
6	Bench #2	3.0
7	Zone 7 North	2.0
7	Zone 7 South	2.0
TOTAL	N/A	26.0

**TABLE 4-5
BUILD-OUT STORAGE SUMMARY**

PRESSURE ZONE	TOTAL (MG)	PLANNED STORAGE (MG)	REMAINING (MG)
1	16.6	10.5	-6.1
2	11.9	12.0	0.1
3a	0.4	0.0	-0.4
3b	1.4	0.0	-1.4
3	10.0	9.0	-1.0
4	13.0	14.0	1.0
5	8.0	0.0	-8.0
6	8.1	12.0	3.9
7	3.8	4.0	0.2
TOTAL	73.2	61.5	-11.5

The proposed Airport 2 tank will take the place of the existing 2.0 MG Airport tank and will have a capacity of 4.0 MG for a net gain of 2.0 MG in total capacity. In order to reduce the storage deficit, it is recommended that additional storage be added at the Cemetery Tank site. If 3.0 MG could be added at the Cemetery Tank site, the remaining shortfall for Zone 1 storage would

be 3.1 MG. Although it is generally preferred to locate sufficient storage within each zone, it is not required that all Zone 1 storage be directly located within Zone 1.

Completing the Old Bingham Highway #2 Tank, as planned, with a capacity of 2.0 MG would provide all of the build-out storage that is projected to be needed in Zone 2. However, the City has indicated they would prefer to increase the size of the proposed tank to 3.0 MG. The additional Zone 2 storage would provide some Zone 2 redundancy while mitigating the Zone 1 shortfall.

Zone 3 also provides water to Zones 3a and 3b via PRV connections. For this reason the total Zone 3 deficiency is effectively 2.8 MG (plus the additional carryover deficit from Zone 1). In order to provide the required storage for Zone 3, it is recommended that the size of the planned Zone 3 Old Bingham Highway tank should be increased from 3.0 MG to 4.0 MG and that an additional 3.0 MG Zone 3 tank should be constructed just north of 7800 South and just east of Mountain View Corridor.

There is currently 7.0 MG of storage located in Zone 4 and the City's current plan is to increase the Zone 4 storage to 14.0 MG. After adding the additional tanks, the City will still have about 1.0 MG of remaining storage capacity in Zone 4. It is therefore recommended that the Zone 4 storage tanks should be constructed as planned.

Previously, the City has not intended to construct storage that would be directly connected to Zone 5. Instead the City has planned to place all of the Zone 5 storage in Zone 6. The storage analysis indicates that the equalization storage requirement for Zone 5 is 8 MG. Through the use of the network model, it was found that supplying all of the Zone 5 equalization storage from the Zone 6 tanks was not feasible based on the size of the existing transmission lines to the Zone 6 tanks. In addition to increasing the transmission capacity between Zone 4 and 6, supplying Zone 5 by way of Zone 6 would require the construction of additional storage and pump station facilities within Zone 6. Rather than construct the new facilities in Zone 6, which would require upsizing the transmission capacity, it is recommended that the new facilities should be constructed to directly serve Zone 5. Constructing the facilities in Zone 5 would eliminate the need for upsizing the transmission between the Zone 6 pump station and the Zone 6 tanks while also reducing the pumping costs as outlined previously. For these reasons, it is recommended that two 4 MG storage tanks should be constructed within Zone 5. One tank should be located to serve the northern half of the system, while the other should be located to the south. The proposed location of the northern tank is at about 7100 West 7500 South and the proposed location of the southern tank is at about 7300 West New Bingham Highway. This sizing breakdown assumes that fire flow storage would continue to be provided by Zone 6.

The City's current plan calls for an additional 3.0 MG at each of the existing Zone 6 tank locations. Since the existing Zone 6 storage capacity is 6.0 MG, this would bring the total to 12.0 MG. Based on the analyses performed for this master plan, 8.1 MG of total Zone 6 storage is needed in order to meet the minimum storage requirements established by the State. However, the City has indicated that they have been contacted by large industries interested in being located in West Jordan City. Therefore, in order to maintain future flexibility it is recommended that the two 3.0 MG tanks should be constructed as planned.

No changes are recommended with respect to the City's plan to construct 4.0 MG of storage in Zone 7. Instead, it is recommended that the City proceed as necessitated by growth and construct two Zone 7 tanks, one to the north and the other to the south.

Based on the storage recommendations outlined above, Table 4-5 has been updated and the results are displayed below as Table 4-6.

**TABLE 4-6
PROPOSED BUILD-OUT STORAGE**

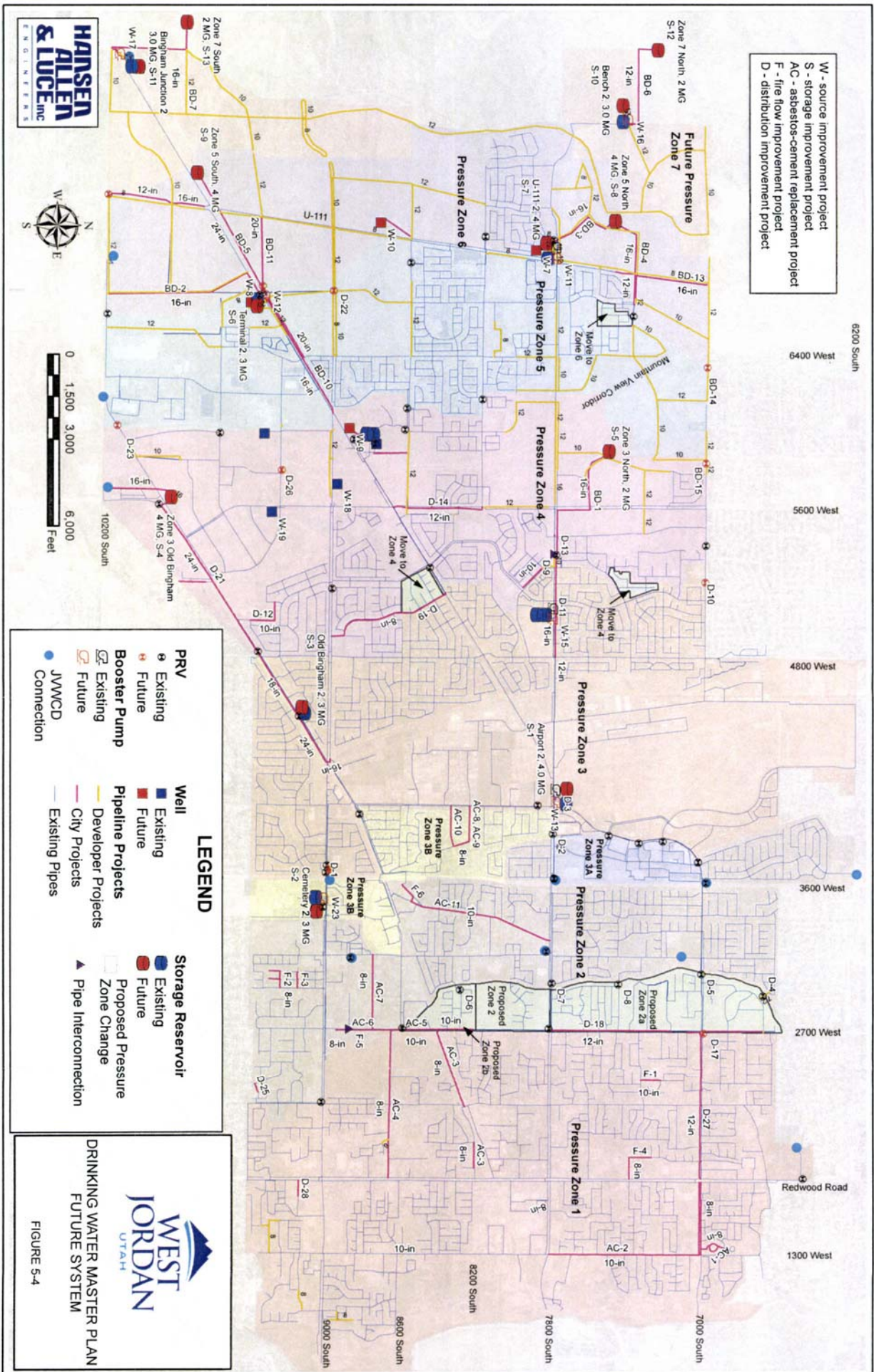
PRESSURE ZONE	TOTAL (MG)	PROPOSED STORAGE (MG)	REMAINING (MG)
1	16.6	13.5	-3.1
2	11.9	13.0	1.1
3a	0.4	0.0	-0.4
3b	1.4	0.0	-1.4
3	10.0	13.0	3.0
4	13.0	14.0	1.0
5	8.0	8.0	0.0
6	12.0	12.0	0.0
7	3.8	4.0	0.2
TOTAL	77.1	77.5	0.4

A list of the proposed storage projects is given in Table 4-7.

**TABLE 4-7
PROPOSED STORAGE PROJECTS**

ID	PROPOSED TANK
S-1	New 4.0 MG Airport Tank
S-2	New 3.0 MG Cemetery Tank
S-3	New 3.0 MG Old Bingham Highway Zone 2 Tank #2
S-4	New 4.0 MG Old Bingham Highway Zone 3 Tank
S-5	New 3.0 MG Zone 3 North Tank
S-6	New 3.0 MG Terminal Tank #2
S-7	New 4.0 MG U-111 Tank #2
S-8	New 4.0 MG Zone 5 North Tank
S-9	New 4.0 MG Zone 5 South Tank
S-10	New 3.0 MG Zone 6 North Tank
S-11	New 3.0 MG Zone 6 South Tank
S-12	New 2.0 MG Zone 7 North Tank
S-13	New 2.0 MG Zone 7 South Tank
Total: 42.0 MG, Net Gain: 40.0 MG	

- W - source improvement project
- S - storage improvement project
- AC - asbestos-cement replacement project
- F - fire flow improvement project
- D - distribution improvement project



WEST JORDAN UTAH

DRINKING WATER MASTER PLAN
 FUTURE SYSTEM

FIGURE 5-4

TABLE 5-3 CONTINUED

ID	PROBLEM	PROPOSED SOLUTION
D-11	Increase transmission capacity from pump station and complete pipeline in north side of 7800 South	Install 1,590 feet of 8-inch pipeline in 7800 South between 5360 West and 5100 West, 355 feet of 12-inch pipe between 5100 West and 5060 West, 1,175 feet of 16-inch pipe between 5060 West and 4880 West, and 480 feet of 12-inch pipe between 4880 West and 4800 West, and 70 feet of 16-inch pipe across 7800 South at 5060 West
D-12	High water user does not have service redundancy	Install 1,530 feet of 10-inch pipe in the business access road beginning at about 4980 West Old Bingham Highway and from that point north to about 9295 South then west to Winter Berry Drive, then north in Winter Berry Drive to connect to the existing 12-inch pipeline in Wild Acres Drive.
D-13	Elevated flow velocity in existing 30-inch pipeline	Install a new connection between the existing 30-inch pipeline and the existing 16-inch pipeline at about 5490 West 7800 South
D-14	Elevated velocities in Wheatridge Lane Pipes, Lack of redundancy	Install 3,120 feet of 12-inch pipe in 5600 West between New Bingham Highway and 8200 South
D-15	N/A	Improve Old Bingham Reservoir, Terminal Reservoir, U-111 Reservoir, and Barney's Reservoir sites with landscaping
D-16	Lack of indoor storage space for water parts and fittings	Construct a new facility at a location to be determined
D-17	Low pressures in Zone 1	Pressure Zone 1 west of 2700 West should be segregated to form a new Zone 2a and 2b pressure zones.
D-18	Zone 2a Transmission	Install 7,900 feet of 12-inch pipeline in 2700 West between 6600 South and 7800 South
D-19	Low pressures in Zone 3	Pressure Zone 3 & 4 boundary relocation including the installation of 4,605 feet of 8-inch pipe beginning at 4900 West 9000 South and proceeding north to 8900 South 4910 West and in McGinnis Lane between 4910 West and New Bingham Highway.
D-20	Low pressures in Zone 5	Move phase 3 of the Maples at Jordan Hills Subdivision to Zone 6
D-21	Inadequate transmission for proposed Zone 3 Old Bingham Highway Tank	Install 2,435 feet of 16-inch pipe between the existing 102 & 56 JWCD connection and the proposed Zone 3 Old Bingham Highway Tank. Install 6,300 feet of 24-inch pipe in Old Bingham Highway between 5600 West and 4850 West parallel to the existing pipe, 2,685 feet of 18-inch pipe in Old Bingham Highway between 4850 West and 4470 West parallel to the existing pipe, 1,900 feet of 24-inch pipe in Old Bingham Highway between 4470 West and the intersection with 9000 South parallel to the existing pipe, and 135 feet of 16-inch pipe across 9000 South to connect with the existing 12-inch pipeline on the north side of the street.
D-22	New PRV needed in 6900 South	Install a new 12-inch PRV at about 6730 West 6900 South
D-23	Well's Park PRV needs to be replaced	Replace the existing PRV with a new 12-inch PRV and vault just west of Mountain View Corridor along Old Bingham Highway

TABLE 8-1 CONTINUED

Priority	TYPE	ID (Old ID ¹)	RECOMMENDED PROJECT ²	TOTAL COST	% FUT	FUTURE COST
5	Source	W-17 (P-4)	New Zone 7 South Booster Station	\$945,000	100%	\$945,000
3	Source	W-18	Well 3 Improvements to allow pumping to Zone 3	\$135,000	0%	\$0
4	Source	W-19	Well 4 Improvements	\$304,000	100%	\$304,000
3	Source	W-20	Exploratory Wells	\$500,000	100%	\$500,000
3	Source	W-21	Water Right Transfer	\$25,000	100%	\$25,000
5	Source	W-22	5 Year Master Plan Update	\$100,000	100%	\$100,000
5	Source	W-23	New Cemetery Tank Booster Station	\$1,350,000	50%	\$675,000
2	Storage	S-1 (S-1)	New 4.0 MG Airport Tank	\$5,454,000	0%	\$0
2	Storage	S-2	New 3.0 MG Cemetery Tank	\$4,050,000	0%	\$0
3	Storage	S-3 (S-9)	New 3.0 MG Old Bingham Highway Zone 2 Tank #2	\$4,050,000	0%	\$0
3	Storage	S-4	New 4.0 MG Old Bingham Highway Zone 3 Tank	\$5,400,000	57%	\$3,078,000
2	Storage	S-5	New 3.0 MG Zone 3 North Tank	\$4,050,000	57%	\$2,308,500
3	Storage	S-6 (S-4)	New 3.0 MG Terminal Tank #2	\$4,050,000	97%	\$3,928,500
3	Storage	S-7 (S-5)	New 4.0 MG U-111 Tank #2	\$5,400,000	97%	\$5,238,000
3	Storage	S-8	New 4.0 MG Zone 5 North Tank	\$5,400,000	100%	\$5,400,000
3	Storage	S-9	New 4.0 MG Zone 5 South Tank	\$5,400,000	100%	\$5,400,000
5	Storage	S-10 (S-6)	New 3.0 MG Zone 6 North Tank	\$4,050,000	100%	\$4,050,000
5	Storage	S-11 (S-12)	New 3.0 MG Zone 6 South Tank	\$4,050,000	100%	\$4,050,000
5	Storage	S-12 (S-11)	New 2.0 MG Zone 7 North Tank	\$2,700,000	95%	\$2,565,000
5	Storage	S-13 (S-11)	New 2.0 MG Zone 7 South Tank	\$2,700,000	95%	\$2,565,000
3	Asb-Cem	AC-1	Install 1,510 feet of 8-inch pipe	\$202,000	0%	\$0
3	Asb-Cem	AC-2	Install 5,320 feet of 10-inch pipe	\$812,000	0%	\$0
3	Asb-Cem	AC-3	Install 2,920 feet of 8-inch pipe	\$390,000	0%	\$0
3	Asb-Cem	AC-4	Install 5,220 feet of 8-inch pipe	\$698,000	0%	\$0
3	Asb-Cem	AC-5	Install 2,520 feet of 10-inch pipe	\$384,000	0%	\$0
3	Asb-Cem	AC-6	Install 2,290 feet of 8-inch pipe	\$306,000	0%	\$0
3	Asb-Cem	AC-7	Install 2,670 feet of 8-inch pipe	\$357,000	0%	\$0
3	Asb-Cem	AC-8	Install 1,265 feet of 8-inch pipe	\$169,000	0%	\$0

TABLE 8-1 CONTINUED

Priority	TYPE	ID (Old ID ¹)	RECOMMENDED PROJECT ²	TOTAL COST	% FUT	FUTURE COST
3	Asb-Cem	AC-9	Install 565 feet of 8-inch pipe	\$76,000	0%	\$0
3	Asb-Cem	AC-10	Install 1,450 feet of 8-inch pipe	\$194,000	0%	\$0
3	Asb-Cem	AC-11	Install 4,600 feet of 8-inch pipe	\$615,000	0%	\$0
1	Fire flow	F-1	Install 690 feet of 10-inch pipe	\$105,000	0%	\$0
1	Fire flow	F-2	Install 1,370 feet of 8-inch pipe	\$182,000	0%	\$0
1	Fire flow	F-3	Install 575 feet of 8-inch pipe	\$77,000	0%	\$0
1	Fire flow	F-4 (D-2)	Install 1,535 feet of 8-inch pipe	\$205,000	0%	\$0
1	Fire flow	F-5	Install a new connection between the existing 8-inch and 6-inch pipelines	\$14,000	0%	\$0
1	Fire flow	F-6	Install 750 feet of 12-inch pipe	\$122,000	25%	\$30,500
3	Distribution	D-1	Install a new 2x12-inch PRVs and a vault	\$270,000	0%	\$0
2	Distribution	D-2	Rehab PRV, run power to the vault and install fan and sump pump	\$34,000	0%	\$0
3	Distribution	D-3	Install a VFD on the smallest Zone 2 booster pump	\$68,000	0%	\$0
3	Distribution	D-4	Install a new 6-inch PRV in existing vault	\$34,000	0%	\$0
3	Distribution	D-5	Install a new 12-inch PRV and vault	\$203,000	0%	\$0
3	Distribution	D-6	Install a new 6-inch PRV in existing vault	\$34,000	0%	\$0
3	Distribution	D-7	Install a new 8-inch PRV in existing vault	\$41,000	0%	\$0
3	Distribution	D-8	Install a new 6-inch PRV and repair vault	\$68,000	0%	\$0
3	Distribution	D-9	Rehab 16-inch PRV and upgrade vault	\$101,000	0%	\$0
3	Distribution	D-10	Relocate 8-inch PRV and vault	\$81,000	0%	\$0
3	Distribution	D-11	Install 1,590 feet of 8-inch pipe, 835 feet of 12-inch pipe, and 1,245 feet of 16-inch pipe	\$575,000	63%	\$362,250
3	Distribution	D-12	Install 1,530 feet of 10-inch pipe	\$233,000	0%	\$0
3	Distribution	D-13	Install a new connection between the existing 30-inch and 16-inch pipelines	\$55,000	0%	\$0
3	Distribution	D-14	Install 3,120 feet of 12-inch pipe	\$505,000	0%	\$0
4	Distribution	D-15	Improve Old Bingham Reservoir, Terminal Reservoir, U-111 Reservoir, and Barney's Reservoir sites with landscaping	\$405,000	0%	\$0
3	Distribution	D-16	Construct an indoor storage facility for water parts and fittings	\$675,000	0%	\$0
3	Distribution	D-17 (D-11,D-12)	Segregate a new Zone 2a pressure zone	\$68,000	0%	\$0
3	Distribution	D-18	Install 7,900 feet of 12-inch pipeline	\$1,280,000	0%	\$0

TABLE 8-1 CONTINUED

Priority	TYPE	ID (Old ID ¹)	RECOMMENDED PROJECT ²	TOTAL COST	% FUT	FUTURE COST
3	Distribution	D-19 (D-9)	Pressure Zone 3 & 4 boundary relocation including the installation of 4,605 feet of 8-inch pipe in 4900 West, 4910 West, and McGinnis Lane	\$615,000	0%	\$0
2	Distribution	D-20	Move phase 3 of the Maples at Jordan Hills Subdivision to Zone 6	\$54,000	0%	\$0
3	Distribution	D-21 (D-7)	Install 2,435 feet of parallel 16-inch pipe, 6,300 feet of parallel 24-inch pipe, 2,685 feet of parallel 18-inch pipe, 1,900 feet of parallel 24-inch pipe, and 135 feet of 16-inch pipe across 9000 South	\$3,376,000	20%	\$675,200
3	Distribution	D-22	Install a new 12-inch PRV and vault	\$203,000	100%	\$203,000
1	Distribution	D-23	Install a new 3x12-inch PRV and vault	\$304,000	0%	\$0
3	Distribution	D-24 (D-16)	Install 1,900 feet of 10-inch pipe to separate pressure zones 3 and 4	\$290,000	0%	\$0
3	Distribution	D-25 (D-15)	Install 1,060 feet of 8-inch pipe	\$142,000	0%	\$0
3	Distribution	D-26	Install a new 8-inch PRV and vault	\$135,000	0%	\$0
5	Distribution	D-27	7,900 feet of 12-inch pipe	\$1,280,000	0%	\$0
5	Distribution	D-28	555 feet of 8-inch pipe	\$74,000	0%	\$0
5	Distribution	BD-1	Install 5,250 feet of 16-inch pipe	\$950,000	100%	\$950,000
5	Distribution	BD-2	Install 5,260 feet of 16-inch pipe	\$952,000	100%	\$952,000
5	Distribution	BD-3	Install 2,575 feet of 16-inch pipe	\$466,000	100%	\$466,000
5	Distribution	BD-4	Install 3,540 feet of 16-inch pipe	\$640,000	100%	\$640,000
5	Distribution	BD-5	Install 6,220 feet of 24-inch pipe, 1,370 feet of 20-inch pipe, and 170 feet of 16-inch pipe	\$2,131,000	100%	\$2,131,000
5	Distribution	BD-6	Install 5,000 feet of 12-inch pipe	\$810,000	100%	\$810,000
5	Distribution	BD-7	Install 3,260 feet of 16-inch pipe	\$590,000	100%	\$590,000
5	Distribution	BD-8	Upsize reimbursements	\$700,000	100%	\$700,000
5	Distribution	BD-9 (D-14)	Install 1,045 feet of 12-inch pipe	\$169,000	100%	\$169,000
5	Distribution	BD-10 (T-9)	Install 5,000 feet of 16-inch pipe	\$905,000	100%	\$905,000
5	Distribution	BD-11	Install 2,670 feet of 20-inch pipe and a 16-inch PRV	\$894,000	100%	\$894,000
5	Distribution	BD-12 (T-7)	Install 2,260 feet of 12-inch pipe and 1,130 feet of 16-inch pipe	\$570,000	100%	\$570,000
5	Distribution	BD-13 (T-8)	Install 3230 feet of 16-inch pipe	\$584,000	100%	\$584,000
5	Distribution	BD-14	Install a 12-inch PRV	\$203,000	100%	\$203,000

TABLE 8-1 CONTINUED

Priority	TYPE	ID (Old ID ¹)	RECOMMENDED PROJECT ²	TOTAL COST	% FUT	FUTURE COST
5	Distribution	BD-15	Install a 12-inch PRV	\$203,000	100%	\$203,000
5	Future	NA	43,126 feet of 10-inch pipe	\$6,579,000	100%	\$6,579,000
5	Future	NA	70,560 feet of future 12-inch pipe	\$14,439,000	100%	\$14,439,000
5	Future	NA	7,965 feet of future 16-inch pipe	\$561,000	100%	\$561,000
5	Future	NA	1,060 feet of future 24-inch pipe	\$303,000	100%	\$303,000
2	SCADA	NA	SCADA upgrade	\$371,000	0%	\$0
TOTAL				\$120,426,000		\$86,234,000

1. For convenience, project ID's from the 2006 Master Plan update have been included where applicable.
2. For project descriptions including addresses, refer to the source, storage and distribution system recommendation summaries presented in previous chapters.

All projects with an existing component are recommended to be completed in 0 to 5 years. In general, the highest priority projects are those which address existing deficiencies. Fire flow projects should be considered the first priority, followed by other existing projects. For convenience, the priority of each project has been rated on a scale from 1 to 5, with 1 being the highest priority.

Projects have also been analyzed in order to determine the percentage of each project which meets future needs. The majority of the projects were either 100% existing or 100% future. In all, eleven projects were identified with both existing and future components. The methodology used to evaluate the future percentage of each of those projects will be described in the following paragraphs.

The majority of the projects with both an existing and a future component are storage tanks. The storage projects were evaluated based on the amount of storage each tank would contribute towards meeting existing and future storage requirements. The proposed storage projects detailed in this master plan will result in a net increase of 40.0 MG of storage capacity for the City. Under existing conditions, the City has a shortfall of 11.0 MG of storage. Under build-out conditions, an excess of 0.4 MG is planned. Therefore, the amount of new storage that will contribute to meeting future storage requirements is 28.6 MG (40.0 MG – 11.0 MG – 0.4 MG). The storage added to the lower zones will go towards meeting existing demands until the 11.0 MG existing shortfall is met. Therefore, all of the storage to Zones 1 and 2 and 3.0 MG of the storage added to Zone 3 will go towards meeting existing needs. The surplus capacity of 0.4 MG was proportioned to the upper zones that are projected to have excess future capacity; 0.2 MG in Zone 7 and 0.2 MG in Zone 4. The remaining storage in each zone was assumed to be applied to future needs. Table 8-2 shows a breakdown of the storage allocation.

Project F-6 is a fire flow project for a proposed development. The percentage attributable to future growth is 25%, and was provided by the City based on the number of undeveloped lots. Projects D-11 and D-21 are distribution projects. Project D-11 was originally requested as an 8-inch pipeline in the north side of 7800 South in order to meet the City's standard of dual pipelines on either side of roads with five or more traffic lanes. However, modeling showed that larger pipes would be needed in the future in order to supply adequate capacity. The future percentage for D-11 was calculated as percentage of the total cost beyond that needed to install

the original 8-inch pipeline to meet City standards. The future percentage for Project D-21 was calculated using the modeled flows in the pipe under existing and build-out conditions, and the build-out flow was 20% higher than the existing flow.

**TABLE 8-2
ALLOCATION OF PROPOSED STORAGE**

ZONE	PLANNED NET ADDED STORAGE (MG)				
		EXISTING (MG)	EXCESS (MG)	FUTURE (MG)	% FUTURE
1	5.0	5	0	0	0
2	3.0	3	0	0	0
3 ¹	7.0	3	0	4	57%
4	7.0	0	0.2	6.8	97%
5	8.0	0	0	8.0	100%
6	6.0	0	0	6.0	35%
7	4.0	0	0.2	3.8	95%
SUM	40.0	11.0	0.4	28.6	72%

1. Zones 3, 3a, and 3b have been combined since no new storage is planned for Zones 3a and 3b

FUNDING OPTIONS

Funding options for the recommended projects, in addition to water use fees, could include the following options: general obligation bonds, revenue bonds, State/Federal grants and loans, and impact fees. In reality, the City may need to consider a combination of these funding options. The following discussion describes each of these options.

General Obligation Bonds

This form of debt enables the City to issue general obligation bonds for capital improvements and replacement. General Obligation (G.O.) Bonds would be used for items not typically financed through the Water Revenue Bonds (for example, the purchase of water source to ensure a sufficient water supply for the City's in the future). G.O. bonds are debt instruments backed by the full faith and credit of the City which would be secured by an unconditional pledge of the City to levy assessments, charges or ad valorem taxes necessary to retire the bonds. G.O. bonds are the lowest-cost form of debt financing available to local governments and can be combined with other revenue sources such as specific fees, or special assessment charges to form a dual security through the City's revenue generating authority. These bonds are supported by the City as a whole, so the amount of debt issued for the water system is limited to a fixed percentage of the real market value for taxable property within the City.

Revenue Bonds

This form of debt financing is also available to the City for utility related capital improvements. Unlike G.O. bonds, revenue bonds are not backed by the City as a whole, but constitute a lien against the water service charge revenues of a Water Utility. Revenue bonds present a greater risk to the investor than do G.O. bonds, since repayment of debt depends on an adequate

revenue stream, legally defensible rate structure and sound fiscal management by the issuing jurisdiction. Due to this increased risk, revenue bonds generally require a higher interest rate than G.O. bonds, although currently interest rates are at historic lows. This type of debt also has very specific coverage requirements in the form of a reserve fund specifying an amount, usually expressed in terms of average or maximum debt service due in any future year. This debt service is required to be held as a cash reserve for annual debt service payment to the benefit of bondholders. Typically, voter approval is not required when issuing revenue bonds.

State/Federal Grants and Loans

Historically, both local and county governments have experienced significant infrastructure funding support from state and federal government agencies in the form of block grants, direct grants in aid, interagency loans, and general revenue sharing. Federal expenditure pressures and virtual elimination of federal revenue sharing dollars are clear indicators that local government may be left to its own devices regarding infrastructure finance in general. However, state/federal grants and loans should be further investigated as a possible funding source for needed water system improvements.

It is also important to assess likely trends regarding federal / state assistance in infrastructure financing. Future trends indicate that grants will be replaced by loans through a public works revolving fund. Local governments can expect to access these revolving funds or public works trust funds by demonstrating both the need for and the ability to repay the borrowed monies, with interest. As with the revenue bonds discussed earlier, the ability of infrastructure programs to wisely manage their own finances will be a key element in evaluating whether many secondary funding sources, such as federal/state loans, will be available to the City.

Impact Fees

Impact fees can be applied to water related facilities under the Utah Impact Fees Act. The Utah Impacts Fees Act is designed to provide a logical and clear framework for establishing new development assessments. It is also designed to establish the basis for the fee calculation which the City must follow in order to comply with the statute. However, the fundamental objective for the fee structure is the imposition on new development of only those costs associated with providing or expanding water infrastructure to meet the capacity needs created by that specific new development. Also, impact fees cannot be applied retroactively.

PROJECT COST CALCULATIONS

ID	Project Description	UNIT	UNIT TYPE	UNIT COST	COST	Contingency (20%) and Engineering (15%)	TOTAL COST
W-1	Zone 1 JVWCD Connection Improvements	1	ea.	\$50,000	\$50,000	\$17,500	\$68,000
W-2	Zone 2 JVWCD Connection Improvements	1	ea.	\$25,000	\$25,000	\$8,750	\$34,000
W-3	Zone 3 JVWCD Connection Improvements	1	ea.	\$50,000	\$50,000	\$17,500	\$68,000
W-4	Zone 4 JVWCD Connection Improvements	1	ea.	\$50,000	\$50,000	\$17,500	\$68,000
W-5	Zone 5 JVWCD Connection Improvements	1	ea.	\$50,000	\$50,000	\$17,500	\$68,000
W-6	Zone 6 JVWCD Connection Improvements	1	ea.	\$25,000	\$25,000	\$8,750	\$34,000
W-7	New U-111 Well	1	ea.	\$1,200,000	\$1,200,000	\$420,000	\$1,620,000
W-8	New Terminal Well	1	ea.	\$1,200,000	\$1,200,000	\$420,000	\$1,620,000
W-9	New Ron Wood Park Well	1	ea.	\$1,200,000	\$1,200,000	\$420,000	\$1,620,000
W-10	New Barney's Wash Well	1	ea.	\$1,200,000	\$1,200,000	\$420,000	\$1,620,000
W-11	New Zone 5 North Booster Station	1	ea.	\$1,000,000	\$1,000,000	\$350,000	\$1,350,000
W-12	New Zone 5 South Booster Station	1	ea.	\$1,000,000	\$1,000,000	\$350,000	\$1,350,000
W-13	Additional Zone 2 booster pump	1	ea.	\$190,000	\$190,000	\$66,500	\$257,000
W-14	Additional Zone 3 booster pump	1	ea.	\$150,000	\$150,000	\$52,500	\$203,000
W-15	Additional Zone 4 booster pump	1	ea.	\$190,000	\$190,000	\$66,500	\$257,000
W-16	New Zone 7 North Booster Station	1	ea.	\$700,000	\$700,000	\$245,000	\$945,000
W-17	New Zone 7 South Booster Station	1	ea.	\$700,000	\$700,000	\$245,000	\$945,000
W-18	Well 3 Improvements to allow pumping to Zone 3	1	ea.	\$100,000	\$100,000	\$35,000	\$135,000
W-19	Well 4 Improvements	1	ea.	\$225,000	\$225,000	\$78,750	\$304,000
W-20	Exploratory Wells	2	ea.	\$185,000	\$370,000	\$129,500	\$500,000
W-21	Water Right Transfer	1	ea.	\$18,500	\$18,500	\$6,475	\$25,000
W-22	5 Year Master Plan Update	1	ea.	\$74,000	\$74,000	\$25,900	\$100,000
W-23	New Cemetery Tank Booster Station	1	ea.	\$1,000,000	\$1,000,000	\$350,000	\$1,350,000
S-1	New 4.0 MG Airport Tank	1	ea.	\$4,000,000	\$4,000,000	\$1,400,000	\$5,400,000
	Piping modifications	1	ea.	\$40,000	\$40,000	\$14,000	\$54,000
S-2	New 3.0 MG Cemetery Tank	1	ea.	\$3,000,000	\$3,000,000	\$1,050,000	\$4,050,000
S-3	New 3.0 MG Old Bingham Highway Zone 2 Tank #2	1	ea.	\$3,000,000	\$3,000,000	\$1,050,000	\$4,050,000
S-4	New 4.0 MG Old Bingham Highway Zone 3 Tank	1	ea.	\$4,000,000	\$4,000,000	\$1,400,000	\$5,400,000
S-5	New 3.0 MG Zone 3 North Tank	1	ea.	\$3,000,000	\$3,000,000	\$1,050,000	\$4,050,000
S-6	New 3.0 MG Terminal Tank #2	1	ea.	\$3,000,000	\$3,000,000	\$1,050,000	\$4,050,000
S-7	New 4.0 MG U-111 Tank #2	1	ea.	\$4,000,000	\$4,000,000	\$1,400,000	\$5,400,000
S-8	New 4.0 MG Zone 5 North Tank	1	ea.	\$4,000,000	\$4,000,000	\$1,400,000	\$5,400,000
S-9	New 4.0 MG Zone 5 South Tank	1	ea.	\$4,000,000	\$4,000,000	\$1,400,000	\$5,400,000
S-10	New 3.0 MG Zone 6 North Tank	1	ea.	\$3,000,000	\$3,000,000	\$1,050,000	\$4,050,000
S-11	New 3.0 MG Zone 6 South Tank	1	ea.	\$3,000,000	\$3,000,000	\$1,050,000	\$4,050,000
S-12	New 2.0 MG Zone 7 North Tank	1	ea.	\$2,000,000	\$2,000,000	\$700,000	\$2,700,000
S-13	New 2.0 MG Zone 7 South Tank	1	ea.	\$2,000,000	\$2,000,000	\$700,000	\$2,700,000
AC-1	Install 1,510 feet of 8-inch pipe	1,510	foot	\$99	\$149,490	\$52,322	\$202,000
AC-2	Install 5,320 feet of 10-inch pipe	5,320	foot	\$113	\$601,160	\$210,406	\$812,000
AC-3	Install 2,920 feet of 8-inch pipe	2,920	foot	\$99	\$289,080	\$101,178	\$390,000
AC-4	Install 5,220 feet of 8-inch pipe	5,220	foot	\$99	\$516,780	\$180,873	\$698,000
AC-5	Install 2,520 feet of 10-inch pipe	2,520	foot	\$113	\$284,760	\$99,666	\$384,000
AC-6	Install 2,290 feet of 8-inch pipe	2,290	foot	\$99	\$226,710	\$79,349	\$306,000
AC-7	Install 2,670 feet of 8-inch pipe	2,670	foot	\$99	\$264,330	\$92,516	\$357,000
AC-8	Install 1,265 feet of 8-inch pipe	1,265	foot	\$99	\$125,235	\$43,832	\$169,000
AC-9	Install 565 feet of 8-inch pipe	565	foot	\$99	\$55,935	\$19,577	\$76,000
AC-10	Install 1,450 feet of 8-inch pipe	1,450	foot	\$99	\$143,550	\$50,243	\$194,000
AC-11	Install 4,600 feet of 8-inch pipe	4,600	foot	\$99	\$455,400	\$159,390	\$615,000
F-1	690 feet of 10-inch pipe	690	foot	\$113	\$77,970	\$27,290	\$105,000
	570 feet of 8-inch pipe	570	foot	\$99	\$56,430	\$19,751	\$76,000
F-2	400 feet of 8-inch pipe	400	foot	\$99	\$39,600	\$13,860	\$53,000
	400 feet of 8-inch pipe	400	foot	\$99	\$39,600	\$13,860	\$53,000
F-3	575 feet of 8-inch pipe	575	foot	\$99	\$56,925	\$19,924	\$77,000
F-4	Install 1,535 feet of 8-inch pipe	1,535	foot	\$99	\$151,965	\$53,188	\$205,000
F-5	8-inch interconnection	1	ea.	\$10,000	\$10,000	\$3,500	\$14,000
F-6	Install 750 feet of 12-inch pipe	750	foot	\$120	\$90,000	\$31,500	\$122,000
D-1	Install new 2x12-inch PRV and vault	1	ea.	\$200,000	\$200,000	\$70,000	\$270,000
D-2	Rehab PRV, run power to the vault and install fan and sur	1	ea.	\$25,000	\$25,000	\$8,750	\$34,000
D-3	Install a VFD on the smallest Zone 2 booster pump	1	ea.	\$50,000	\$50,000	\$17,500	\$68,000
D-4	Install a new 6-inch PRV in existing vault	1	ea.	\$25,000	\$25,000	\$8,750	\$34,000
D-5	Install a new 12-inch PRV and vault	1	ea.	\$150,000	\$150,000	\$52,500	\$203,000
D-6	Install a new 6-inch PRV in existing vault	1	ea.	\$25,000	\$25,000	\$8,750	\$34,000
D-7	Install a new 8-inch PRV in existing vault	1	ea.	\$30,000	\$30,000	\$10,500	\$41,000
D-8	Install a new 6-inch PRV and repair vault	1	ea.	\$50,000	\$50,000	\$17,500	\$68,000
D-9	Install a new 16-inch PRV in existing vault	1	ea.	\$75,000	\$75,000	\$26,250	\$101,000
D-10	Install a new 8-inch PRV and relocate vault	1	ea.	\$60,000	\$60,000	\$21,000	\$81,000
	Install 1,590 feet of 8-inch pipe	1,590	foot	\$99	\$157,410	\$55,094	\$213,000
	Install 355 feet of 12-inch pipe	355	foot	\$120	\$42,600	\$14,910	\$58,000

PROJECT COST CALCULATIONS

D-11	Install 1,175 feet of 16-inch pipe	1,175	foot	\$134	\$157,450	\$55,108	\$213,000
	Install 480 feet of 12-inch pipe	480	foot	\$120	\$57,600	\$20,160	\$78,000
	Install 70 feet of 16-inch pipe	70	foot	\$134	\$9,380	\$3,283	\$13,000
D-12	Install 1,530 feet of 10-inch pipe	1,530	foot	\$113	\$172,890	\$60,512	\$233,000
D-13	New 30-inch Connection	1	ea.	\$41,000	\$41,000	\$14,350	\$55,000
D-14	Install 3,120 feet of 12-inch pipe	3,120	foot	\$120	\$374,400	\$131,040	\$505,000
D-15	Landscaping at select water sites	4	ea.	\$75,000	\$300,000	\$105,000	\$405,000
D-16	Indoor Storage Facility for Water Parts and Fittings	1	ea.	\$500,000	\$500,000	\$175,000	\$675,000
D-17	Segregate a new Zone 2a pressure zone	2	ea.	\$25,000	\$50,000	\$17,500	\$68,000
D-18	Install 7,900 feet of 12-inch pipe	7,900	foot	\$120	\$948,000	\$331,800	\$1,280,000
D-19	Install 4,605 feet of 8-inch pipe	4,605	foot	\$99	\$455,895	\$159,563	\$615,000
D-20	8-inch pipeline connection changes	4	ea.	\$10,000	\$40,000	\$14,000	\$54,000
D-21	Install 2,435 feet of 16-inch pipe	2,435	foot	\$134	\$326,290	\$114,202	\$440,000
	Install 6,300 feet of 24-inch pipe	6,300	foot	\$212	\$1,335,600	\$467,460	\$1,803,000
	Install 2,685 feet of 18-inch pipe	2,685	foot	\$156	\$418,860	\$146,601	\$565,000
	Install 1,900 feet of 24-inch pipe	1,900	foot	\$212	\$402,800	\$140,980	\$544,000
	Install 135 feet of 16-inch pipe	135	foot	\$134	\$18,090	\$6,332	\$24,000
D-22	Install a new 12-inch PRV and vault	1	ea.	\$150,000	\$150,000	\$52,500	\$203,000
D-23	Install a new 3x12-inch PRV and vault	1	ea.	\$225,000	\$225,000	\$78,750	\$304,000
D-24	Install 1,900 feet of 10-inch pipe	1,900	foot	\$113	\$214,700	\$75,145	\$290,000
D-25	Install 1,060 feet of 8-inch pipe	1,060	foot	\$99	\$104,940	\$36,729	\$142,000
D-26	Install a new 8-inch PRV and vault	1	ea.	\$100,000	\$100,000	\$35,000	\$135,000
D-27	7,900 feet of 12-inch pipe	7,900	foot	\$120	\$948,000	\$331,800	\$1,280,000
D-28	555 feet of 8-inch pipe	555	foot	\$99	\$54,945	\$19,231	\$74,000
BD-1	Install 5,250 feet of 16-inch pipe	5,250	foot	\$134	\$703,500	\$246,225	\$950,000
BD-2	Install 5,260 feet of 16-inch pipe	5,260	foot	\$134	\$704,840	\$246,694	\$952,000
BD-3	Install 2,575 feet of 16-inch pipe	2,575	foot	\$134	\$345,050	\$120,768	\$466,000
BD-4	Install 3,540 feet of 16-inch pipe	3,540	foot	\$134	\$474,360	\$166,026	\$640,000
BD-5	Install 6,220 feet of 24-inch pipe	6,220	foot	\$212	\$1,318,640	\$461,524	\$1,780,000
	Install 1,370 feet of 20-inch pipe	1,370	foot	\$173	\$237,010	\$82,954	\$320,000
	Install 170 feet of 16-inch pipe	170	foot	\$134	\$22,780	\$7,973	\$31,000
BD-6	Install 5,000 feet of 12-inch pipe	5,000	foot	\$120	\$600,000	\$210,000	\$810,000
BD-7	Install 3,260 feet of 16-inch pipe	3,260	foot	\$134	\$436,840	\$152,894	\$590,000
BD-8	Upsize Reimbursements	1	ea.	\$700,000	\$700,000	N/A	\$700,000
BD-9	Install 1,045 feet of 12-inch pipe	1,045	foot	\$120	\$125,400	\$43,890	\$169,000
BD-10	Install 5,000 feet of 16-inch pipe	5,000	foot	\$134	\$670,000	\$234,500	\$905,000
BD-11	Install 2,670 feet of 20-inch pipe	2,670	foot	\$173	\$461,910	\$161,669	\$624,000
	Install a 16-inch PRV and vault	1	ea.	\$200,000	\$200,000	\$70,000	\$270,000
BD-12	Install 1,130 feet of 16-inch pipe	1,130	foot	\$134	\$151,420	\$52,997	\$204,000
	Install 2,260 feet of 12-inch pipe	2,260	foot	\$120	\$271,200	\$94,920	\$366,000
BD-13	Install 3,230 feet of 16-inch pipe	3,230	foot	\$134	\$432,820	\$151,487	\$584,000
BD-14	Install a new 12-inch PRV and vault	1	ea.	\$150,000	\$150,000	\$52,500	\$203,000
BD-15	Install a new 12-inch PRV and vault	1	ea.	\$150,000	\$150,000	\$52,500	\$203,000
NA	43,126 feet of future 10-inch pipe	43,126	foot	\$113	\$4,873,238	\$1,705,633	\$6,579,000
NA	70,560 feet of future 12-inch pipe	89,130	foot	\$120	\$10,695,600	\$3,743,460	\$14,439,000
NA	7,965 feet of future 16-inch pipe	3,100	foot	\$134	\$415,400	\$145,390	\$561,000
NA	1,060 feet of future 24-inch pipe	1,060	foot	\$212	\$224,720	\$78,652	\$303,000
NA	SCADA Upgrade	1	ea.	\$275,000	\$275,000	\$96,250	\$371,000

TOTAL \$120,426,000