Appendix E

Cost Estimates

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Region A Regional Water Planning Area Cost Estimates

As part of the 2011 PWPA Regional Water Plan, cost estimates were developed for each of the recommended water management strategies in Region A. As appropriate, these cost estimates have been updated for the 2016 regional water plan. In accordance with the Texas Water Development Board guidance the costs for water management strategies are to be updated from second quarter 2008 dollars to September 2013 dollars. The methodology used to develop the 2016 costs is described in the following sections. Where updated unit costs were not available, the Engineering News Record (ENR) Index for construction was used to increase the costs from second quarter 2008 (September) costs to September 2013 costs. An increase of 111.6% from September 2008 to September 2013 was determined using the ENR Index method.

Introduction

1. The evaluation of water management strategies requires developing cost estimates. Guidance for cost estimates may be found in the TWDB's "First Amended General Guidelines for Regional Water Plan Development (2012-2017)", Section 5.1. Costs are to be reported in September 2013 dollars.

2. Standard unit costs for installed pipe, pump stations, standard treatment facilities, and well fields were developed and/or updated using the costing tool provided by the TWDB. The unit costs do not include engineering, contingency, financial and legal services, costs for land and rights-of-way, permits, environmental and archeological studies, or mitigation. The costs for these items are determined separately in the cost tables.

3. The information presented in this section is intended to be 'rule-of-thumb' guidance. Specific situations may call for alteration of the procedures and costs. Note that the costs in this memorandum provide a planning level estimate for comparison purposes.

4. It is important that when comparing alternatives that the cost estimates be similar and include similar items. If an existing reliable cost estimate is available for a project it should be used where appropriate. All cost estimates must meet the requirements set forth in the TWDB's "First Amended General Guidelines for Regional Water Plan Development (2012-2017)".

5. The cost estimates have two components:

    - Initial Capital Costs: Including total construction cost of facilities, engineering and legal contingencies, environmental and archaeology studies and mitigation, land acquisition and surveying, and interest incurred during construction (4.0% annual interest rate less a 1.0% rate of return on investment of unspent funds).

- Average Annual Costs: Including annual operation and maintenance costs, pumping energy costs, purchase of water and debt service.

TWDB does not require the consultant to determine life cycle or present value analysis. For most situations annual costs are sufficient for comparison purposes and a life-cycle analysis is not required.

ASSUMPTIONS FOR CAPITAL COSTS:

Conveyance Systems

The unit costs and factors shown in Tables 1-7 were developed directly from the TWDB costing tool. These costs are the basis of the capital costs developed for this plan. Standard pipeline costs used for these cost estimates are shown in Table 1. Pump station costs are based on required Horsepower capacity and are listed in Table 2. The power capacity is to be determined from the hydraulic analyses included in the TWDB costing tool (or detailed analysis if available). Pipelines and pump stations are to be sized for peak pumping capacity.

- Pump efficiency is assumed to be 70 percent.
- Peaking factor of 2 times the average demand is to be used for strategies when the water is pumped directly to a water treatment plant. (or historical peaking factor, if available)
- The target flow velocity in pipes is 5 fps and the Hazen-Williams Factor is assumed to be 120.
- Peaking factor of 1.2 to 1.5 can be used if there are additional water sources and/or the water is transported to a terminal storage facility.
- Ground storage is to be provided at each booster pump station along the transmission line unless there is a more detailed design.
- Ground storage tanks should provide sufficient storage for 2.5 to 4 hours of pumping at peak capacity. Costs for ground storage are shown in Table 3. Covered storage tanks are used for all strategies transporting treated water.

Water Treatment Plants

Water treatment plants are to be sized for peak day capacity (assume peaking factor of 2 if no specific data is available). Costs estimated include six different treatment levels of varying degree. These levels are groundwater chlorine disinfection, iron and manganese removal, simple filtration, construction of a

new conventional treatment plant, expansion of a conventional treatment plant, brackish desalination, and seawater desalination. Costs are also based upon a TDS factor that will increase or decrease the cost of treatment accordingly. These costs are summarized in Table 4. **All treatment plants are to be sized for finished water capacity**.

Direct Reuse

Direct reuse refers to the introduction of reclaimed water directly from a water reclamation plant to a distribution system. The following assumptions were made for direct potable and non-potable reuse strategies.

Direct Non-Potable Reuse

Non-potable reuse is the use of reclaimed water that is used directly for non-potable beneficial uses such as landscape irrigation. The TWDB costing tool currently does not have a direct non-potable reuse treatment plant improvements option, therefore the following assumptions were made.

- It was assumed that the cost of an iron and manganese removal plant would be an appropriate approximation of the improvements that would be needed at the Wastewater Treatment Plant. This cost was further refined by assuming that only upgrades to an existing facility would be required, and not construction of an entirely new plant.
- Approximately two miles of 6-inch pipeline was also included in the cost estimates for transport of the treated water to the destination. Since reuse is still relatively new, there is a lack of piping infrastructure for reuse water. It was also assumed that the pump station was included in the WWTP improvements.

Direct Potable Reuse

Direct potable reuse is the use of reclaimed water that is transported directly from a wastewater treatment plant to a drinking water system. The TWDB costing tool currently does not have a direct potable reuse treatment plant improvements option, therefore the following assumptions were made.

- Due to the high level of treatment that is required for direct potable reuse, the wastewater treatment plant improvements cost was assumed to be equivalent to 75% of a conventional treatment plant expansion plus brackish desalination treatment

improvements. The 25% discount was given to Level 3 Treatment in order to alleviate any redundancy being assumed by the costing tool.

New Groundwater Wells

Cost estimates required for water management strategies that include additional wells or well fields were determined through the TWDB costing tool (unless a more detailed design was available). The associated costs are shown in Table 5. The costing tool differentiated the wells based upon purpose. The categories were Public Supply, Irrigation, and ASR. These cost relationships are "rule-of-thumb" in nature and are only appropriate in the broad context of the cost evaluations for the RWP process.

The cost relationships assume construction methods required for public water supply wells, including carbon steel surface casing and pipe-based, stainless steel, and wire-wrap screen. The cost estimates assume that wells would be gravel-packed in the screen sections and the surface casing cemented to their total depth. Estimates include the cost of drilling, completion, well development, well testing, pump, motor, motor controls, column pipe, installation and mobilization. The cost relationships do not include engineering, contingency, financial and legal services, land costs, or permits. A more detailed cost analysis should be completed prior to developing a project.

The costs associated with conveyance systems for multi-well systems can vary widely based on the distance between wells, terrain characteristics, well production, and distance to the treatment facility. These costs should be estimated using standard engineering approaches and site-specific information. For planning purposes, these costs were estimated using the TWDB costing tool's assumptions for conveyance. It is important to note that conveyance costs were not included for point of use water user groups such as mining.

Other Costs

- Engineering, contingency, construction management, financial and legal costs are to be estimated at 30 percent of construction cost for pipelines and 35 percent of construction costs for pump stations, treatment facilities and reservoir projects. (This is in accordance with TWDB guidance.)
- Permitting and mitigation for transmission and treatment projects are to be estimated at $25,000 per mile. For reservoirs, mitigation and permitting costs are assumed equal to twice the land purchase cost, unless site specific data is available.

- Right-of-way (ROW) costs for transmission lines are estimated through costs provided by the Texas A&M University Real Estate Center (http://recenter.tamu.edu/data/rland/) which gives current land costs based on county. The ROW width is assumed to be 20 ft. If a small pipeline follows existing right-of-ways (such as highways), no additional right-of-way cost may be assumed. Large pipelines will require ROW costs regardless of routing.

Interest during construction is the total of interest accrued at the end of the construction period using a 4.0 percent annual interest rate on total borrowed funds, less a 1 percent rate of return on investment of unspent funds. This is calculated assuming that the total estimated project cost (excluding interest during construction) would be drawn down at a constant rate per month during the construction period. Factors were determined for different lengths of time for project construction. These factors were used in cost estimating and are presented in Table 6.

ASSUMPTIONS FOR ANNUAL COSTS:

Annual costs are to be estimated using the following assumptions:

- Debt service for all transmission and treatment facilities is to be annualized over 20 years, but not longer than the life of the project. [Note: uniform amortization periods should be used when evaluating similar projects for an entity.]
- Annual interest rate for debt service is 5.5 percent.
- Water purchase costs are to be based on wholesale rates reported by the selling entity when possible. In lieu of known rates, a typical regional cost for treated water and raw water will be developed.
- Operation and Maintenance costs are to be calculated based on the construction cost of the capital improvement. Engineering, permitting, etc. should not be included as a basis for this calculation. However, a 20% allowance for construction contingencies should be included for all O&M calculations. Per the "First Amended General Guidelines for Regional Water Plan Development (2012-2017)", O&M should be calculated at:
    - 1 percent of the construction costs for pipelines
    - 1.5 percent for dams
    - 2.5 percent of the construction costs for pump stations
    - O&M Costs for the varying levels of water treatment plant improvements were developed by the TWDB and are shown in Table 7.
- Pumping costs are to be estimated using an electricity rate of $0.09 per Kilowatt Hour. If local data is available, this can be used.

Table 1

Pipeline Costs

Diameter	Soil		Rock	
	Rural	**Urban**	**Rural**	**Urban**
(Inches)	($/Foot)	($/Foot)	($/Foot)	(Feet)
6	$18	$25	$22	$30
8	$28	$39	$34	$47
10	$31	$44	$38	$53
12	$35	$48	$41	$58
14	$46	$64	$55	$78
16	$57	$81	$68	$97
18	$68	$97	$83	$116
20	$81	$112	$96	$135
24	$103	$144	$123	$172
30	$137	$191	$164	$230
36	$170	$239	$204	$287
42	$204	$286	$246	$343
48	$239	$334	$286	$401
54	$273	$382	$327	$457
60	$306	$429	$368	$515
66	$358	$501	$430	$602
72	$419	$587	$504	$705
78	$490	$687	$589	$825
84	$574	$804	$689	$965
90	$672	$941	$806	$1,129
96	$772	$1,082	$927	$1,298
102	$865	$1,211	$1,038	$1,453
108	$952	$1,332	$1,142	$1,599
114	$1,047	$1,465	$1,256	$1,758
120	$1,152	$1,612	$1,382	$1,934
132	$1,324	$1,854	$1,589	$2,225
144	$1,523	$2,132	$1,828	$2,559

Table 2
Pump Station Costs

Horsepower	Booster PS Cost ($-million)	Intake PS cost ($-millions)
0	$0.00	$0.00
5	$0.62	$0.67
10	$0.68	$0.72
20	$0.72	$0.77
25	$0.75	$0.82
50	$0.79	$1.03
100	$0.83	$1.55
200	$1.67	$2.06
300	$1.83	$2.58
400	$2.32	$3.09
500	$2.39	$3.61
600	$2.45	$4.12
700	$2.52	$4.64
800	$2.97	$5.15
900	$3.08	$5.67
1,000	$3.20	$6.18
2,000	$4.33	$8.66
3,000	$5.46	$10.00
4,000	$6.60	$11.34
5,000	$7.73	$12.37
6,000	$8.87	$13.40
7,000	$10.00	$14.43
8,000	$11.13	$15.46
9,000	$12.27	$16.49
10,000	$13.40	$17.52
20,000	$24.74	$28.86
30,000	$29.69	$38.13
40,000	$37.11	$48.44
50,000	$46.39	$57.72
60,000	$55.67	$66.99
70,000	$66.80	$77.30

Note:
1. Intake PS costs include intake and pump station.
2. Adjust pump station costs upward if the pump station is designed to move large quantities of water at a low head (i.e. low horsepower).
3. Assumed multiple pump setup for all pump stations.

Table 3
Ground Storage Tanks

Tank Volume (MG)	With Roof ($)	Without Roof ($)
0.05	$178,301	$118,524
0.1	$192,730	$174,179
0.5	$412,257	$374,123
1	$698,776	$618,386
1.5	$967,774	$674,041
2	$1,236,772	$803,902
2.5	$1,339,836	$922,426
3	$1,442,900	$1,040,950
3.5	$1,649,029	$1,154,320
4	$1,855,158	$1,267,691
5	$2,061,286	$1,463,513
6	$2,370,479	$1,752,093
7	$2,782,736	$2,009,754
8	$3,194,994	$2,370,479
10	$3,997,864	$3,071,316
12	$4,997,331	$3,916,444
14	$6,021,017	$4,740,958

Note: Costs assume steel tanks smaller than 1 MG, concrete tanks 1 MG and larger.

Table 4
Conventional Water Treatment Plant Costs

	Level 0	Level 1	Level 2	Level 3 (new)	Level 3 (exp)	Level 4	Level 5
	Chlorine Disinfection (GW)	Iron & Manganese Removal	Simple Filtration	Conventional Treatment	Conventional Treatment	Brackish Desalination	Seawater Desalination
Capacity (MGD)	Capital Cost ($)	Capital Cost ($)	Capital Cost ($)	Capital Cost ($)	Capital Cost ($)	Capital Cost ($)	Capital Cost ($)
0	0	0	0	0	0	0	0
0.1	17,948	224,345	1,030,643	1,373,739	1,373,739	916,221	2,202,644
1	69,098	900,371	3,607,251	4,844,022	4,844,022	3,664,883	14,738,196
10	440,703	3,747,009	19,066,897	32,980,578	18,551,575	24,777,648	98,615,306
50	2,203,515	10,882,523	72,145,015	135,606,271	66,991,800	94,233,468	372,343,747
75	3,305,272	15,701,003	105,469,141	199,327,155	106,502,260	131,935,273	520,364,186
100	4,407,030	19,236,530	138,793,267	261,974,046	129,095,574	167,517,457	659,848,640
150	6,610,545	29,438,241	205,441,519	385,074,680	193,640,235	234,539,403	922,162,931
200	8,814,060	33,898,368	272,089,771	506,100,496	238,822,748	297,793,331	1,169,350,182

Note: Plant is sized for finished peak day capacity.

Table 5
Cost Elements for Water Wells

Public Supply Well Costs						
	Well Capacity (MGD)					
Well Depth (ft)	**100**	**175**	**350**	**700**	**1000**	**1800**
150	$124,138	$188,450	$321,561	$363,439	$453,177	$662,565
300	$167,510	$239,301	$382,882	$438,220	$541,419	$767,259
500	$216,867	$299,127	$454,672	$523,472	$644,618	$892,892
700	$261,736	$352,969	$518,984	$601,244	$737,347	$1,003,569
1000	$343,996	$451,681	$638,635	$743,330	$909,345	$1,209,967
1500	$481,594	$617,696	$836,059	$981,135	$1,193,515	$1,550,971
2000	$619,192	$782,216	$1,033,482	$1,218,941	$1,479,181	$1,893,471
Irrigation Well Costs						
150	$68,800	$106,190	$180,972	$207,893	$263,231	$379,891
300	$91,234	$136,103	$221,353	$261,736	$332,031	$463,646
500	$113,669	$170,502	$264,727	$320,065	$406,812	$560,863
700	$131,615	$195,928	$302,118	$369,422	$472,620	$644,618
1000	$171,998	$252,762	$379,891	$471,124	$602,740	$809,137
1500	$240,797	$349,979	$508,515	$640,130	$818,111	$1,081,342
2000	$308,100	$444,203	$637,139	$807,642	$1,034,978	$1,355,043
ASR Well Costs						
150	$137,598	$212,379	$369,422	$417,282	$520,480	$767,259
300	$180,972	$263,231	$430,742	$492,063	$608,723	$873,449
500	$230,327	$324,553	$502,532	$577,315	$713,417	$997,587
700	$276,692	$378,395	$568,341	$655,087	$804,651	$1,109,759
1000	$357,456	$477,107	$686,496	$797,173	$976,649	$1,314,662
1500	$496,550	$641,627	$883,919	$1,034,978	$1,260,819	$1,655,665
2000	$632,653	$806,146	$1,081,342	$1,272,783	$1,546,484	$1,998,165

Table 6
Factors for Interest During Construction

Construction Period	Factor
6 months	0.0175
12 months	0.035
18 months	0.0525
24 months	0.07
36 months	0.105
48 month	0.14
60 months	0.175
72 months	0.21
84 months	0.245

Table 7
Annual Water Treatment Plant O&M Costs

	Level 0	Level 1	Level 2	Level 3 (New)	Level (Exp)	Level 4	Level 5
Capacity (MGD)	**Chlorine Disinfection (GW)**	**Iron & Manganese Removal**	**Simple Filtration**	**Conventional Treatment**	**Conventional Treatment**	**Brackish Desalination**	**Seawater Desalination**
0	0	0	0	0	0	0	0
0.1	5,384	37,017	103,064	68,687	68,687	83,293	374,449
1	20,729	148,561	360,725	242,201	242,201	333,171	2,505,493
10	132,211	618,256	1,906,690	1,649,029	927,579	2,252,513	16,764,602
50	661,054	1,795,616	7,214,502	6,780,314	3,349,590	8,566,679	63,298,437
75	991,582	2,590,666	10,546,914	9,966,358	5,325,113	11,994,116	88,461,912
100	1,322,109	3,174,027	13,879,327	13,098,702	6,454,779	15,228,860	112,174,269
150	1,983,163	4,857,310	20,544,152	19,253,734	9,682,012	21,321,764	156,767,698
200	2,644,218	5,593,231	27,208,977	25,305,025	11,941,137	27,072,121	198,789,531

Table E-1
City of Amarillo
Develop Potter County Well Field (Ogallala Aquifer)

Owner:	City of Amarillo
Quantity:	6,000

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Wells	12	EA	$627,000	$7,524,000
Well Field Collection Pipeline(s)	211,200	LF	$88	$18,660,000
Connection to Existing Infrastructure	26,400	LF	$301	$7,944,000
Pump Station Upgrade	1	EA	$1,500,000	$1,500,000
Storage Tank (3 MG)	2	EA	$1,443,000	$2,886,000
Total Capital Costs				**$38,514,000**

Other Project Cost:	**Quantity**	**Units**	**Unit Price**	**Cost**
Engineering and Contingencies (30% for pipeline)				$7,981,000
Engineering and Contingencies (35% for other items)				$3,644,000
Land Acquisition	273	AC	$1,200	$327,000
Permitting and Mitigation	45	MI	$25,000	$1,125,000
Interest During Construction (12 months)				$1,806,000
Groundwater Rights/ Purchase				$0
TOTAL CAPITAL COST				**$53,397,000**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$4,468,000
Electricity				$468,000
Water Treatment O&M				$75,000
Operation and Maintenance				$632,000
Total Annual Cost				**$5,643,000**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$941**
Water Cost ($ per 1,000 gallons)				**$2.89**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$196**
Water Cost ($ per 1,000 gallons)				**$0.60**

Table E-2
City of Amarillo
Develop Carson County Well Field (Ogallala Aquifer)

Owner:	City of Amarillo			
Quantity:	11,200			
Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Wells	18	EA	$673,000	$12,114,000
Well Field Collection Pipeline(s) (range 8" to 30")	95,040	LF	$63	$5,998,000
Connection to Existing Infrastructure (42")	15,840	LF	$226	$3,575,000
Storage Tank	0	EA	$699,000	$0
Pump Station Overhaul	1	EA	$1,000,000	$1,000,000
Total Capital Costs				**$22,687,000**
Other Project Cost:	**Quantity**	**Units**	**Unit Price**	**Cost**
Engineering and Contingencies (30% for pipeline)				$2,872,000
Engineering and Contingencies (35% for other items)				$4,590,000
Land Acquisition	145	AC	$1,200	$174,000
Permitting and Mitigation	21	MI	$25,000	$525,000
Interest During Construction (12 months)				$1,080,000
Groundwater Rights/ Purchase	11,200	Ac-Ft	$500	$5,600,000
TOTAL CAPITAL COST				**$37,528,000**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$3,140,000
Electricity				$1,160,000
Water Treatment O&M				$132,000
Operation and Maintenance				$508,000
Total Annual Cost				**$4,940,000**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$441**
Water Cost ($ per 1,000 gallons)				**$1.35**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$161**
Water Cost ($ per 1,000 gallons)				**$0.49**

Table E-3
City of Amarillo
Develop Roberts County Well Field (Ogallala Aquifer)

Owner:	City of Amarillo			
Quantity:	11,200			
Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Wells	18	EA	$584,000	$10,512,000
Well Field Collection Pipeline(s) (12" to 42")	95,040	LF	$88	$8,397,000
Connection to Existing Infrastructure (42")	396,000	LF	$226	$89,366,000
Storage Tank (3 MG)	2	EA	$1,443,000	$2,886,000
Pump Station	2	EA	$6,030,000	$12,060,000
Total Capital Costs				**$123,221,000**
Other Project Cost:	**Quantity**	**Units**	**Unit Price**	**Cost**
Engineering and Contingencies (30% for pipeline)				$29,329,000
Engineering and Contingencies (35% for other items)				$8,910,000
Land Acquisition	564	AC	$1,200	$676,000
Permitting and Mitigation	93	MI	$25,000	$2,325,000
Interest During Construction (12 months)				$5,756,000
Groundwater Rights/ Purchase				$0
TOTAL CAPITAL COST				**$170,217,000**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$14,244,000
Electricity				$910,000
Water Treatment O&M				$132,000
Operation and Maintenance				$1,937,000
Total Annual Cost				**$17,223,000**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$1,538**
Water Cost ($ per 1,000 gallons)				**$4.72**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$266**
Water Cost ($ per 1,000 gallons)				**$0.82**

Table E-4
City of Amarillo
Direct Reuse

Owner:	City of Amarillo			
Quantity:	6,100	AF/Y	**(5.45 MGD Average)**	

Capital Costs	**Quantity**	**Units**	**Unit Price**	**Cost**
20- inch pipeline	36,960	LF	$124	$4,572,000
8 MGD Pre-Treatment WTP	1	EA	$11,629,000	$11,629,000
8 MGD RO Plant	1	EA	$21,303,000	$21,303,000
Wastewater Treatment Plant Improvements	1	LS	$2,500,000	$2,500,000
Pump Station at WWTP	1	LS	$1,500,000	$1,500,000
12 inch RO Discharge Line	36,960	LF	$54	$1,978,000
Total Capital Cost				**$43,482,000**

Other Project Cost:	**Quantity**	**Units**	**Unit Price**	**Cost**
Engineering, Legal Costs and Contingencies (30% pipelines)				$1,965,000
Engineering, Legal Costs and Contingencies (35% all other)				$12,401,200
Land Acquisition	170	Ac	$10,000	$1,697,000
Permitting and Mitigation	14	mi	$25,000	$850,000
Interest During Construction (18 months)				$3,171,000
Total Project Cost				**$63,566,200**

Annual Costs	
Debt Service (5.5 percent for 20 years)	$5,319,000
Pipeline and Well Operation and Maintenance	$128,000
Treatment O&M	$2,601,265
Pumping Energy Costs ($0.09/kWh)	$295,000
Total Annual Cost	**$8,343,265**

UNIT COST (Until Amortized)	
Annual Cost of Water ($ per acft)	$1,368
Annual Cost of Water ($ per 1,000 gallons)	$4.20

UNIT COSTS (After Amortization)	
Water Cost ($ per ac-ft)	$496
Water Cost ($ per 1,000 gallons)	$1.52

Table E-5
Canadian River Municipal Water Authority
Replace Capacity of Roberts County Well Field (Ogallala Aquifer) in 2030

Owner:	Canadian River Municipal Water Authority
Quantity:	9,500 AF/Y

Capital Costs	**Quantity**	**Units**	**Unit Price**	**Cost**
Collection Pipeline(s)	5	EA	$100,000	$500,000
Well Field(s) and Wells	5	EA	$1,087,000	$5,435,000
Total Capital Cost				**$5,935,000**

Other Project Cost:	**Quantity**	**Units**	**Unit Price**	**Cost**
Engineering, Legal Costs and Contingencies (30% for pipelines)				$150,000
Engineering, Legal Costs and Contingencies (35% for wellfield)				$1,902,250
Interest During Construction (1 year)				$280,000
Total Project Cost				**$8,267,250**

Annual Costs	
Debt Service (5.5 percent for 20 years)	$692,000
Pipeline and Well Operation and Maintenance	$141,000
Pumping Energy Costs ($0.09/kWh)	$850,000
Total Annual Cost	**$1,683,000**

Unit Cost	
Annual Cost of Water ($ per acft)	$177
Annual Cost of Water ($ per 1,000 gallons)	$0.54

Table E-6
Canadian River Municipal Water Authority
Replace Capacity of Roberts County Well Field (Ogallala Aquifer) in 2050

Owner:	Canadian River Municipal Water Authority
Quantity:	18,500 AF/Y

Capital Costs:	**Quantity**	**Units**	**Unit Price**	**Cost**
Collection Pipeline(s)	10	EA	$100,000	$1,000,000
Well Field(s) and Wells	10	EA	$1,087,000	$10,870,000
Total Capital Cost				**$11,870,000**
Other Project Cost:	**Quantity**	**Units**	**Unit Price**	**Cost**
Engineering, Legal Costs and Contingencies (30% for pipelines)				$300,000
Engineering, Legal Costs and Contingencies (35% for wellfield)				$3,804,500
Interest During Construction (1 year)				$559,000
Total Project Cost				**$16,533,500**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$1,384,000
Pipeline and Well Operation and Maintenance				$282,000
Pumping Energy Costs ($0.09/kWh)				$1,654,000
Total Annual Cost				**$3,320,000**
Unit Cost				
Annual Cost of Water ($ per acft)				$179
Annual Cost of Water ($ per 1,000 gallons)				$0.55

Table E-7
Canadian River Municipal Water Authority
Expansion of Roberts County Well Field (Ogallala Aquifer) in 2024

Owner:	Canadian River Municipal Water Authority			
Quantity:	48,000	AF/Y		
Capital Costs	**Quantity**	**Units**	**Unit Price**	**Cost**
54 inch line (Amarillo)	354,486	LF	$342	$121,234,000
14 inch line (Pampa)	3,587	LF	$88	$316,000
8" Air Valve in Vault	98	EA	$14,000	$1,372,000
8" Air Valve in Vault	47	EA	$10,000	$470,000
Tunneled Crossing (72" STL Casing)	1,700	LF	$1,000	$1,700,000
Water Crossing (Slope Protected)	18	EA	$25,000	$450,000
Pipeline Connections	2	EA	$250,000	$500,000
Well Field Collection Pipeline(s)	20	EA	$100,000	$2,000,000
Well Field(s) and Wells	20	EA	$1,268,000	$25,360,000
Impressed Current Deep Well Groundbed	24	EA	$50,000	$1,182,000
54 MGD Pump Station	2	EA	$16,000,000	$32,000,000
9 MG Storage Tank	1	EA	$4,000,000	$4,000,000
Total Capital Cost				**$190,584,000**
Other Project Cost:	**Quantity**	**Units**	**Unit Price**	**Cost**
Contingnecy/Land Acquisition (16%)				$30,493,000
Engineering (10%)				$19,058,000
Permitting and Mitigation	68	mi	$25,000	$1,700,000
Interest During Construction (1 year)				$8,464,000
Total Project Cost				**$250,299,000**
UNIT COST (Until Amortized)				
Debt Service (5.5 percent for 20 years)				$20,945,000
Pipeline and Well Operation and Maintenance				$2,844,000
Pumping Energy Costs ($0.09/kWh)				$8,677,000
Total Annual Cost				**$32,466,000**
Unit Cost (Until Amortized)				
Annual Cost of Water ($ per acft)				$676
Annual Cost of Water ($ per 1,000 gallons)				$2.08
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				$240
Water Cost ($ per 1,000 gallons)				$0.74

Table E-8
City of Borger
Develop New Well Field (Ogallala Aquifer)

Owner:	City of Borger
Quantity:	6,000 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (600 GPM)	13	EA	$504,000	$6,552,000
Well Field Collection Pipeline(s)	13	EA	$100,000	$1,300,000
Connection to Pump Station	13	EA	$140,000	$1,820,000
Storage Tank (Closed)	1	EA	$2,370,000	$2,370,000
Subtotal for Wellfield and Treatment				**$12,042,000**
Transmission System				
24" Pipeline - Transmission Main	52,800	LF	$113	$5,966,000
Pump Station	1	LS	$813,000	$813,000
Subtotal for Transmission				**$6,779,000**
TOTAL CONSTRUCTION COST				**$18,821,000**
Other Project Cost:	**Quantity**	**Units**	**Unit Price**	**Cost**
Engineering and Contingencies (30% for pipelines)				$2,478,100
Engineering and Contingencies (35% for well field)				$4,044,300
Easement - Rural	24	AC	$1,200	$29,000
Permitting and Mitigation	10	MI	$25,000	$250,000
Groundwater Rights/ Purchase				$0
Interest During Construction (6 Months)				$448,000
TOTAL CAPITAL COST				**$26,070,400**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$2,182,000
Electricity				$436,900
Water Treatment				$74,641
Operation and Maintenance				$433,900
Total Annual Cost				**$3,127,441**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$521**
Water Cost ($ per 1,000 gallons)				**$1.60**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$158**
Water Cost ($ per 1,000 gallons)				**$0.48**

Table E-9
City of Cactus
Develop New Well Field (Ogallala Aquifer)

Owner:	City of Cactus				
Quantity:	5,500	AF/Y			
Capital Costs	**Quantity**		**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment					
Water Wells (850 GPM)	8		EA	$627,000	$5,016,000
Well Field Collection Pipeline(s)	8		EA	$100,000	$800,000
Connection to Pump Station	8		EA	$140,000	$1,120,000
Storage Tank (Closed)	1		EA	$699,000	$699,000
Subtotal for Wellfield and Treatment					**$7,635,000**
Transmission System					
24" Pipeline - Transmission Main	15,840		LF	$113	$1,790,000
Pump Station	1		LS	$1,749,000	$1,749,000
Subtotal for Transmission					**$3,539,000**
TOTAL CONSTRUCTION COST					**$11,174,000**
Other Project Cost:	**Quantity**		**Units**	**Unit Price**	**Cost**
Engineering and Contingencies (30% for pipelines)					$866,500
Engineering and Contingencies (35% for well field)					$3,004,400
Easement - Rural	7		AC	$1,200	$9,000
Permitting and Mitigation	3		MI	$25,000	$75,000
Groundwater Rights/ Purchase	5,500	AC-FT		$500	$2,750,000
Interest During Construction (6 Months)					$313,000
TOTAL CAPITAL COST					**$18,191,900**
Annual Costs					
Debt Service (5.5 percent for 20 years)					$1,522,000
Electricity					$439,100
Water Treatment					$69,116
Operation and Maintenance					$288,600
Total Annual Cost					**$2,318,816**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$422**
Water Cost ($ per 1,000 gallons)					**$1.29**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$145**
Water Cost ($ per 1,000 gallons)					**$0.44**

Table E-10
Connecting to Palo Duro Reservoir

Owner:	Palo Duro River Authority		Percentage
Quantity:	Cactus	1,744	45.0%
	Dumas	1,356	35.0%
	Sunray	271	7.0%
	Gruver	116	3.0%
	Spearman	271	7.0%
	Stinnet	116	3.0%
	Total	3,875	100.0%

	Quantity	Units	Unit Price	Cost
Water Treatment Plant				
9 MGD Conventional Treatment Plant	1	LS	$29,854,000	$29,854,000
Engineering and Contingencies (35%)				$10,449,000
Subtotal for Water Treatment Plant				**$40,303,000**

	Construction	Capital	O&M
Cactus	$13,434,000	$18,136,000	$672,000
Dumas	$10,449,000	$14,106,000	$522,000
Sunray	$2,090,000	$2,821,000	$104,000
Gruver	$896,000	$1,209,000	$45,000
Spearman	$2,090,000	$2,821,000	$104,000
Stinnet	$896,000	$1,209,000	$45,000
check total	$29,855,000	$40,302,000	$1,492,000

		Quantity	Units	Unit Price	Cost
Pipeline System Components					
24" line from Res. to WTP		9,000	LF	$124	$1,113,000
24" line from WTP to Spearman		51,000	LF	$124	$6,308,000
Crossings		230	LF	$617	$142,000
Connection to Spearman		1	LS		$20,000
ROW	20	23	AC	$1,200	$28,000
Engineering and Contingencies (30%)					$2,275,000
Pipeline Subtotal at Spearman					**$9,886,000**

	Construction	Capital	Electricity ($)
Cactus	$3,339,000	$4,449,000	$90,000
Dumas	$2,597,000	$3,460,000	$70,000
Sunray	$519,000	$692,000	$14,000
Gruver	$223,000	$297,000	$6,000
Spearman	$519,000	$692,000	$14,000
Stinnet	$223,000	$297,000	$6,000
check total	$7,420,000	$9,887,000	$200,000

Table E-10, Continued

		Quantity	Units	Unit Price	Cost
8" line from Spearman to Gruver		71,300	LF	$34	$2,412,000
Crossings		460	LF	$206	$95,000
Connection to Gruver		1	LS		$15,000
ROW	15	25	AC	$1,200	$30,000
Engineering and Contingencies (30%)					$757,000
Pipeline Subtotal at Gruver					**$3,309,000**

	Construction	Capital	Electricity ($)
Cactus	$0	$0	$0
Dumas	$0	$0	$0
Sunray	$0	$0	$0
Gruver	$2,412,000	$3,309,000	$4,700
Spearman	$0	$0	$0
Stinnet	$0	$0	$0
check total	$2,412,000	$3,309,000	$4,700

		Quantity	Units	Unit Price	Cost
24" line from Spearman to Stinnet		133,500	LF	$124	$16,512,700
Crossings		460	LF	$617	$284,000
ROW	20	61	AC	$1,200	$73,000
Engineering and Contingencies (30%)					$5,039,000
Pipeline Subtotal at Stinnet					**$21,908,700**

	Construction	Capital	Electricity ($)
Cactus	$8,256,000	$10,954,000	$72,000
Dumas	$6,422,000	$8,520,000	$56,000
Sunray	$1,284,000	$1,704,000	$11,000
Gruver	$0	$0	$0
Spearman	$0	$0	$0
Stinnet	$550,000	$730,000	$5,000
check total	$16,512,000	$21,908,000	$144,000

		Quantity	Units	Unit Price	Cost
8" line Stinnet Spur		83,350	LF	$34	$2,819,000
Crossings		1,680	LF	$206	$345,000
Connection to Stinnet		1	LS		$15,000
ROW	20	38	AC	$1,200	$46,000
Engineering and Contingencies (30%)					$954,000
Pipeline Subtotal at Stinnet					**$4,179,000**

	Construction	Capital	Electricity ($)
Cactus	$0	$0	$0
Dumas	$0	$0	$0
Sunray	$0	$0	$0
Gruver	$0	$0	$0
Spearman	$0	$0	$0
Stinnet	$2,819,000	$4,179,000	$5,900
check total	$2,819,000	$4,179,000	$5,900

Table E-10, Continued

		Quantity	Units	Unit Price	Cost
24" line from Stinnet Spur to Dumas		122,800	LF	$124	$15,189,000
Crossings		460	LF	$617	$284,000
Connection to Dumas		1	LS		$20,000
ROW	20	56	AC	$1,200	$67,000
Engineering and Contingencies (30%)					$4,648,000
Pipeline Subtotal at Dumas					**$20,208,000**

	Construction	Capital	Electricity ($)
Cactus	$7,856,000	$10,452,000	$108,000
Dumas	$6,111,000	$8,130,000	$84,000
Sunray	$1,222,000	$1,626,000	$17,000
Gruver	$0	$0	$0
Spearman	$0	$0	$0
Stinnet	$0	$0	$0
check total	$15,189,000	$20,208,000	$209,000

		Quantity	Units	Unit Price	Cost
8" line Sunray Spur		28,000	LF	$34	$947,000
Crossings		460	LF	$206	$95,000
Pressure Reducing Valve		1	EA		$35,000
Connection to Sunray		1	LS		$15,000
ROW	15	10	AC	$1,200	$12,000
Engineering and Contingencies (30%)					$328,000
Pipeline Subtotal at Sunray					**$485,000**

	Construction	Capital	Electricity ($)
Cactus	0	$0	$0
Dumas	0	$0	$0
Sunray	$947,000	$485,000	$0
Gruver	0	$0	$0
Spearman	0	$0	$0
Stinnet	0	$0	$0
check total	$947,000	$485,000	$0

		Quantity	Units	Unit Price	Cost
18" line from Dumas to Cactus		67,150	LF	$83	$5,560,000
Crossings		460	LF	$463	$213,000
Connection to Cactus		1	LS		$17,500
ROW	20	31	AC	$1,200	$37,000
Engineering and Contingencies (30%)					$1,737,000
Pipeline Subtotal at Sunray					**$7,564,500**

Table E-10, Continued

	Construction	Capital	Electricity ($)
Cactus	$5,560,000	$7,564,500	$21,700
Dumas	0	$0	$0
Sunray	0	$0	$0
Gruver	0	$0	$0
Spearman	0	$0	$0
Stinnet	0	$0	$0
check total	$5,560,000	$7,564,500	$21,700

Pump Station Components	**Quantity**	**Units**	**Unit Price**	**Cost**
9 MGD PS at intake	250	HP		$2,319,000
9 MGD PS at WTP	250	HP		$2,319,000
9 MGD PS at Spearman	400	HP		$3,092,000
8.12 MGD at Stinnet Spur	400	HP		$3,092,000
4.04 MGD at Dumas	100	HP		$1,546,000
Engineering and Contingencies (35%)				$4,329,000
Pump Station Subtotal				**$16,697,000**

Construction Costs	9 MGD PS at intake	9 MGD PS at WTP	9 MGD PS at Spearman	8.12 MGD at Stinnet Spur	4.04 MGD at Dumas
Cactus	$1,044,000	$1,044,000	$1,391,000	$1,546,000	$870,000
Dumas	$812,000	$812,000	$1,082,000	$1,202,000	$676,000
Sunray	$162,000	$162,000	$216,000	$240,000	$0
Gruver	$70,000	$70,000	$93,000	$0	$0
Spearman	$162,000	$162,000	$216,000	$0	$0
Stinnet	$70,000	$70,000	$93,000	$103,000	$0
check total	$2,320,000	$2,320,000	$3,091,000	$3,091,000	$1,546,000

Capital Costs	9 MGD PS at intake	9 MGD PS at WTP	9 MGD PS at Spearman	8.12 MGD at Stinnet Spur	4.04 MGD at Dumas
Cactus	$1,409,000	$1,409,000	$1,878,000	$2,087,000	$1,174,000
Dumas	$1,096,000	$1,096,000	$1,461,000	$1,623,000	$913,000
Sunray	$219,000	$219,000	$292,000	$325,000	$0
Gruver	$94,000	$94,000	$125,000	$0	$0
Spearman	$219,000	$219,000	$292,000	$0	$0
Stinnet	$94,000	$94,000	$125,000	$139,000	$0
check total	$3,131,000	$3,131,000	$4,173,000	$4,174,000	$2,087,000

Ground Storage Tanks	**Quantity**	**Units**	**Unit Price**	**Cost**
3 MG at WTP	1	LS	$1,041,000	$1,041,000
3 MG at Spearman	1	LS	$1,041,000	$1,041,000
2.5 MG at Stinnet Spur	1	LS	$922,000	$922,000
1.5 MG at Dumas	1	LS	$674,000	$674,000
Engineering and Contingencies (35%)				$1,287,000
Pump Station Subtotal				**$4,965,000**

Table E-10, Continued

Construction Costs	3 MG at WTP	3 MG at Spearman	2.5 MG at Stinnet Spur	1.5 MG at Dumas	
Cactus	$468,000	$468,000	$461,000	$379,000	
Dumas	$364,000	$364,000	$359,000	$295,000	
Sunray	$73,000	$73,000	$72,000	$0	
Gruver	$31,000	$31,000	$0	$0	
Spearman	$73,000	$73,000	$0	$0	
Stinnet	$31,000	$31,000	$31,000	$0	
check total	$1,040,000	$1,040,000	$923,000	$674,000	$3,677,000

Capital Costs	3 MG at WTP	3 MG at Spearman	2.5 MG at Stinnet Spur	1.5 MG at Dumas	
Cactus	$632,000	$632,000	$622,000	$512,000	
Dumas	$492,000	$492,000	$484,000	$398,000	
Sunray	$98,000	$98,000	$97,000	$0	
Gruver	$42,000	$42,000	$0	$0	
Spearman	$98,000	$98,000	$0	$0	
Stinnet	$42,000	$42,000	$41,000	$0	
check total	$1,404,000	$1,404,000	$1,244,000	$910,000	$4,962,000

TOTAL CONSTRUCTION COST

Cactus	$61,910,500
Dumas	$42,271,000
Sunray	$8,676,000
Gruver	$5,212,000
Spearman	$4,439,000
Stinnet	$6,992,000
check total	$129,500,500

Interest During Construction
(24 month)

Cactus	$4,334,000
Dumas	$2,959,000
Sunray	$607,000
Gruver	$365,000
Spearman	$311,000
Stinnet	$489,000
check total	$9,065,000

Permitting and Mitigation

Cactus	$479,000
Dumas	$321,000
Sunray	$76,000
Gruver	$44,000
Spearman	$34,000
Stinnet	$55,000
check total	$1,009,000

Table E-10, Continued

TOTAL CAPITAL COST	
Cactus	$66,723,500
Dumas	$45,551,000
Sunray	$9,359,000
Gruver	$5,621,000
Spearman	$4,784,000
Stinnet	$7,536,000
check total	$139,574,500

Annual Costs - Cactus	**Cost**
Debt Service (5.5 percent for 20 years)	$5,583,400
Electricity ($0.09 per kwh)	$291,700
Price to Purchase Water ($0.15 per 1,000 gal)	$85,000
Operation and Maintenance	$1,114,000
Total Annual Cost	$7,074,100
UNIT COSTS (Until Amortized)	
Water Cost ($ per ac-ft)	$4,057
Water Cost ($ per 1,000 gallons)	$12.45
UNIT COSTS (After Amortization)	
Water Cost ($ per ac-ft)	$855
Water Cost ($ per 1,000 gallons)	$2.62

Annual Costs - Dumas	**Cost**
Debt Service (5.5 percent for 20 years)	$3,812,000
Electricity ($0.09 per kwh)	$210,000
Price to Purchase Water ($0.15 per 1,000 gal)	$66,000
Operation and Maintenance	$822,000
Total Annual Cost	$4,910,000
UNIT COSTS (Until Amortized)	
Water Cost ($ per ac-ft)	$3,620
Water Cost ($ per 1,000 gallons)	$11.11
UNIT COSTS (After Amortization)	
Water Cost ($ per ac-ft)	$810
Water Cost ($ per 1,000 gallons)	$2.48

Table E-10, Continued

Annual Costs - Sunray	**Cost**
Debt Service (5.5 percent for 20 years)	$783,000
Electricity ($0.09 per kwh)	$42,000
Price to Purchase Water ($0.15 per 1,000 gal)	$13,000
Operation and Maintenance	$169,000
Total Annual Cost	$1,007,000
UNIT COSTS (Until Amortized)	
Water Cost ($ per ac-ft)	$3,712
Water Cost ($ per 1,000 gallons)	$11.39
UNIT COSTS (After Amortization)	
Water Cost ($ per ac-ft)	$826
Water Cost ($ per 1,000 gallons)	$2.53

Annual Costs - Gruver	**Cost**
Debt Service (5.5 percent for 20 years)	$470,000
Electricity ($0.09 per kwh)	$10,700
Price to Purchase Water ($0.15 per 1,000 gal)	$6,000
Operation and Maintenance	$79,000
Total Annual Cost	$565,700
UNIT COSTS (Until Amortized)	
Water Cost ($ per ac-ft)	$4,866
Water Cost ($ per 1,000 gallons)	$14.93
UNIT COSTS (After Amortization)	
Water Cost ($ per ac-ft)	$823
Water Cost ($ per 1,000 gallons)	$2.53

Annual Costs - Spearman	**Cost**
Debt Service (5.5 percent for 20 years)	$400,000
Electricity ($0.09 per kwh)	$14,000
Price to Purchase Water ($0.15 per 1,000 gal)	$13,300
Operation and Maintenance	$36,000
Total Annual Cost	$463,300
UNIT COSTS (Until Amortized)	
Water Cost ($ per ac-ft)	$1,708
Water Cost ($ per 1,000 gallons)	$5.24
UNIT COSTS (After Amortization)	
Water Cost ($ per ac-ft)	$233
Water Cost ($ per 1,000 gallons)	$0.72

Table E-10, Continued

Annual Costs - Stinnet	**Cost**
Debt Service (5.5 percent for 20 years)	$630,600
Electricity ($0.09 per kwh)	$16,900
Price to Purchase Water ($0.15 per 1,000 gal)	$5,700
Operation and Maintenance	$91,600
Total Annual Cost	$744,800
UNIT COSTS (Until Amortized)	
Water Cost ($ per ac-ft)	$6,407
Water Cost ($ per 1,000 gallons)	$19.66
UNIT COSTS (After Amortization)	
Water Cost ($ per ac-ft)	$982
Water Cost ($ per 1,000 gallons)	$3.01

Table E-11
Greenbelt Municipal and Industrial Water Authority
Ogallala Aquifer in Donley County

Owner:	Greenbelt Municipal Water Authority
Quantity:	2,000 AF/Y

Capital Costs	**Quantity**	**Units**	**Unit Price**	**Cost**
16 inch Pipeline from North Ogallala toWTP	80,083	LF	$69	$5,499,000
Wellfield infrastructure pipelines	2	EA	$100,000	$200,000
Wells	2	EA	$755,000	$1,510,000
0.5 MG Storage Tank	1	EA	$467,000	$467,000
Electricity Connection	1	LS	$100,000	$100,000
Groundwater rights	2,000	AC	$500	$1,000,000
CONSTRUCTION TOTAL				**$8,776,000**
Other Project Cost:	**Quantity**	**Units**	**Unit Price**	**Cost**
Engineering and Contingencies (30% for pipelines)				$1,710,000
Engineering and Contingencies (35% for well field)				$727,000
Right of Way Easements (ROW)	80,083	LF	$5.00	$400,000
Permitting and Mitigation	15	MI	$25,000	$375,000
Interest During Construction (1 year)				$629,000
TOTAL PROJECT COST				**$12,617,000**
ANNUAL COSTS				
Debt Service (5.5% for 20 years)				$1,056,000
Electricity ($0.09 kWh)				$92,844
Operation & Maintenance				$109,540
Total Annual Costs				**$1,258,384**
UNIT COSTS				
UNIT COSTS (Pre Amort.)				
Per Acre-Foot				$629.19
Per 1,000 Gallons				$1.93
UNIT COSTS (Post Amort.)				
Per Acre-Foot				$101
Per 1,000 Gallons				$0.31

Table E-12
City of Claude
Develop Ogallala Aquifer Supplies

Owner:	City of Claude
Quantity:	400 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (300 GPM)	2	EA	$283,508	$567,000
8" Well Field Piping	2,000	LF	$31	$62,000
Connection to Pump Station	2	EA	$140,000	$280,000
Subtotal for Wellfield and Treatment				**$909,000**
Transmission System				
8" Pipeline - Transmission Main	13,200	LF	$31	$409,000
Pump Station	1	LS	$728,000	$728,000
Subtotal for Transmission				**$1,137,000**
TOTAL CONSTRUCTION COST				**$2,046,000**

Other Project Cost:	**Quantity**	**Units**	**Unit Price**	**Cost**
Engineering and Contingencies (30% for pipelines)				$161,800
Engineering and Contingencies (35% for well field)				$551,300
Easement - Rural	6	AC	$1,200	$7,000
Permitting and Mitigation	3	MI	$25,000	$75,000
Groundwater Rights/ Purchase	0	AC-FT	$500	$0
Interest During Construction (6 Months)				$50,000
TOTAL CAPITAL COST				**$2,891,100**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$242,000
Electricity				$11,200
Water Treatment				$9,763
Operation and Maintenance				$53,000
Total Annual Cost				**$315,963**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$790**
Water Cost ($ per 1,000 gallons)				**$2.42**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$185**
Water Cost ($ per 1,000 gallons)				**$0.57**

Table E-13
City of Panhandle
Develop Ogallala Aquifer Supplies

Owner:	City of Panhandle				
Quantity:	600	AF/Y			
Capital Costs	**Quantity**	**Unit**		**Unit Price**	**Cost**
Wellfield and Treatment					
Water Wells (475 GPM)	2		EA	$616,000	$1,232,000
Well Field Collection Pipeline(s)	2		EA	$100,000	$200,000
Subtotal for Wellfield and Treatment					**$1,432,000**
Transmission System					
Pump Station	1	LS		$696,000	$696,000
Subtotal for Transmission					**$696,000**
TOTAL CONSTRUCTION COST					**$2,128,000**
Engineering and Contingencies (30% for pipelines)					$60,000
Engineering and Contingencies (35% for well field)					$674,800
Easement - Rural	0	AC		$1,200	$0
Permitting and Mitigation	0	MI		$25,000	$0
Groundwater Rights/ Purchase	600	AC-FT		$500	$300,000
Interest During Construction (6 Months)					$55,000
TOTAL CAPITAL COST					**$3,217,800**
Annual Costs					
Debt Service (5.5 percent for 20 years)					$269,000
Electricity					$30,700
Water Treatment					$12,805
Operation and Maintenance					$60,200
Total Annual Cost					**$372,705**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$621**
Water Cost ($ per 1,000 gallons)					**$1.91**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$173**
Water Cost ($ per 1,000 gallons)					**$0.53**

Table E-14
City of Wellington
Develop Seymour Aquifer Supplies

Owner:	City of Wellington
Quantity:	180 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (100 GPM)	2	EA	$127,029	$254,000
6" Well Field Collection Lines	5,280	LF	$20	$106,000
Connection to Pump Station	2	EA	$140,000	$280,000
Subtotal for Wellfield and Treatment				**$640,000**
Transmission System				
8" Pipeline - Transmission Main	15,840	LF	$31	$491,000
Pump Station	1	LS	$629,000	$629,000
Subtotal for Transmission				**$1,120,000**
TOTAL CONSTRUCTION COST				**$1,760,000**
Engineering and Contingencies (30% for pipelines)				$203,700
Engineering and Contingencies (35% for well field)				$407,100
Easement - Rural	7	AC	$1,200	$9,000
Permitting and Mitigation	3	MI	$25,000	$75,000
Groundwater Rights/ Purchase	180	AC-FT	$500	$90,000
Interest During Construction (6 Months)				$45,000
TOTAL CAPITAL COST				**$2,589,800**
Annual Costs				
Debt Service (6 percent for 20 years)				$217,000
Electricity				$1,700
Water Treatment				$6,417
Operation and Maintenance				$42,100
Total Annual Cost				**$267,217**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$1,485**
Water Cost ($ per 1,000 gallons)				**$4.56**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$279**
Water Cost ($ per 1,000 gallons)				**$0.86**

Table E-15
City of Wellington
Advanced Treatment (Nitrate Removal)

Owner:	City of Wellington				
Quantity:	180	AF/Y			
Capital Costs	**Quantity**		**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment					
0.5 MGD RO Treatment Facility	1		EA	$2,267,000	$2,267,000
Storage Tank (Closed)	1		EA	$412,000	$412,000
Subtotal for Wellfield and Treatment					**$2,679,000**
Transmission System					
Subtotal for Transmission					**$0**
TOTAL CONSTRUCTION COST					**$2,679,000**
Engineering and Contingencies (30% for pipelines)					$0
Engineering and Contingencies (35% for well field)					$937,700
Groundwater Rights/ Purchase	0	AC-FT		$500	$0
Interest During Construction (6 Months)					$63,000
TOTAL CAPITAL COST					**$3,679,700**
Annual Costs					
Debt Service (5.5 percent for 20 years)					$308,000
Electricity					$0
Water Treatment					$194,350
Operation and Maintenance					$12,400
Total Annual Cost					**$514,750**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$2,860**
Water Cost ($ per 1,000 gallons)					**$8.78**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$1,149**
Water Cost ($ per 1,000 gallons)					**$3.52**

Table E-16
City of Dalhart
Develop Ogallala Aquifer Supplies

Owner:	City of Dalhart
Quantity:	2,700 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Rehab Exisitng wells	3	EA	$100,000	$300,000
Water Wells (800 GPM)	1	EA	$552,871	$553,000
Rehab Well Field Collection Pipeline(s)	3	EA	$50,000	$150,000
Connection to Pump Station	1	EA	$140,000	$140,000
Storage Tank (Closed)	1	EA	$412,000	$412,000
Subtotal for Wellfield and Treatment				**$1,255,000**
Transmission System				
Pump Station	1	LS	$800,000	$800,000
Subtotal for Transmission				**$800,000**
TOTAL CONSTRUCTION COST				**$2,055,000**
Engineering and Contingencies (30% for pipelines)				$87,000
Engineering and Contingencies (35% for well field)				$722,800
Groundwater Rights/ Purchase	0 AC-FT		$500	$0
Interest During Construction (6 Months)				$50,000
TOTAL CAPITAL COST				**$2,914,800**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$244,000
Electricity				$118,000
Water Treatment				$38,177
Operation and Maintenance				$65,500
Total Annual Cost				**$465,677**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$172**
Water Cost ($ per 1,000 gallons)				**$0.53**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$82**
Water Cost ($ per 1,000 gallons)				**$0.25**

Table E-17
City of Texline
Develop Ogallala Aquifer Supplies

Owner:	City of Texline			
Quantity:	150	AF/Y		
Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (200 GPM)	1	EA	$477,000	$477,000
Well Field Collection Pipeline(s)	1	EA	$100,000	$100,000
Connection to Pump Station	1	EA	$140,000	$140,000
Subtotal for Wellfield and Treatment				**$717,000**
TOTAL CONSTRUCTION COST				**$717,000**
Engineering and Contingencies (30% for pipelines)				$30,000
Engineering and Contingencies (35% for well field)				$216,000
Groundwater Rights/ Purchase	150	AC-FT	$500	$75,000
Interest During Construction (6 Months)				$18,000
TOTAL CAPITAL COST				**$1,056,000**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$88,000
Electricity				$3,100
Water Treatment				$5,960
Operation and Maintenance				$19,700
Total Annual Cost				**$116,760**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$778**
Water Cost ($ per 1,000 gallons)				**$2.39**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$192**
Water Cost ($ per 1,000 gallons)				**$0.59**

Table E-18
City of McLean
Develop Ogallala Aquifer Supplies

Owner:	City of McLean
Quantity:	200 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield				
Water Wells (260 GPM)	1	EA	$264,291	$264,000
Well Field Collection Pipeline(s)	1	EA	$100,000	$100,000
Connection to Pump Station	1	EA	$140,000	$140,000
Subtotal for Wellfield				**$504,000**
TOTAL CONSTRUCTION COST				**$504,000**
Engineering and Contingencies (30% for pipelines)				$30,000
Engineering and Contingencies (35% for well field)				$141,400
Groundwater Rights/ Purchase	200	AC-FT	$500	$100,000
Interest During Construction (6 Months)				$14,000
TOTAL CAPITAL COST				**$789,400**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$66,000
Electricity				$3,200
Water Treatment				$6,721
Operation and Maintenance				$13,300
Total Annual Cost				**$89,221**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$446**
Water Cost ($ per 1,000 gallons)				**$1.37**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$116**
Water Cost ($ per 1,000 gallons)				**$0.36**

Table E-19
City of Pampa
Develop Ogallala Aquifer Supplies

Owner:	City of Pampa
Quantity:	2,000 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (620 GPM)	4	EA	$525,288	$2,101,000
Well Field Collection Pipeline(s)	4	EA	$100,000	$400,000
Connection to Pump Station	4	EA	$140,000	$560,000
Storage Tank (Closed)	1	EA	$412,000	$412,000
Subtotal for Wellfield and Treatment				**$3,473,000**
Transmission System				
18" Pipeline - Transmission Main	15,840	LF	$76	$1,204,000
Pump Station	1	LS	$809,000	$809,000
Subtotal for Transmission				**$2,013,000**
TOTAL CONSTRUCTION COST				**$5,486,000**
Engineering and Contingencies (30% for pipelines)				$541,400
Engineering and Contingencies (35% for well field)				$1,358,700
Easement - Rural	7	AC	$1,200	$9,000
Permitting and Mitigation	3	MI	$25,000	$75,000
Groundwater Rights/ Purchase	2,000	AC-FT	$500	$1,000,000
Interest During Construction (6 Months)				$148,000
TOTAL CAPITAL COST				**$8,618,100**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$721,000
Electricity				$93,500
Water Treatment				$30,442
Operation and Maintenance				$135,700
Total Annual Cost				**$980,642**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$490**
Water Cost ($ per 1,000 gallons)				**$1.50**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$130**
Water Cost ($ per 1,000 gallons)				**$0.40**

Table E-20
City of Memphis
Develop Ogallala Aquifer Supplies

Owner:	City of Memphis
Quantity:	150 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (150 GPM)	2	EA	$167,000	$334,000
Well Field Collection Pipeline(s)	2	EA	$100,000	$200,000
Connection to Pump Station	2	EA	$140,000	$280,000
Subtotal for Wellfield and Treatment				**$814,000**
TOTAL CONSTRUCTION COST				**$814,000**
Engineering and Contingencies (30% for pipelines)				$60,000
Engineering and Contingencies (35% for well field)				$214,900
Groundwater Rights/ Purchase	150	AC-FT	$500	$75,000
Interest During Construction (6 Months)				$20,000
TOTAL CAPITAL COST				**$1,183,900**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$99,000
Electricity				$1,500
Water Treatment				$5,960
Operation and Maintenance				$20,800
Total Annual Cost				**$127,260**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$848**
Water Cost ($ per 1,000 gallons)				**$2.60**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$188**
Water Cost ($ per 1,000 gallons)				**$0.58**

Table E-21
County Other - Hall County (Brice-Lesly)
New Groundwater Source

Owner:	County Other - Hall County
Quantity:	50 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (75 GPM)	1	EA	$217,731	$218,000
Subtotal for Wellfield and Treatment				**$218,000**
Transmission System				
Subtotal for Transmission				**$0**
TOTAL CONSTRUCTION COST				**$218,000**
Engineering and Contingencies (30% for pipelines)				$0
Engineering and Contingencies (35% for well field)				$76,300
Groundwater Rights/ Purchase	0	AC-FT	$500	$0
Interest During Construction (6 Months)				$5,000
TOTAL CAPITAL COST				**$299,300**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$25,000
Electricity				$500
Water Treatment				$2,401
Operation and Maintenance				$6,500
Total Annual Cost				**$34,401**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$688**
Water Cost ($ per 1,000 gallons)				**$2.11**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$188**
Water Cost ($ per 1,000 gallons)				**$0.58**

Table E-22
County Other - Hall County (Estelline)
New Groundwater Source

Owner:	County Other - Hall County
Quantity:	50 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (75 GPM)	1	EA	$102,700	$103,000
Subtotal for Wellfield and Treatment				**$103,000**
Transmission System				
Subtotal for Transmission				**$0**
TOTAL CONSTRUCTION COST				**$103,000**
Engineering and Contingencies (30% for pipelines)				$0
Engineering and Contingencies (35% for well field)				$36,100
Groundwater Rights/ Purchase	0	AC-FT	$500	$0
Interest During Construction (6 Months)				$2,000
TOTAL CAPITAL COST				**$141,100**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$12,000
Electricity				$500
Water Treatment				$2,401
Operation and Maintenance				$3,100
Total Annual Cost				**$18,001**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$360**
Water Cost ($ per 1,000 gallons)				**$1.10**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$120**
Water Cost ($ per 1,000 gallons)				**$0.37**

Table E-23
County Other - Hall County (Lakeview)
Advanced Treatment (Nitrate Removal)

Owner:	County Other - Hall County
Quantity:	50 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
0.2 MGD RO Treatment Facility	1	EA	$972,000	$972,000
Storage Tank (Closed)	1	EA	$193,000	$193,000
Subtotal for Wellfield and Treatment				**$1,165,000**
Transmission System				
Subtotal for Transmission				**$0**
TOTAL CONSTRUCTION COST				**$1,165,000**
Engineering and Contingencies (30% for pipelines)				$0
Engineering and Contingencies (35% for well field)				$407,800
Groundwater Rights/ Purchase	0	AC-FT	$500	$0
Interest During Construction (6 Months)				$28,000
TOTAL CAPITAL COST				**$1,600,800**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$134,000
Electricity				$0
Water Treatment				$83,293
Operation and Maintenance				$5,800
Total Annual Cost				**$223,093**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$4,462**
Water Cost ($ per 1,000 gallons)				**$13.69**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$1,782**
Water Cost ($ per 1,000 gallons)				**$5.47**

Table E-24
County Other - Hall County (Turkery)
New Groundwater Source

Owner:	County Other - Hall County
Quantity:	100 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (170 GPM)	2	EA	$264,079	$528,000
Subtotal for Wellfield and Treatment				**$528,000**
Transmission System				
6" Pipeline - Transmission Main	18,480	LF	$20	$370,000
Subtotal for Transmission				**$370,000**
TOTAL CONSTRUCTION COST				**$898,000**
Engineering and Contingencies (30% for pipelines)				$129,500
Engineering and Contingencies (35% for well field)				$184,800
Groundwater Rights/ Purchase	0	AC-FT	$500	$0
Interest During Construction (6 Months)				$23,000
TOTAL CAPITAL COST				**$1,345,300**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$113,000
Electricity				$0
Water Treatment				$4,803
Operation and Maintenance				$20,200
Total Annual Cost				**$138,003**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$1,380**
Water Cost ($ per 1,000 gallons)				**$4.24**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$250**
Water Cost ($ per 1,000 gallons)				**$0.77**

Table E-25
City of Gruver
Develop Ogallala Aquifer Supplies

Owner:	City of Gruver
Quantity:	350 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (265 GPM)	2	EA	$268,154	$536,000
Well Field Collection Pipeline(s)	2	EA	$100,000	$200,000
Connection to Pump Station	2	EA	$140,000	$280,000
Subtotal for Wellfield and Treatment				**$1,016,000**
TOTAL CONSTRUCTION COST				**$1,016,000**
Engineering and Contingencies (30% for pipelines)				$60,000
Engineering and Contingencies (35% for well field)				$285,600
Groundwater Rights/ Purchase	0	AC-FT	$500	$0
Interest During Construction (6 Months)				$24,000
TOTAL CAPITAL COST				**$1,385,600**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$116,000
Electricity				$5,500
Water Treatment				$9,002
Operation and Maintenance				$26,900
Total Annual Cost				**$157,402**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$450**
Water Cost ($ per 1,000 gallons)				**$1.38**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$118**
Water Cost ($ per 1,000 gallons)				**$0.36**

Table E-26
City of Spearman
Develop Ogallala Aquifer Supplies

Owner:	City of Spearman				
Quantity:	650	AF/Y			
Capital Costs	**Quantity**	**Unit**		**Unit Price**	**Cost**
Wellfield and Treatment					
Water Wells (620 GPM)	2		EA	$527,914	$1,056,000
Well Field Collection Pipeline(s)	2		EA	$100,000	$200,000
Connection to Pump Station	2		EA	$140,000	$280,000
Subtotal for Wellfield and Treatment					**$1,536,000**
Transmission System					
Pump Station	1	LS		$700,000	$700,000
Pipeline	5280	LF			
Subtotal for Transmission					**$700,000**
TOTAL CONSTRUCTION COST					**$2,236,000**
Engineering and Contingencies (30% for pipelines)					$60,000
Engineering and Contingencies (35% for well field)					$712,600
Groundwater Rights/ Purchase	650	AC-FT		$500	$325,000
Interest During Construction (6 Months)					$58,000
TOTAL CAPITAL COST					**$3,391,600**
Annual Costs					
Debt Service (5.5 percent for 20 years)					$284,000
Electricity					$29,600
Water Treatment					$13,565
Operation and Maintenance					$63,500
Total Annual Cost					**$390,665**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$601**
Water Cost ($ per 1,000 gallons)					**$1.84**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$164**
Water Cost ($ per 1,000 gallons)					**$0.50**

Table E-27
City of Stinnett
Develop Ogallala Aquifer Supplies

Owner:	City of Stinnett				
Quantity:	225	AF/Y			
Capital Costs	**Quantity**	**Unit**		**Unit Price**	**Cost**
Wellfield and Treatment					
Water Wells (625 GPM)	1		EA	$436,658	$437,000
Well Field Collection Pipeline(s)	0		EA	$100,000	$0
Connection to Pump Station	1		EA	$140,000	$140,000
Subtotal for Wellfield and Treatment					**$577,000**
Transmission System					
Pump Station	0	LS		$623,000	$0
Subtotal for Transmission					**$0**
TOTAL CONSTRUCTION COST					**$577,000**
Engineering and Contingencies (30% for pipelines)					$0
Engineering and Contingencies (35% for well field)					$202,000
Groundwater Rights/ Purchase	225	AC-FT		$500	$113,000
Interest During Construction (6 Months)					$16,000
TOTAL CAPITAL COST					**$908,000**
Annual Costs					
Debt Service (5.5 percent for 20 years)					$76,000
Electricity					$6,900
Water Treatment					$7,101
Operation and Maintenance					$17,300
Total Annual Cost					**$107,301**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$477**
Water Cost ($ per 1,000 gallons)					**$1.46**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$139**
Water Cost ($ per 1,000 gallons)					**$0.43**

Table E-28
TCW Supply Inc.
Develop Ogallala Aquifer Supplies

Owner:	TCW Supply Inc.
Quantity:	575 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (360 GPM)	2	EA	$480,899	$962,000
Well Field Collection Pipeline(s)	2	EA	$100,000	$200,000
Connection to Pump Station	2	EA	$140,000	$280,000
Storage Tank (Closed)	1	EA	$193,000	$193,000
Subtotal for Wellfield and Treatment				**$1,635,000**
Transmission System				
Pump Station	1	LS	$694,000	$694,000
12" Pipeline - Transmission Main	10560	LF	$38	$401,000
Subtotal for Transmission				**$1,095,000**
TOTAL CONSTRUCTION COST				**$2,730,000**
Engineering and Contingencies (30% for pipelines)				$60,000
Engineering and Contingencies (35% for well field)				$745,200
Groundwater Rights/ Purchase	575 AC-FT		$500	$288,000
Interest During Construction (6 Months)				$67,000
TOTAL CAPITAL COST				**$3,890,200**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$326,000
Electricity				$18,200
Water Treatment				$12,425
Operation and Maintenance				$66,300
Total Annual Cost				**$422,925**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$736**
Water Cost ($ per 1,000 gallons)				**$2.26**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$169**
Water Cost ($ per 1,000 gallons)				**$0.52**

Table E-29
City of Booker
Develop Ogallala Aquifer Supplies

Owner:	City of Booker				
Quantity:	560	AF/Y			
Capital Costs	**Quantity**	**Unit**		**Unit Price**	**Cost**
Wellfield and Treatment					
Water Wells (620 GPM)	2		EA	$341,916	$684,000
Well Field Collection Pipeline(s)	2		EA	$100,000	$200,000
Connection to Pump Station	0		EA	$140,000	$0
Subtotal for Wellfield and Treatment					**$884,000**
Transmission System					
Pump Station	0	LS		$693,000	$0
Subtotal for Transmission					**$0**
TOTAL CONSTRUCTION COST					**$884,000**
Engineering and Contingencies (30% for pipelines)					$60,000
Engineering and Contingencies (35% for well field)					$239,400
Groundwater Rights/ Purchase	560	AC-FT		$500	$280,000
Interest During Construction (6 Months)					$26,000
TOTAL CAPITAL COST					**$1,489,400**
Annual Costs					
Debt Service (5.5 percent for 20 years)					$125,000
Electricity					$16,700
Water Treatment					$12,196
Operation and Maintenance					$22,900
Total Annual Cost					**$176,796**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$316**
Water Cost ($ per 1,000 gallons)					**$0.97**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$92**
Water Cost ($ per 1,000 gallons)					**$0.28**

Table E-30
City of Dumas
Develop Ogallala Aquifer Supplies

Owner:	City of Dumas				
Quantity:	4,500	AF/Y			
Capital Costs	**Quantity**		**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment					
Water Wells (690 GPM)	9		EA	$496,046	$4,464,000
Well Field Collection Pipeline(s)	9		EA	$100,000	$900,000
Connection to Pump Station	9		EA	$140,000	$1,260,000
Subtotal for Wellfield and Treatment					**$6,624,000**
Transmission System					
Pump Station	1		LS	$875,000	$875,000
Subtotal for Transmission					**$875,000**
TOTAL CONSTRUCTION COST					**$7,499,000**
Engineering and Contingencies (30% for pipelines)					$270,000
Engineering and Contingencies (35% for well field)					$2,309,700
Groundwater Rights/ Purchase	4,500	AC-FT		$500	$2,250,000
Interest During Construction (6 Months)					$216,000
TOTAL CAPITAL COST					**$12,544,700**
Annual Costs					
Debt Service (6 percent for 20 years)					$1,050,000
Electricity					$175,900
Water Treatment					$58,066
Operation and Maintenance					$208,800
Total Annual Cost					**$1,492,766**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$332**
Water Cost ($ per 1,000 gallons)					**$1.02**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$98**
Water Cost ($ per 1,000 gallons)					**$0.30**

Table E-31
City of Sunray
Develop Ogallala Aquifer Supplies

Owner:	City of Sunray			
Quantity:	850	AF/Y		
Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (470 GPM)	3	EA	$422,867	$1,269,000
8" Well Field Piping	10,560	LF	$31	$327,000
Connection to Pump Station	3	EA	$140,000	$420,000
Storage Tank (Closed)	1	EA	$248,000	$248,000
Subtotal for Wellfield and Treatment				**$2,264,000**
Transmission System				
Pump Station	0	LS	$716,000	$0
Subtotal for Transmission				**$0**
TOTAL CONSTRUCTION COST				**$2,264,000**
Engineering and Contingencies (30% for pipelines)				$98,100
Engineering and Contingencies (35% for well field)				$678,000
Groundwater Rights/ Purchase	850	AC-FT	$500	$425,000
Interest During Construction (6 Months)				$61,000
TOTAL CAPITAL COST				**$3,526,100**
Annual Costs				
Debt Service (6 percent for 20 years)				$295,000
Electricity				$28,900
Water Treatment				$16,607
Operation and Maintenance				$62,000
Total Annual Cost				**$402,507**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$474**
Water Cost ($ per 1,000 gallons)				**$1.45**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$126**
Water Cost ($ per 1,000 gallons)				**$0.39**

Table E-32
County Other - Moore County
New Groundwater Source

Owner:	County Other - Moore County
Quantity:	100 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (200 GPM)	1	EA	$239,301	$239,000
Connection to User	1	EA	$25,000	$25,000
Subtotal for Wellfield and Treatment				**$264,000**
Transmission System				
Pump Station	0	LS	$294,000	$0
Subtotal for Transmission				**$0**
TOTAL CONSTRUCTION COST				**$264,000**
Engineering and Contingencies (30% for pipelines)				$0
Engineering and Contingencies (35% for well field)				$92,400
Groundwater Rights/ Purchase	0	AC-FT	$500	$0
Interest During Construction (6 Months)				$6,000
TOTAL CAPITAL COST				**$362,400**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$30,000
Electricity				$3,300
Water Treatment				$4,803
Operation and Maintenance				$7,900
Total Annual Cost				**$46,003**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$460**
Water Cost ($ per 1,000 gallons)				**$1.41**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$160**
Water Cost ($ per 1,000 gallons)				**$0.49**

Table E-33
City of Perryton
Develop Ogallala Aquifer Supplies

Owner:	City of Perryton				
Quantity:	2,800	AF/Y			
Capital Costs	**Quantity**	**Unit**		**Unit Price**	**Cost**
Wellfield and Treatment					
Water Wells (490 GPM)	8		EA	$492,647	$3,941,000
Well Field Collection Pipeline(s)	8		EA	$100,000	$800,000
Connection to Pump Station	4		EA	$140,000	$560,000
Subtotal for Wellfield and Treatment					**$5,301,000**
Transmission System					
Pump Station	1	LS		$802,000	$802,000
Pipeline	10560	LF		$76	$803,000
Subtotal for Transmission					**$1,605,000**
TOTAL CONSTRUCTION COST					**$6,906,000**
Engineering and Contingencies (30% for pipelines)					$240,000
Engineering and Contingencies (35% for well field)					$1,856,100
Groundwater Rights/ Purchase	2,800	AC-FT		$500	$1,400,000
Interest During Construction (6 Months)					$182,000
TOTAL CAPITAL COST					**$10,584,100**
Annual Costs					
Debt Service (6 percent for 20 years)					$886,000
Electricity					$96,200
Water Treatment					$39,282
Operation and Maintenance					$168,700
Total Annual Cost					**$1,190,182**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$425**
Water Cost ($ per 1,000 gallons)					**$1.30**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$109**
Water Cost ($ per 1,000 gallons)					**$0.33**

Table E-34
County Other - Potter County
Develop Ogallala Aquifer Supplies

Owner:	Potter County-Other
Quantity:	900 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (70 GPM)	15	EA	$122,642	$1,840,000
Subtotal for Wellfield and Treatment				**$1,840,000**
Transmission System				
Pump Station	1	LS	$724,000	$724,000
Subtotal for Transmission				**$724,000**
TOTAL CONSTRUCTION COST				**$2,564,000**
Engineering and Contingencies (30% for pipelines)				$0
Engineering and Contingencies (35% for well field)				$897,400
Groundwater Rights/ Purchase	900	AC-FT	$500	$450,000
Interest During Construction (6 Months)				$68,000
TOTAL CAPITAL COST				**$3,979,400**
Annual Costs				
Debt Service (6 percent for 20 years)				$333,000
Electricity				$11,700
Water Treatment				$17,368
Operation and Maintenance				$76,900
Total Annual Cost				**$438,968**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$488**
Water Cost ($ per 1,000 gallons)				**$1.50**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$118**
Water Cost ($ per 1,000 gallons)				**$0.36**

Table E-35
County Other - Potter County
Develop Dockum Aquifer Supplies

Owner:	Potter County-Other
Quantity:	700 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (70 GPM)	12	EA	$122,642	$1,472,000
Subtotal for Wellfield and Treatment				**$1,472,000**
Transmission System				
Pump Station	1	LS	$704,000	$704,000
Subtotal for Transmission				**$704,000**
TOTAL CONSTRUCTION COST				**$2,176,000**
Engineering and Contingencies (30% for pipelines)				$0
Engineering and Contingencies (35% for well field)				$761,600
Groundwater Rights/ Purchase	700	AC-FT	$500	$350,000
Interest During Construction (6 Months)				$58,000
TOTAL CAPITAL COST				**$3,345,600**
Annual Costs				
Debt Service (6 percent for 20 years)				$280,000
Electricity				$9,100
Water Treatment				$14,326
Operation and Maintenance				$65,300
Total Annual Cost				**$368,726**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$527**
Water Cost ($ per 1,000 gallons)				**$1.62**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$127**
Water Cost ($ per 1,000 gallons)				**$0.39**

Table E-36
Manufacturing Potter County
Direct Reuse

Owner:	Manufacturing Potter County
Quantity:	5,700 AF/Y

Capital Costs	**Quantity**	**Units**	**Unit Price**	**Cost**
18- inch pipeline	52,800	LF	$107	$5,625,000
6.5 MGD Pre-Treatment WTP	1	EA	$9,916,000	$9,916,000
6.5 MGD RO Plant	1	EA	$17,571,000	$17,571,000
Wastewater Treatment Plant Improvements	1	LS	$2,500,000	$2,500,000
Pump Station at WWTP	1	LS	$1,500,000	$1,500,000
12 inch RO Discharge Line	36,960	LF	$54	$1,978,000
TOTAL CONSTRUCTION COST				**$39,090,000**
Other Project Cost:	**Quantity**	**Units**	**Unit Price**	**Cost**
Engineering, Legal Costs and Contingencies (30% pipelines)				$2,280,900
Engineering, Legal Costs and Contingencies (35% all other)				$10,495,450
Land Acquisition	206	Ac	$10,000	$2,061,000
Permitting and Mitigation	17	mi	$25,000	$925,000
Interest During Construction (18 months)				$2,880,000
TOTAL CAPITAL COST				**$57,732,350**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$4,831,000
Operation and Maintenance				$139,000
Treatment O&M				$2,167,145
Pumping Energy Costs ($0.09/kWh)				$340,000
Total Annual Cost				**$7,477,145**
UNIT COST (Until Amortized)				
Annual Cost of Water ($ per acft)				$1,312
Annual Cost of Water ($ per 1,000 gallons)				$4.03
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				$464
Water Cost ($ per 1,000 gallons)				$1.42

Table E-37
City of Canyon
Drill Nine Wells (Dockum Aquifer)

Owner:	City of Canyon			
Quantity:	4,300 AF/Y			
Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Mobilization	1	LS	$335,000	$335,000
Wells	9	Ea.	$447,000	$4,023,000
Subtotal for Wellfield and Treatment				**$4,358,000**
Transmission System				
PVC C905 Pipe	15,000	LF	$112	$1,680,000
PVC C900 Pipe	21,300	LF	$56	$1,192,800
GV & B	4	EA	$22,000	$88,000
GV & B	10	EA	$5,600	$56,000
Bore Under Railroad	340	LF	$391	$132,900
Casing thru Bore	340	LF	$223	$75,800
Ground Stoarage Tank	1	EA	$1,116,000	$1,116,000
Controls	1	EA	$56,000	$56,000
Fittings	20,000	LBS	$6	$120,000
Electrical Service	1	LS	$111,628	$111,600
Subtotal for Transmission				**$4,629,100**
TOTAL CONSTRUCTION COST				**$8,987,100**
Other Project Cost:	**Quantity**	**Units**	**Unit Price**	**Cost**
Contingencies (10%)				$899,000
Engineering (11%)				$989,000
Enginnering Survey (1%)				$99,000
Testing (0.55%)				$49,000
Project Representation (2.2%)				$198,000
Interest During Construction (1 year)				$393,000
TOTAL CAPITAL COST				**$11,614,100**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$1,012,600
Electricity				$202,700
Water Treatment ($0.30 per 1,000 gal)				$420,300
Operation and Maintenance				$191,200
Total Annual Cost				**$1,826,800**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$425**
Water Cost ($ per 1,000 gallons)				**$1.30**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$189**
Water Cost ($ per 1,000 gallons)				**$0.58**

Table E-38
Lake Tanglewood
Develop Ogallala Aquifer Supplies

Owner:	Lake Tanglewood
Quantity:	300 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (200 GPM)	2	EA	$238,000	$476,000
Well Field Collection Pipeline(s)	2	EA	$100,000	$200,000
Connection to Pump Station	1	EA	$140,000	$140,000
Subtotal for Wellfield and Treatment				**$816,000**
Transmission System				
8" Pipeline - Transmission Main	15,840	LF	$31	$491,000
Pump Station	1	LS	$694,000	$694,000
Subtotal for Transmission				**$1,185,000**
TOTAL CONSTRUCTION COST				**$2,001,000**
Engineering and Contingencies (30% for pipelines)				$231,900
Engineering and Contingencies (35% for well field)				$458,500
Easement - Rural	7	AC	$1,200	$9,000
Permitting and Mitigation	3	MI	$25,000	$75,000
Groundwater Rights/ Purchase	300	AC-FT	$500	$150,000
Interest During Construction (6 Months)				$51,000
TOTAL CAPITAL COST				**$2,976,400**
Annual Costs				
Debt Service (6 percent for 20 years)				$249,000
Electricity				$5,800
Water Treatment				$8,242
Operation and Maintenance				$47,600
Total Annual Cost				**$310,642**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$1,035**
Water Cost ($ per 1,000 gallons)				**$3.18**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$205**
Water Cost ($ per 1,000 gallons)				**$0.63**

Table E-39
County Other - Randall County
Develop Ogallala Aquifer Supplies

Owner:	Randall County-Other
Quantity:	2,800 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (490 GPM)	8	EA	$482,192	$3,858,000
Subtotal for Wellfield and Treatment				**$3,858,000**
TOTAL CONSTRUCTION COST				**$3,858,000**
Engineering and Contingencies (35% for wells)				$1,350,300
Interest During Construction (6 Months)				$91,000
TOTAL CAPITAL COST				**$5,299,300**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$443,000
Electricity				$96,600
Water Treatment				$39,282
Operation and Maintenance				$115,700
Total Annual Cost				**$694,582**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$248**
Water Cost ($ per 1,000 gallons)				**$0.76**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$90**
Water Cost ($ per 1,000 gallons)				**$0.28**

Table E-40
Manufacturing - Randall County
Develop Ogallala Aquifer Supplies

Owner:	Randall County Manufacturing
Quantity:	620 AF/Y

Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment				
Water Wells (150 GPM)	4	EA	$271,707	$1,087,000
Subtotal for Wellfield and Treatment				**$1,087,000**
TOTAL CONSTRUCTION COST				**$1,087,000**
Engineering and Contingencies (35% for wells)				$380,000
Interest During Construction (6 Months)				$26,000
TOTAL CAPITAL COST				**$1,493,000**
Annual Costs				
Debt Service (5.5 percent for 20 years)				$125,000
Electricity				$24,600
Operation and Maintenance				$32,600
Total Annual Cost				**$182,200**
UNIT COSTS (Until Amortized)				
Water Cost ($ per ac-ft)				**$294**
Water Cost ($ per 1,000 gallons)				**$0.90**
UNIT COSTS (After Amortization)				
Water Cost ($ per ac-ft)				**$92**
Water Cost ($ per 1,000 gallons)				**$0.28**

Table E-41
City of Wheeler
Develop Ogallala Aquifer Supplies

Owner:	City of Wheeler				
Quantity:	500	AF/Y			
Capital Costs	**Quantity**		**Unit**	**Unit Price**	**Cost**
Wellfield and Treatment					
Water Wells (400 GPM)	2		EA	$283,529	$567,000
8" Well Field Piping	2,000		LF	$31	$62,000
Connection to Pump Station	2		EA	$140,000	$280,000
Subtotal for Wellfield and Treatment					**$909,000**
Transmission System					
8" Pipeline - Transmission Main	10,560		LF	$31	$327,000
Pump Station	1		LS	$760,000	$760,000
Subtotal for Transmission					**$1,087,000**
TOTAL CONSTRUCTION COST					**$1,996,000**
Other Project Cost:	**Quantity**		**Units**	**Unit Price**	**Cost**
Engineering and Contingencies (30% for pipelines)					$133,100
Engineering and Contingencies (35% for well field)					$562,500
Easement - Rural	5		AC	$1,200	$6,000
Permitting and Mitigation	2		MI	$25,000	$50,000
Groundwater Rights/ Purchase	0	AC-FT		$500	$0
Interest During Construction (6 Months)					$48,000
TOTAL CAPITAL COST					**$2,795,600**
Annual Costs					
Debt Service (5.5 percent for 20 years)					$234,000
Electricity					$14,300
Water Treatment					$11,284
Operation and Maintenance					$52,900
Total Annual Cost					**$312,484**
UNIT COSTS (Until Amortized)					
Water Cost ($ per ac-ft)					**$625**
Water Cost ($ per 1,000 gallons)					**$1.92**
UNIT COSTS (After Amortization)					
Water Cost ($ per ac-ft)					**$157**
Water Cost ($ per 1,000 gallons)					**$0.48**