

MEMORANDUM

To: Jim Parks

From: Tom Gooch

Date: May 10, 2005 File: NTD02182:\T\Task 4 – Water Mgmt Strategies\M_Cost with No Reservoirs.doc

Project: NTD-02182 – Region C Water Plan

Subject: Cost Impact of Removing New Reservoirs from the Region C Water Plan

Introduction

1. It has been suggested that Region C should remove all new reservoirs from the *2006 Region C Water Plan*. This would involve removing the following projects:
 - Lower Bois d’Arc Creek Reservoir
 - Lake Ralph Hall
 - Marvin Nichols Reservoir
 - Lake Fastrill

(I am assuming that Muenster Lake, a small reservoir under construction in Cooke County and near completion, is not included in the recommendation.)
2. As you requested, this memorandum evaluates the impact of this recommendation on the cost of water for citizens in Region C.
3. Environmental groups suggest replacing the new reservoirs with water from Lake Texoma, Lake O’ the Pines, Lake Wright Patman, Lake Livingston, Lake Sam Rayburn/Lake B.A. Steinhagen, Toledo Bend Reservoir, and “three others”.

Supplies Lost by Removing Reservoirs

4. Taking out Lower Bois d’Arc Creek Reservoir, Lake Ralph Hall, Marvin Nichols Reservoir, and Lake Fastrill would remove supplies from the plan as follows:
 - Lower Bois d’Arc Creek Reservoir – 123,000 acre-feet per year for NTMWD
 - Lake Ralph Hall – 32,940 acre-feet per year for UTRWD
 - Marvin Nichols Reservoir – 489,840 acre-feet per year: 280,000 acre-feet per year for TRWD, 174,840 acre-feet per year for NTMWD, and 35,000 acre-feet per year for UTRWD
 - Lake Fastrill – 112,100 acre-feet per year for DWU

The total supplies removed from the plan would be 757,880 acre-feet per year.

MEMORANDUM to Jim Parks from Tom Gooch

Subject: Cost Impact of Removing New Reservoirs from the Region C Water Plan

May 10, 2005

Page 2 of 5

Approaches to Replacing Yield

5. We have looked at two ways to replace the yield that would be lost by removing reservoirs:

a) **The first approach relies primarily on new supplies not already included as recommended strategies in the plan.** We would add the three projects recommended by the environmental groups that are not already in the plan to provide 487,900 acre-feet per year of additional supplies, and we would increase the amount used from Lake Wright Patman from 112,100 acre-feet per year for DWU to 390,000 acre-feet per year (the amount available from system operation with purchase from Texarkana and reallocation of flood storage).

- Lake O' the Pines – 87,900 acre-feet per year
- Lakes Sam Rayburn/B.A. Steinhagen – 200,000 acre-feet per year
- Lake Livingston – 200,000 acre-feet per year
- Lake Wright Patman – 277,900 acre-feet per year (from 112,100 to 390,000)

The total replacement supply from this approach would be 765,800 acre-feet per year – within 1 percent of the supply lost from removing new reservoirs as strategies.

b) **The second approach relies primarily on increasing the supplies from sources already included as recommended strategies in the plan.** We would increase the use from Toledo Bend Reservoir from 400,000 acre-feet per year to 600,000 acre-feet per year, increase the use from Lake Texoma from 165,000 acre-feet per year to 270,000 acre-feet per year, and increase the use from Lake Wright Patman from 112,100 acre-feet per year to 390,000 acre-feet per year. To get a total replacement supply of 757,900 acre-feet per year, we would also bring 175,000 acre-feet per year from Lake Livingston.

- Toledo Bend Reservoir – 200,000 acre-feet per year (400,000 to 600,000)
- Lake Texoma – 105,000 acre-feet per year (165,000 to 270,000)
- Lake Wright Patman – 277,900 acre-feet per year (from 112,100 to 390,000)
- Lake Livingston – 175,000 acre-feet per year.

The total replacement supply from this approach would be 757,900 acre-feet per year – within 20 acre-feet per year of the supply lost from removing new reservoirs as strategies.

Basis for Cost Estimates

6. We used cost estimates already developed for Region C water planning to estimate the changes to cost for water supply that would be caused by removing new

MEMORANDUM to Jim Parks from Tom Gooch

Subject: Cost Impact of Removing New Reservoirs from the Region C Water Plan

May 10, 2005

Page 3 of 5

reservoirs from the Region C water plan and replacing them with other strategies. In a couple of cases, the amount or destination of supply for a replacement strategy varied slightly from the previously-developed Region C costs. In those cases, we developed the cost estimate using the assumptions and methodologies used for all Region C cost estimates. Basic assumptions included:

- Consistent unit prices for construction based on recent experience with similar projects.
- Raw water prices based on available information.
- Electricity at \$0.06 per kilowatt-hour.
- Debt service assuming 30-year bonds at 6% annual interest for all projects.
- 30% allowance for engineering and contingencies on pipelines, 35% on other projects.

Increased Costs with the First Approach – Connecting Non-Recommended Sources

7. Table 1 shows the comparative costs of the supplies from new reservoirs and the first approach for replacement supplies - Connecting Non-Recommended Sources. Figure 1 is a graphical comparison of cumulative annual costs over 50 years for new reservoirs and the replacement strategies. Note that:
 - a) Removing new reservoirs from the plan and replacing them with non-recommended strategies would increase capital costs by \$1.24 billion dollars.
 - b) Removing new reservoirs from the plan and replacing them with non-recommended strategies would increase annual costs by \$177 million per year until debt service is paid off.
 - c) Removing new reservoirs from the plan and replacing them with non-recommended strategies would increase annual costs by \$87 million dollars per year after debt service is paid off.
 - d) Over 50 years of operation at full yield, removing new reservoirs from the plan and replacing them with non-recommended strategies would increase total costs to Region C citizens by \$7.05 billion.

Attachment A gives details on the cost estimates for the reservoir strategies and the replacement strategies.

Increased Costs with the Second Approach – Increasing Use from Recommended Sources

8. Table 2 shows the comparative costs of the supplies from new reservoirs and the 2nd approach for replacement supplies – Increasing Use from Recommended Sources.

MEMORANDUM to Jim Parks from Tom Gooch

Subject: Cost Impact of Removing New Reservoirs from the Region C Water Plan

May 10, 2005

Page 4 of 5

Figure 2 is a graphical comparison of cumulative annual costs over 50 years for new reservoirs and the replacement strategies. Note that:

- a) Removing new reservoirs from the plan and replacing them with increased use from recommended strategies would increase capital costs by \$365 million dollars.
- b) Removing new reservoirs from the plan and replacing them with increased use from recommended strategies would increase annual costs by \$100 million per year until debt service is paid off.
- c) Removing new reservoirs from the plan and replacing them with increased use from recommended strategies would increase annual costs by \$74 million dollars per year after debt service is paid off.
- d) Over 50 years of operation at full yield, removing new reservoirs from the plan and replacing them with increased use from recommended strategies would increase total costs to Region C citizens by \$4.49 billion.

Attachment A gives details on the cost estimates for the reservoir strategies and the replacement strategies.

Table 1
Comparison of Costs with and without New Reservoirs - Alternative 1: Connect Non-Recommended Sources

Strategy	Region C Yield (Ac-Ft/Yr)	Capital Cost	Annual Cost		Cumulative Cost over 50 Years
			With Debt Service	Without Debt Service	
Lower Bois d'Arc Creek Reservoir	123,000	\$408,717,000	\$35,443,000	\$5,750,000	\$1,178,290,000
Lake Ralph Hall	32,940	\$211,153,000	\$18,130,000	\$2,790,000	\$599,700,000
Marvin Nichols Reservoir	489,840	\$2,159,053,000	\$219,825,000	\$62,972,000	\$7,854,190,000
Lake Fastrill	112,100	\$426,014,000	\$39,987,000	\$9,038,000	\$1,380,370,000
Total - Recommended	757,880	\$3,204,937,000	\$313,385,000	\$80,550,000	\$11,012,550,000
Lake O' the Pines	87,900	\$469,492,500	\$56,358,000	\$22,250,000	\$2,135,740,000
Lake Livingston	200,000	\$1,284,928,000	\$147,219,000	\$53,870,000	\$5,493,970,000
Sam Rayburn/Steinhagen	200,000	\$1,416,181,000	\$147,665,000	\$44,781,000	\$5,325,570,000
Additional Wright Patman	277,900	\$1,265,778,000	\$138,472,000	\$46,515,000	\$5,084,460,000
Total - No New Reservoirs	765,800	\$4,436,379,500	\$489,714,000	\$167,416,000	\$18,039,740,000
Additional Cost - Removing New Reservoirs		\$1,231,442,500	\$176,329,000	\$86,866,000	\$7,027,190,000

Note : Costs are based on standard Region C assumptions, including:
Unit costs for construction based on recent experience with similar projects.
Raw water prices based on available information.
Electricity at \$0.06 per thousand gallons.
Debt service assuming 30-years bonds at 6% per year interest.
Engineering and Contingencies of 30% for pipelines and 35% for other projects.

Table 2
Comparison of Costs with and without New Reservoirs - Alternative 2: Use More from Recommended Sources

Strategy	Region C Yield (Ac-Ft/Yr)	Capital Cost	Annual Cost		Cumulative Cost over 50 Years
			With Debt Service	Without Debt Service	
Lower Bois d'Arc Creek Reservoir	123,000	\$408,717,000	\$35,443,000	\$5,750,000	\$1,178,290,000
Lake Ralph Hall	32,940	\$211,153,000	\$18,130,000	\$2,790,000	\$599,700,000
Marvin Nichols Reservoir	489,840	\$2,159,053,000	\$219,825,000	\$62,972,000	\$7,854,190,000
Lake Fastrill	112,100	\$426,014,000	\$39,987,000	\$9,038,000	\$1,380,370,000
Total - Recommended	757,880	\$3,204,937,000	\$313,385,000	\$80,550,000	\$11,012,550,000
Additional Toledo Bend	200,000	\$530,748,000	\$69,925,000	\$31,366,000	\$2,725,070,000
Additional Texoma	105,000	\$621,447,600	\$74,190,000	\$29,043,000	\$2,806,560,000
Additional Wright Patman	277,900	\$1,265,778,000	\$138,472,000	\$46,515,000	\$5,084,460,000
Lake Livingston	175,000	\$1,140,178,000	\$130,270,000	\$47,437,000	\$4,856,840,000
Total - No New Reservoirs	757,900	\$3,558,151,600	\$412,857,000	\$154,361,000	\$15,472,930,000
Additional Cost - Removing New Reservoirs		\$353,214,600	\$99,472,000	\$73,811,000	\$4,460,380,000

Note : Costs are based on standard Region C assumptions, including:
Unit costs for construction based on recent experience with similar projects.
Raw water prices based on available information.
Electricity at \$0.06 per thousand gallons.
Debt service assuming 30-years bonds at 6% per year interest.
Engineering and Contingencies of 30% for pipelines and 35% for other projects.

Figure 1: Comparison of Cumulative Cost over 50 Years with and without New Reservoirs - Replacement Alt. 1

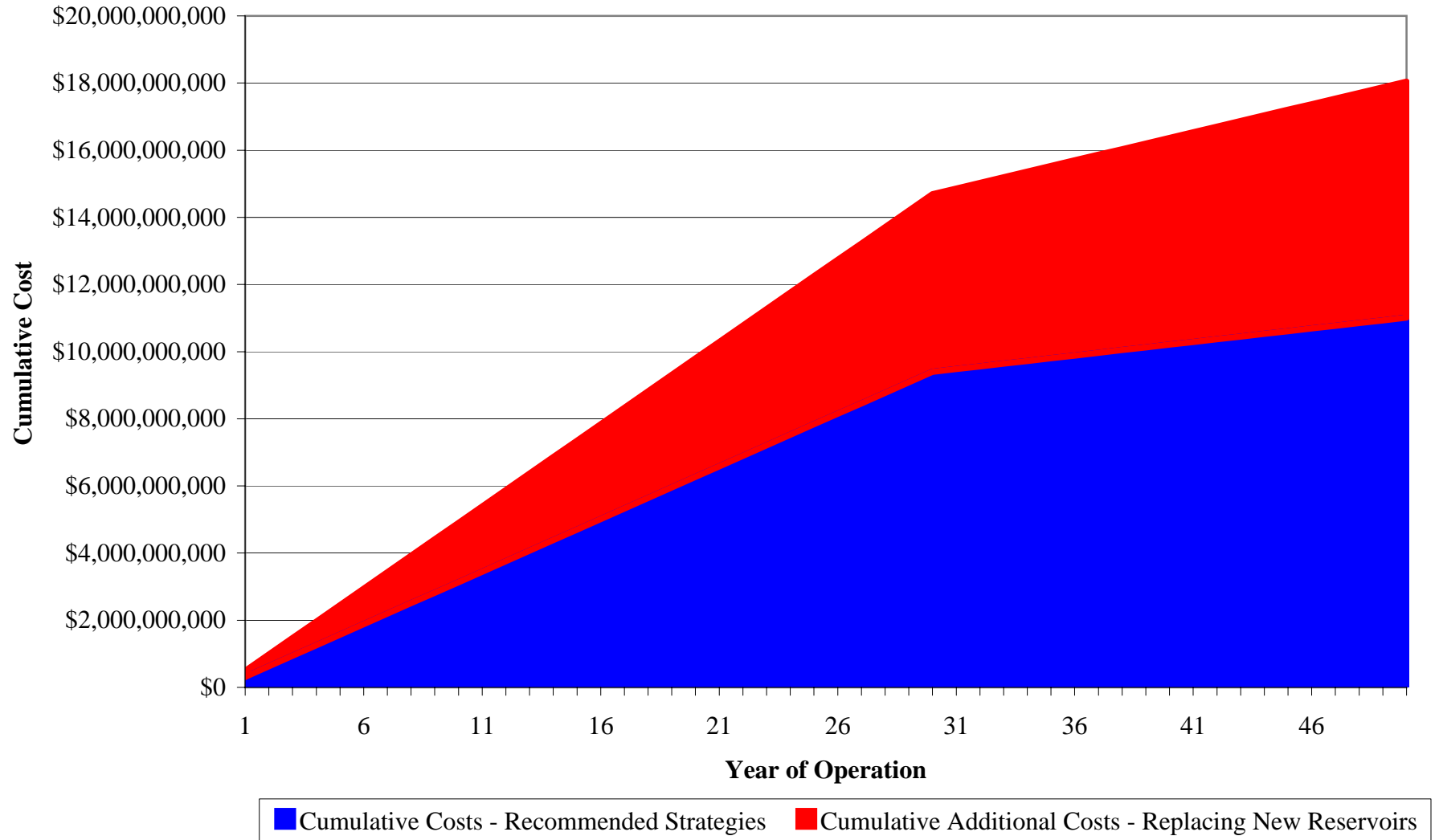
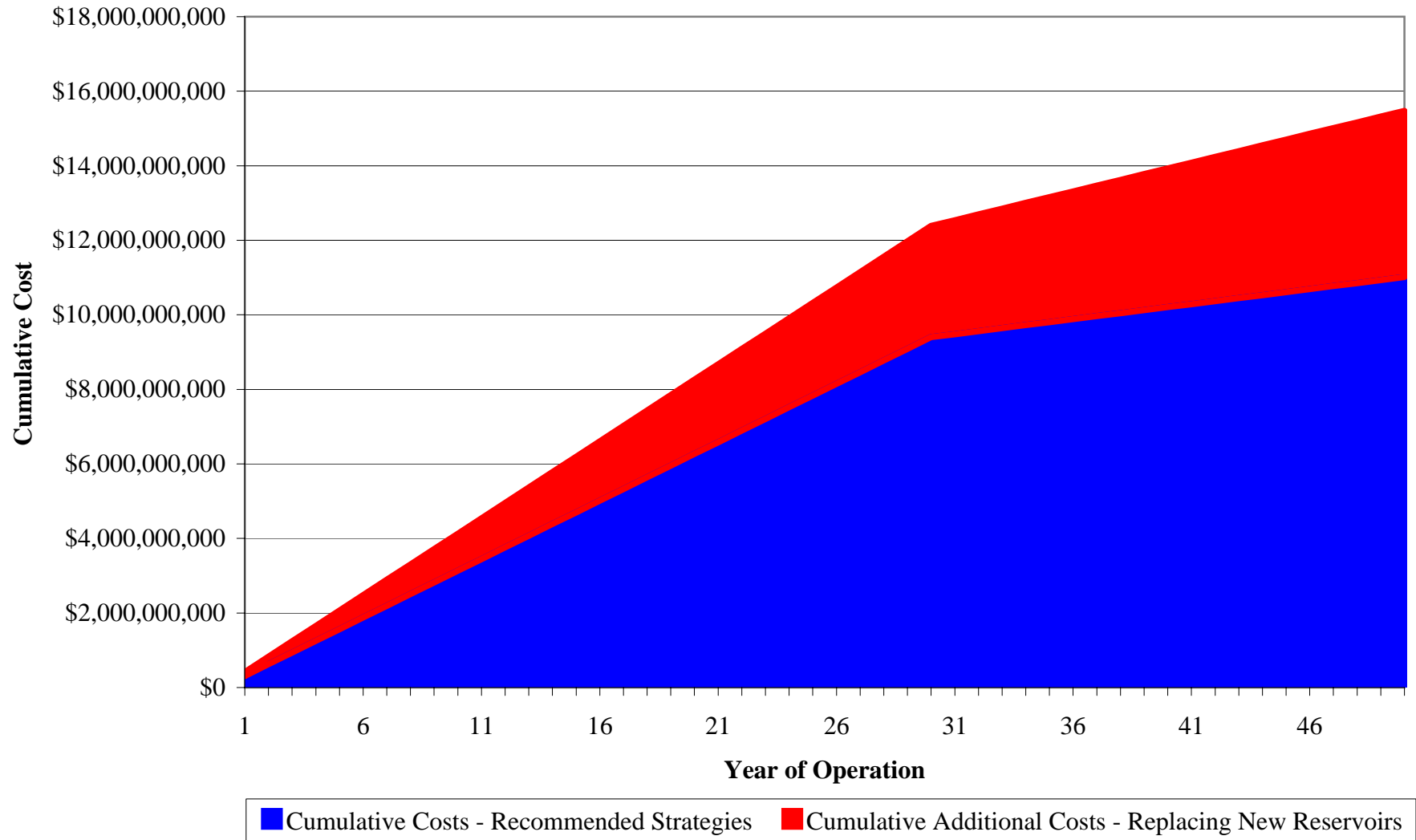


Figure 2: Comparison of Cumulative Cost over 50 Years with and without New Reservoirs - Replacement Alt. 2



ATTACHMENT A

**Table A-1
Cost of Lower Bois d'Arc Creek Reservoir Site**

Probable Owner: NTMWD
Quantity 123,000 AF/Y

CONSTRUCTION COSTS

Dam & Reservoir	Size	Quantity	Unit	Unit Price	Cost
Mobilization		1	LS	\$1,993,295	\$1,993,000
Clearing and Grubbing		85	Ac	\$5,000	\$425,000
Care of Water During Construction		1	LS	\$350,000	\$350,000
Required Excavation		3,026,902	CY	\$2.00	\$6,054,000
Borrow Excavation		833,419	CY	\$1.50	\$1,250,000
Random Compacted Fill		3,225,521	CY	\$2.00	\$6,451,000
Core Compacted Fill		634,799	CY	\$2.00	\$1,270,000
Soil Bentonite Slurry Trench		480,300	SF	\$12.00	\$5,764,000
Soil Cement		105,308	CY	\$45.00	\$4,739,000
Flex Base Roadway		6,695	CY	\$25.00	\$167,000
Sand Filter Drain		193,975	CY	\$30.00	\$5,819,000
Grassing		43	AC	\$4,000	\$172,000
Outlet Works Tower and Conduit		1	LS	\$500,000	\$500,000
Spillway Structure and Reinforced Con		18,101	CY	\$275	\$4,978,000
Roller Compacted Concrete		14,653	CY	\$65.00	\$952,000
Bridge		3,000	SF	\$125	\$375,000
Instrumentation		1	LS	\$350,000	\$350,000
Misc. Internal Drainage		1	LS	\$250,000	\$250,000
Engineering and Contingencies (35%)					\$14,651,000
Subtotal for Dam & Reservoir					\$56,510,000

Conflicts **\$23,207,000**

TRANSMISSION FACILITIES

Pipeline	Size	Quantity	Unit	Unit Price	Cost
Pipeline to Farmersville WTI	96 in.	217,536	LF	\$510	\$110,943,000
Right of Way Easements (ROW)		200	AC	\$3,000	\$599,000
Engineering and Contingencies (30%)					\$33,463,000
Subtotal of Pipeline					\$145,005,000

Table A-1, Continued**Intake Pump Station**

Intake Pump Station	1	LS	\$23,400,000	\$23,400,000
Engineering and Contingencies (35%)				\$8,190,000
Subtotal of Pump Station				\$31,590,000

Two Day Terminal Storage (460 MG)

Compacted Fill	1,320,020	CY	\$5.00	\$6,600,000
12" Soil Cement	92,488	CY	\$50.00	\$4,624,000
HDPE Liner	277,463	SY	\$3.15	\$874,000
Roads	13,036	SY	\$15.00	\$196,000
Grassing	20	AC	\$3,000.00	\$60,000
Control structures	4	EA	\$250,000.00	\$1,000,000
Fencing	8,045	LF	\$15.00	\$121,000
Mobilization	1	LS	5.00%	\$674,000
Engineering and Contingencies (35%)				\$4,952,000
Subtotal Terminal Storage				\$19,101,000

Permitting and Mitigation for Conveyance System **\$1,612,000**

CONSTRUCTION TOTAL **\$277,025,000**

Land Acquisition **\$34,509,000**

Interest During Construction (36 months) **\$28,165,000**

Permitting and Mitigation of reservoir and terminal storage **\$69,018,000**

TOTAL COST **\$408,717,000**

ANNUAL COSTS

	Cost
Debt Service (6% for 30 years)	\$29,693,000
Electricity (\$0.06 kWh)	\$2,721,000
Operation & Maintenance	\$3,029,000
Total Annual Costs	\$35,443,000

UNIT COSTS (Before Amortization)

Per Acre-Foot	\$288
Per 1,000 Gallons	\$0.88

UNIT COSTS (After Amortization)

Per Acre-Foot	\$47
Per 1,000 Gallons	\$0.14

**Table A-2
Lake Ralph Hall and Reuse for UTRWD**

Probable Owner: UTRWD
 Quantity: 32,940 Ac-Ft/Yr from Ralph Hall
 17,800 Ac-Ft/Yr from Reuse (60% return flows on 29,600 ac-ft/yr delivered)
 Peak: 36.7 MGD (1.25:1 peak)

CONSTRUCTION COSTS

Dam, Reservoir and Conflicts

	Size	Quantity	Unit	Unit Price	Cost
Mobilization and Demobilization		1	LS	\$5,100,000	\$5,100,000
Stormwater Prevention		1	LS	\$912,900	\$913,000
Clearing & Grubbing		450	AC	\$2,100	\$945,000
Roadways		23,800	LF	\$215	\$5,117,000
Bridges		13,080	LF	\$1,435	\$18,770,000
Utility Relocations		53,500	LF	\$80	\$4,280,000
Embankment Random Fill		2,447,520	CY	\$3.00	\$7,343,000
Embankment Core		1,928,515	CY	\$4.00	\$7,714,000
Principal Spillway Reinf. Conc.		36,835	CY	\$275	\$10,130,000
Emergency Spillway Reinf. Conc.		38,170	CY	\$275	\$10,497,000
Rock Riprap		215,000	SY	\$100	\$21,500,000
Miscellaneous Relocations		1	LS	\$2,000,000	\$2,000,000
Care of Water		1	LS	\$201,000	\$201,000
Engineering and Contingencies (35%)					\$33,079,000
Subtotal for Dam, Reservoir and Conflicts					\$127,589,000

TRANSMISSION FACILITIES

Pipeline	Size	Quantity	Unit	Unit Price	Cost
Pipeline to Balancing	48 in.	158,400	LF	\$176	\$27,878,000
Right of Way Easements	30 ft.	109	Ac	\$3,000	\$327,000
Engineering and Contingencies (30%)					\$8,363,000
Subtotal of Pipeline					\$36,568,000

Intake Pump Station

Pump Station	2400 HP	1	LS	\$5,060,000	\$5,060,000
Engineering and Contingencies (35%)					\$1,771,000
Subtotal of Pump Station					\$6,831,000

CONSTRUCTION TOTAL

\$170,988,000

Table A-2, Continued

Land Acquisition and Mitigation	\$22,781,000
Interest During Construction (30 months)	\$17,384,000
TOTAL COST	\$211,153,000
ANNUAL COSTS	Cost
Debt Service (6% for 30 years)	\$15,340,000
Electricity (\$0.06 kWh)	\$1,234,000
Operation & Maintenance	\$1,556,000
Total Annual Costs	\$18,130,000
UNIT COSTS (Until Amortized)	
Per Acre-Foot (Ralph Hall and Reuse)	\$357
Per 1,000 Gallons	\$1.10
UNIT COSTS (After Amortization)	
Per Acre-Foot (Ralph Hall and Reuse)	\$55
Per 1,000 Gallons	\$0.17

Table A-3
Cost of Marvin Nichols I Reservoir and Transmission System
North Texas MWD, Tarrant Regional WD, and Upper Trinity RWD

Total Yield =	612,300	acre-feet per year (with Ralph Hall senior, system operation with Wright Patman)		
	Region D	122,460	20.0%	Portion of Region C
	NTMWD	174,840 AF/Y	28.6%	35.8%
	TRWD	280,000 AF/Y	45.7%	57.1%
	Upper Trinity			
	RWD	35,000 AF/Y	5.7%	7.1%
	<u>Total</u>	<u>612,300 AF/Y</u>		

CONSTRUCTION COSTS

DAM & RESERVOIR	Size	Quantity	Unit	Unit Price	Cost
Land Purchase Costs		1	LS	\$73,169,000	\$73,169,000
Mobilization		1	LS	\$6,500,000	\$6,500,000
Spillway Construction					
Mass Concrete		87,300	CY	\$125	\$10,913,000
Reinforced Concrete		26,800	CY	\$475	\$12,730,000
Soil Cement		3,600	CY	\$31.50	\$113,000
Spillway Bridge		640	LF	\$1,100	\$704,000
Gates, Including Anchoring System		14,040	SF	\$235	\$3,299,000
Gate Hoist and Operating System		13	EA	\$225,000	\$2,925,000
Stop Gate and Lift Beam		640	LF	\$1,600	\$1,024,000
Instrumentation		640	LF	\$700	\$448,000
Excavation		2,894,000	CY	\$3	\$8,682,000
Structural Fill		121,000	CY	\$12	\$1,452,000
Subtotal of Spillway Construction					\$42,290,000
Embankment Construction					
Random Fill		6,049,600	CY	\$2.00	\$12,099,000
Impervious Core		1,455,000	CY	\$2.50	\$3,638,000
Borrow		4,731,600	CY	\$2.00	\$9,463,000
Foundation Drain (Filter Material)		502,500	CY	\$31.00	\$15,578,000
Soil Cement		337,800	CY	\$35.00	\$11,823,000
Slurry Trench Cutoff		1,770,000	SF	\$8.50	\$15,045,000
Asphalt Paving on Embankment Crest		68,350	SY	\$17.50	\$1,196,000
Containment Levee		79,100	CY	\$2.50	\$198,000
Subtotal of Embankment Construction					\$69,040,000
Other Items					
Barrier Warning System		640	LF	\$90	\$58,000
Electrical System		1	LS	\$500,000	\$500,000
Power Drop		1	LS	\$200,000	\$200,000
Spillway Low-Flow System		1	LS	\$350,000	\$350,000
Stop Gate Monorail System		640	LF	\$800	\$512,000
Grassing		100	AC	\$13,500	\$1,350,000
Clearing and Grubbing/ Site Preparation		27960	LF	\$30	\$839,000
Care of Water		640	LF	\$1,250	\$800,000
Reservoir Land Clearing		16800	AC	\$750	\$12,600,000
Subtotal of Other Items					\$17,209,000

Table A-3, Continued

Conflicts		1	LS	\$	52,688,000	\$52,688,000
Engineering and Contingencies (35%)						\$65,704,000
Permitting and Mitigation						\$166,738,000
Total Dam and Reservoir						\$493,338,000
Subtotal for Region C Part of Dam & Reservoir						\$493,338,000
<i>NTMWD Portion of Dam & Reservoir</i>	<i>35.8%</i>					<i>\$176,615,000</i>
<i>TRWD Portion of Dam & Reservoir</i>	<i>57.1%</i>					<i>\$281,696,000</i>
<i>Upper Trinity RWD Portion Dam & Reservoir</i>	<i>7.1%</i>					<i>\$35,027,000</i>
<i>Subtotal Check</i>						<i>\$493,338,000</i>
TRANSMISSION FACILITIES						
Pipeline	Size	Quantity	Unit	Unit Price		Cost
Pipeline Rural (Reservoir to Lk. Lavon)	2-108 in	419,200	LF	\$633		\$530,707,000
Pipeline Urban (Reservoir to Lk. Lavon)	2-108 in	10,000	LF	\$886		\$17,720,000
Right of Way Easements Rural (ROW)		770	Acres	\$3,000		\$2,310,000
Right of Way Easements Urban (ROW)		18	Acres	\$30,000		\$540,000
Engineering and Contingencies (30%)						\$164,528,000
Permitting & Mitigation						\$6,581,000
Subtotal of Pipeline (Reservoir to Lake Lavon)						\$722,386,000
Pipeline Rural (Lake Lavon to Lewisville)	2-90 in	69,000	LF	\$459		\$63,342,000
Pipeline Urban (Lake Lavon to Lewisville)	2-90 in	103,500	LF	\$643		\$133,101,000
Right of Way Easements Rural (ROW)		127	Acres	\$3,000		\$381,000
Right of Way Easements Urban (ROW)		190	Acres	\$30,000		\$5,700,000
Engineering and Contingencies (30%)						\$58,933,000
Permitting & Mitigation						\$2,357,000
Subtotal of Pipeline (Lake Lavon to Lake Lewisville)						\$263,814,000
Pipeline Rural (Lake Lewisville to Eagle)	2-90 in	136,290	LF	\$459		\$125,114,000
Pipeline Urban (Lake Lewisville to Eagle)	2-90 in	58,410	LF	\$643		\$75,115,000
Right of Way Easements Rural (ROW)		250	Acres	\$3,000		\$750,000
Right of Way Easements Urban (ROW)		107	Acres	\$30,000		\$3,210,000
Engineering and Contingencies (30%)						\$60,069,000
Permitting & Mitigation						\$2,403,000
Subtotal of Pipeline (Lake Lewisville to Eagle Mountain Lake)						\$266,661,000
Total Pipeline Cost						\$1,252,861,000
<i>NTMWD Portion of Pipeline</i>	<i>35.8% (Res to Lavon)</i>					<i>\$258,614,000</i>
<i>TRWD Portion of Pipeline</i>	<i>57.1% (Res to Lavon) & 88.9% (Lavon to Lewisville) & 100% (Lewisville to Eagle Mountain)</i>					<i>\$913,674,000</i>
<i>Upper Trinity RWD Portion of Pipeline</i>	<i>7.1% (Res to Lavon) & 11.1% (Lavon to Lewisville)</i>					<i>\$80,573,000</i>
<i>Total Check</i>						<i>\$1,252,861,000</i>

Table A-3, Continued

Pump Station(s)	Size (per PS)	Quantity	Unit	Unit Price	Cost
Pump Stations (Reservoir to Lake Lavon)	55,800	2	LS	\$23,450,000	\$46,900,000
Intake Structure	552 MGD	1	LS	\$18,375,000	\$18,375,000
Ground Storage Tanks at booster station	10 MG	7	EA	\$1,400,000	\$9,800,000
Engineering and Contingencies (35%)					\$26,276,000
Permitting & Mitigation					\$901,000
Subtotal of Pump Station(s) (Reservoir to Lake Lavon)					\$102,252,000
Pump Station (Lake Lavon to Lake Lewisville)	24,200	1	LS	\$15,260,000	\$15,260,000
Ground Storage Tanks	9 MG	5	EA	\$1,250,000	\$6,250,000
Engineering and Contingencies (35%)					\$7,529,000
Permitting & Mitigation					\$258,000
Subtotal of Pump Station(s) (Lake Lavon to Lake Lewisville)					\$29,297,000
Pump Stations (Lewisville to Eagle Mountain)	26,900	1	LS	\$16,070,000	\$16,070,000
Ground Storage Tanks	10 MG	4	EA	\$1,400,000	\$5,600,000
Engineering and Contingencies (35%)					\$7,585,000
Permitting & Mitigation					\$260,000
Subtotal of Pump Station(s) (Lake Lewisville to Eagle Mountain Lake)					\$29,515,000
Total Pump Station Costs (Including Storage Tanks)					\$161,064,000
<i>NTMWD</i>	<i>35.8% (Res to Lavon)</i>				<i>\$36,606,000</i>
<i>TRWD</i>	<i>57.1% (Res to Lavon) & 88.9% (Lavon to Lewisville) & 100%</i>				<i>\$113,946,000</i>
<i>UTRWD</i>	<i>7.1% (Res to Lavon) & 11.1% (Lavon to Lewisville)</i>				<i>\$10,512,000</i>
<i>Total Check</i>					<i>\$161,064,000</i>
CONSTRUCTION TOTAL					\$1,907,263,000
Interest During Construction	(36 months - pipeline)				\$251,790,000
	(48 months for reservoir)				
TOTAL COST					\$2,159,053,000
<i>NTMWD</i>					<i>\$534,125,000</i>
<i>TRWD</i>					<i>\$1,482,167,000</i>
<i>Upper Trinity RWD</i>					<i>\$142,761,000</i>
<i>Total Check</i>					<i>\$2,159,053,000</i>
TOTAL COST ANALYSIS					
NTMWD					Cost
Debt Service (6% for 30 years)					\$38,804,000
Electricity (\$0.06 kWh)					\$11,451,000
Operation & Maintenance					\$3,231,000
Total Annual Costs (NTMWD)					\$53,486,000
TRWD					
Debt Service (6% for 30 years)					\$107,678,000
Electricity (\$0.06 kWh)					\$32,062,000
Operation & Maintenance					\$12,087,000
Total Annual Costs (TRWD)					\$151,827,000

Table A-3, Continued**Upper Trinity RWD**

Debt Service (6% for 30 years)	\$10,371,000
Electricity (\$0.06 kWh)	\$3,016,000
Operation & Maintenance	\$1,125,000
Total Annual Costs (Upper Trinity RWD)	\$14,512,000

TOTAL ANNUAL

Debt Service (6% for 30 years)	\$156,853,000
Electricity (\$0.06 kWh)	\$46,529,000
Operation & Maintenance	\$16,443,000
Total Annual Costs (All Users)	\$219,825,000

UNIT COSTS (During Amortization)**NTMWD**

Per Acre-Foot	\$306
Per 1,000 Gallons	\$0.94

TRWD

Per Acre-Foot	\$542
Per 1,000 Gallons	\$1.66

Upper Trinity RWD

Per Acre-Foot	\$415
Per 1,000 Gallons	\$1.27

Total All Users

Per Acre-Foot	\$449
Per 1,000 Gallons	\$1.38

ANNUAL COSTS (After Amortization)**NTMWD**

Electricity (\$0.06 kWh)	\$11,451,000
Operation & Maintenance	\$3,231,000
Total Annual Costs (NTMWD)	\$14,682,000

TRWD

Electricity (\$0.06 kWh)	\$32,062,000
Operation & Maintenance	\$12,087,000
Total Annual Costs (TRWD)	\$44,149,000

Upper Trinity RWD

Electricity (\$0.06 kWh)	\$3,016,000
Operation & Maintenance	\$1,125,000
Total Annual Costs (Upper Trinity RWD)	\$4,141,000

Total All Users

Electricity (\$0.06 kWh)	\$46,529,000
Operation & Maintenance	\$16,443,000
Total Annual Costs (All Users)	\$62,972,000

Table A-3, Continued**UNIT COSTS (After Amortization)****NTMWD**

Per Acre-Foot	\$84
Per 1,000 Gallons	\$0.26

TRWD

Per Acre-Foot	\$158
Per 1,000 Gallons	\$0.48

Table R-12, Continued**Upper Trinity RWD**

Per Acre-Foot	\$118
Per 1,000 Gallons	\$0.36

All Users

Per Acre-Foot	\$129
Per 1,000 Gallons	\$0.39

COST ANALYSIS FOR PHASE I**TOTAL COST**

<i>NTMWD</i>	<i>\$375,685,167</i>
<i>TRWD</i>	<i>\$942,182,075</i>
<i>Upper Trinity RWD</i>	<i>\$94,696,758</i>
<i>Total</i>	<i>\$1,412,564,000</i>

NTMWD

Debt Service (6% for 30 years)	\$27,293,000
Electricity (\$0.06 kWh)	\$5,725,500
Operation & Maintenance	\$1,954,000
Total Annual Costs (NTMWD)	\$34,972,500

TRWD

Debt Service (6% for 30 years)	\$68,449,000
Electricity (\$0.06 kWh)	\$16,031,000
Operation & Maintenance	\$7,059,000
Total Annual Costs (TRWD)	\$91,539,000

Upper Trinity

Debt Service (6% for 30 years)	\$6,880,000
Electricity (\$0.06 kWh)	\$1,508,000
Operation & Maintenance	\$682,000
Total Annual Costs (Upper Trinity)	\$9,070,000

Total, All Users

Debt Service (6% for 30 years)	\$102,622,000
Electricity (\$0.06 kWh)	\$23,264,500
Operation & Maintenance	\$9,695,000
Total Annual Costs (All Users)	\$135,581,500

PHASE I UNIT COSTS (During Amortization)**NTMWD**

Per Acre-Foot	\$400
Per 1,000 Gallons	\$1.23

Table A-3, Continued**TRWD**

Per Acre-Foot	\$654
Per 1,000 Gallons	\$2.01

Upper Trinity

Per Acre-Foot	\$518
Per 1,000 Gallons	\$1.59

All Users

Per Acre-Foot	\$554
Per 1,000 Gallons	\$1.70

COST ANALYSIS FOR Phase II**TOTAL COST**

<i>NTMWD</i>	\$158,441,792
<i>TRWD</i>	\$539,983,113
<i>Upper Trinity RWD</i>	\$48,064,095
<i>Total</i>	\$746,490,300

NTMWD

Debt Service (6% for 30 years)	\$11,511,000
Electricity (\$0.06 kWh)	\$5,725,500
Operation & Maintenance	\$1,277,000
Total Annual Costs (NTMWD)	\$18,513,500

TRWD

Debt Service (6% for 30 years)	\$39,229,000
Electricity (\$0.06 kWh)	\$16,031,000
Operation & Maintenance	\$5,028,000
Total Annual Costs (TRWD)	\$60,288,000

Upper Trinity

Debt Service (6% for 30 years)	\$3,492,000
Electricity (\$0.06 kWh)	\$1,508,000
Operation & Maintenance	\$443,000
Total Annual Costs (Upper Trinity)	\$5,443,000

All Users

Debt Service (6% for 30 years)	\$54,232,000
Electricity (\$0.06 kWh)	\$23,264,500
Operation & Maintenance	\$6,748,000
Total Annual Costs (All Users)	\$84,244,500

UNIT COSTS FOR PHASE II (During Amortization)**NTMWD**

Per Acre-Foot	\$212
Per 1,000 Gallons	\$0.65

TRWD

Per Acre-Foot	\$431
Per 1,000 Gallons	\$1.32

Table A-3, Continued

Upper Trinity

Per Acre-Foot	\$311
Per 1,000 Gallons	\$0.96

Total All Users

Per Acre-Foot	\$344
Per 1,000 Gallons	\$1.06

**Table A-4
Cost of Lake Fastrill for Dallas Water Utilities**

Probable Owner: DWU

Quantity: 112,100 AF/Y Operated as a system with Lake Palestine.
Firm Yield of 148,780 acre-feet per year (operated as a system
with Lake Palestine). 36,680 for local use.
120 MGD peak flow - 1.2 peak

CONSTRUCTION COSTS

	Size	Quantity	Unit	Unit Price	Cost
Dam and Reservoir					
Dam and Reservoir Construction (from HDR)		1	LS	\$108,297,000	\$108,297,000
Engineering and Contingencies (35%)					\$37,904,000
Land Acquisition and Mitigation		1	LS	\$119,760,000	\$119,760,000
Total Dam and Reservoir					\$265,961,000
DWU Share of Dam and Reservoir					\$200,391,000
Transmission System					
Intake and Pump Station	11,200 HP	1	LS	\$11,850,000	\$11,850,000
Transmission Pipeline (Rural)	78 in.	269,400	LF	\$364	\$98,062,000
Upgrade Palestine Intake Pump Station		1	LS	\$5,000,000	\$5,000,000
Booster Pump Station at Lake Palestine	15,000 HP	1	LS	\$8,750,000	\$8,750,000
Enlarge Booster on Palestine Pipeline	from 9,800 HP to 15,000 HP	1	LS	\$6,720,000	\$6,720,000
Storage Tanks	8 MG	4	Ea.	\$1,100,000	\$4,400,000
ROW Easements (Rural)	40'	247	Acre	\$3,000	\$742,000
					\$135,524,000
Engineering and Contingencies (30% for pipelines, 35% for other)					\$42,271,000
Permitting & Mitigation - Conveyance System					\$1,617,000
DWU Share of Construction					\$379,803,000
Interest During Construction (36 months)					\$46,211,000
TOTAL CAPITAL COST					\$426,014,000
ANNUAL COSTS					Cost
Debt Service (6% for 30 years)					\$30,949,000
Electricity (\$0.06 kWh)					\$5,291,000
Operation & Maintenance					\$3,747,000
Total Annual Costs					\$39,987,000

UNIT COSTS (Until Amortized)

Per Acre-Foot	\$357
Per 1,000 Gallons	\$1.10

UNIT COSTS (After Amortization)

Per Acre-Foot	\$81
Per 1,000 Gallons	\$0.25

Table A-5
TRWD Lake of the Pines
From Lake of the Pines to Rolling Hills WTP

Probable Owner: TRWD updated by SWG 2/10/05
Quantity: 87,900 AF/Y modified by SFK 2/11/05

CONSTRUCTION COSTS
TRANSMISSION FACILITIES

Pipeline	Size	Quantity	Unit	Unit Price	Cost
Pipeline Rural (from LOTP to WTP)	72 in.	869,778	LF	\$321	\$279,199,000
30-ft Right of Way Easements (ROW)		599	ACRE	\$3,000	\$1,797,000
Engineering and Contingencies (30%)					\$83,760,000
Subtotal of Pipeline					\$364,756,000
Pump Station(s)					
Pump at LOTP with intake & building	12,500 HP	1	LS	\$13,850,000	\$13,850,000
Booster Pump Station #1	12,500 HP	1	LS	\$10,250,000	\$10,250,000
Booster Pump Station #2	12,500 HP	1	LS	\$10,250,000	\$10,250,000
Engineering and Contingencies (35%)					\$12,022,500
Subtotal of Pump Station(s)					\$46,372,500
Ground Storage					
Ground Storage Tanks at Pump Stations	6 MG	4	LS	\$750,000	\$3,000,000
Engineering and Contingencies (35%)					\$1,050,000
Subtotal of Ground Storage					\$4,050,000
CONSTRUCTION TOTAL					\$415,178,500
Permitting and Mitigation					\$3,799,000
Interest During Construction					\$50,515,000
					(36 months)
TOTAL COST					\$469,492,500
ANNUAL COSTS					
Debt Service (6% for 30 years)					\$34,108,000
Electricity (\$0.06 kWh)					\$9,186,000
Operation & Maintenance					\$4,471,000
Raw Water Purchase					\$8,593,000
Total Annual Costs					\$56,358,000
UNIT COSTS (Until Amortized)					
Per Acre-Foot					\$641
Per 1,000 Gallons					\$1.97
UNIT COSTS (After Amortization)					
Per Acre-Foot					\$253
Per 1,000 Gallons					\$0.78

Notes: Cost for buying raw water is assumed to be \$0.30 per 1,000 gallons
Based on 2003 NTMWD study of the Cypress Basin.

Table A-6
Lake Livingston to Tarrant Regional Water District

Probable Owner: TRWD 200,000 Acre-Feet per Year
 Peak Delivery: 223 MGD (1.25 Peaking Factor)

CONSTRUCTION COSTS

TRANSMISSION FACILITIES

Pipeline	Size	Quantity	Unit	Unit Price	Cost
Pipeline (Rural)	2 - 78 in.	973,000	LF	\$364 ea.	\$708,344,000
Pipeline (Urban)	2 - 78 in.	77,000	LF	\$510 ea.	\$78,540,000
ROW Easements (Rural)		1,787	Acres	\$3,000	\$5,361,000
ROW Easements (Urban)		141	Acres	\$30,000	\$4,230,000

Engineering and Contingencies (30%) \$236,065,000

Subtotal of Pipeline \$1,032,540,000

Pump Station(s)	Size (per PS)	Quantity	Unit	Unit Price	Cost
Lake Pump Station	22,000 HP	1	LS	\$19,640,000	\$19,640,000
Booster Pump Stations	22,000 HP	3	Ea	\$14,600,000	\$43,800,000
Ground Storage Tanks	10 MG	9	Ea	\$1,400,000	\$12,600,000

Engineering and Contingencies (35%) \$26,614,000

Subtotal of Pump Stations \$102,654,000

Permitting and mitigation 1 LS \$10,355,000

CONSTRUCTION TOTAL \$1,145,549,000

Interest During Construction (36 months) \$139,379,000

TOTAL COST \$1,284,928,000

ANNUAL COSTS

Debt Service (6% for 30 years)	\$93,349,000
Raw Water (\$95 per acre-foot)	\$19,000,000
Electricity (\$.06 kWh)	\$23,146,000
Operation & Maintenance	\$11,724,000
Total Annual Costs	\$147,219,000

UNIT COSTS (Until Amortized)

Per Acre-Foot	\$736
Per 1,000 Gallons	\$2.26

UNIT COSTS (After Amortization))

Per Acre-Foot	\$269
Per 1,000 Gallons	\$0.83

**Table A-7
Sam Rayburn/Steinhagen to North Texas Municipal Water District**

Probable Owner: NTMWD 200,000 Acre-Feet per Year
 Peak Delivery: 223 MGD (1.25 Peaking Factor)
 Note: Delivery taken from B.A. Steinhagen to allow hydropower generation from Sam Rayburn (per LNVA).

CONSTRUCTION COSTS

TRANSMISSION FACILITIES

Pipeline	Size	Quantity	Unit	Unit Price	Cost
Pipeline (Rural)	2 - 78 in.	1,026,000	LF	\$364 ea.	\$746,928,000
Pipeline (Urban)	2 - 78 in.	120,000	LF	\$510 ea.	\$122,400,000
ROW Easements (Rural)		1,884	Acres	\$3,000	\$5,652,000
ROW Easements (Urban)		220	Acres	\$30,000	\$6,600,000

Engineering and Contingencies (30%) \$260,798,000

Subtotal of Pipeline \$1,142,378,000

Pump Station(s)	Size (per PS)	Quantity	Unit	Unit Price	Cost
Lake Pump Station	16,200 HP	1	LS	\$16,292,000	\$16,292,000
Booster Pump Stations	16,200 HP	4	Ea	\$12,100,000	\$48,400,000
Ground Storage Tanks	10 MG	12	Ea	\$1,400,000	\$16,800,000

Engineering and Contingencies (35%) \$28,522,000

Subtotal of Pump Stations \$110,014,000

CONSTRUCTION TOTAL \$1,252,392,000

Permitting and mitigation 1 LS \$11,410,000

Interest During Construction (36 months) \$152,379,000

TOTAL COST \$1,416,181,000

ANNUAL COSTS

Debt Service (6% for 30 years)	\$102,884,000
Raw Water (10 cents per 1,000 gallons)	\$6,517,000
Electricity (\$0.06 kWh)	\$25,387,000
Operation & Maintenance	\$12,877,000
Total Annual Costs	\$147,665,000

UNIT COSTS (Until Amortized)

Per Acre-Foot	\$738
Per 1,000 Gallons	\$2.27

UNIT COSTS (After Amortization)

Per Acre-Foot	\$224
Per 1,000 Gallons	\$0.69

Table A-8
Wright Patman to Dallas Water Utilities
Purchase 100,000 Acre-Feet per Year from Texarkana

Probable Owner: DWU 100,000 Acre-Feet per Year
 Peak Delivery: 112 MGD (1.25 Peaking Factor)

Note: Pipeline straight to East Side WTP.

CONSTRUCTION COSTS

TRANSMISSION FACILITIES

Pipeline	Size	Quantity	Unit	Unit Price	Cost
Pipeline (Rural)	78 in.	777,000	LF	\$364	\$282,828,000
Pipeline (Urban)	78 in.	8,000	LF	\$510	\$4,080,000
ROW Easements (Rural)		713	Acres	\$3,000	\$2,139,000
ROW Easements (Urban)		7	Acres	\$30,000	\$210,000

Engineering and Contingencies (30%) \$86,072,000

Subtotal of Pipeline \$375,329,000

Pump Station(s)	Size (per PS)	Quantity	Unit	Unit Price	Cost
Lake Wright Patman Pump Station	8,700 HP	1	LS	\$11,200,000	\$11,200,000
Booster Pump Stations	8,700 HP	2	Ea	\$8,290,000	\$16,580,000
Ground Storage Tanks	8 MG	4	Ea	\$1,100,000	\$4,400,000

Engineering and Contingencies (35%) \$11,263,000

Subtotal of Pump Stations \$43,443,000

CONSTRUCTION TOTAL \$418,772,000

Permitting and Mitigation 1 LS \$3,829,000

Interest During Construction (36 months) \$50,952,000

TOTAL COST \$473,553,000

ANNUAL COSTS

Debt Service (6% for 30 years)	\$34,403,000
Raw Water (31 cents per 1,000 gallons)	\$10,101,000
Electricity (\$0.06 kWh)	\$6,706,000
Operation & Maintenance	\$4,408,000
Total Annual Costs	\$55,618,000

UNIT COSTS (Until Amortized)

Per Acre-Foot	\$556
Per 1,000 Gallons	\$1.71

UNIT COSTS (After Amortization)

Per Acre-Foot	\$212
Per 1,000 Gallons	\$0.65

Table A-9
Develop 97,840 Acre-Feet per Year to Lavon and 292,160 Acre-Feet per Year to Lewisville

Probable Owner: Multiple 390,000 Acre-Feet per Year
 Peak Delivery: 435 MGD (1.25 Peaking Factor)

Note: Water includes 100,000 acre-feet per year purchased from Texarkana, 182,000 acre-feet per year new supply, and 108,000 acre-feet per year system operation. Pipeline to Lake Lavon and Lake Lewisville.

CONSTRUCTION COSTS

RAW WATER IMPROVEMENTS (all Phase 1)

	Size	Quantity	Unit	Unit Price	Cost
Storage Purchase from COE			L.S.	\$11,000,000	\$11,000,000
Real Estate Purchase from COE			L.S.	\$10,000,000	\$10,000,000
Relocation Cost (facilities)			L.S.	\$13,000,000	\$13,000,000
Mitigation			L.S.	\$20,000,000	\$20,000,000
NEPA Evaluation			L.S.	\$1,875,000	\$1,875,000
Engineering, Acquisition and Contingencies at 35%			L.S.	\$19,556,000	\$19,556,000
Raw Water Improvements					\$75,431,000

TRANSMISSION FACILITIES

Pipeline Phase 1	Size	Quantity	Unit	Unit Price	Cost
Segment 1 (WP to Chapman - Total Capacity = 614 mgd, Phase 1 capacity = 307 mgd)					
Pipeline	108 in.	426,149	L.F.	\$633	\$269,752,000
ROW Easements (80 Ft.)		783	Acres	\$3,000	\$2,349,000
Engineering and Contingencies (30%)					\$80,926,000
Segment 1 Subtotal					\$353,027,000
Segment 2 (Chapman to Lavon - Total Capacity = 435 mgd, Phase 1 capacity = 218 mgd)					
Pipeline (rural)	96 in.	188,450	L.F.	\$510	\$96,110,000
Pipeline (urban)	96 in.	20,000	L.F.	\$714	\$14,280,000
ROW Easements (80 Ft., rural)		346	Acres	\$3,000	\$1,038,000
ROW Easements (80 Ft., urban)		37	Acres	\$30,000	\$1,110,000
Engineering and Contingencies (30%)					\$33,117,000
Segment 2 Subtotal					\$145,655,000
Segment 3 (Lavon to Lewisville - Capacity = 326 mgd, phase 1 capacity = 163 mgd)					
Pipeline (rural)	90 in.	69,000	L.F.	\$459	\$31,671,000
Pipeline (urban)	90 in.	103,500	L.F.	\$643	\$66,551,000
ROW Easements (80 Ft., rural)		127	Acres	\$3,000	\$381,000
ROW Easements (80 Ft., urban)		190	Acres	\$30,000	\$5,700,000
Engineering and Contingencies (30%)					\$29,467,000
Segment 3 Subtotal					\$133,770,000
Phase 1 Pipeline Total					\$632,452,000

Table A-9, Continued

Pipeline Phase 2	Size	Quantity	Unit	Unit Price	Cost
Segment 1 (WP to Chapman - Total Capacity = 614 mgd)					
Pipeline	108 in.	426,149	L.F.	\$633	\$269,752,000
Engineering and Contingencies (30%)					\$80,926,000
Segment 1 Subtotal					\$350,678,000
Segment 2 (Chapman to Lavon - Total Capacity = 435 mgd)					
Pipeline (rural)	96 in.	198,450	L.F.	\$510	\$101,210,000
Pipeline (urban)	96 in.	10,000	L.F.	\$714	\$7,140,000
Engineering and Contingencies (30%)					\$32,505,000
Segment 2 Subtotal					\$140,855,000
Segment 3 (Lavon to Lewisville - Total Capacity = 326 mgd)					
Pipeline (rural)	84 in.	69,000	L.F.	\$409	\$28,221,000
Pipeline (urban)	84 in.	103,500	L.F.	\$573	\$59,306,000
Engineering and Contingencies (30%)					\$26,258,000
Segment 3 Subtotal					\$113,785,000
Phase 2 Pipeline Total					\$605,318,000
PIPELINE TOTAL					\$1,237,770,000
Pump Station Phase 1	Size	Quantity	Unit	Unit Price	Cost
Segment 1 (WP to Chapman - Capacity = 614 mgd)					
New Pump Station for Texarkana	2,200 HP	1	LS	\$4,880,000	\$4,880,000
Lake Wright Patman Pump Station	28,000 HP	1	LS	\$22,200,000	\$22,200,000
Booster Pump Station 1	32,500 HP	1	Ea	\$17,600,000	\$17,600,000
Booster 1 Ground Storage Tanks	8 MG	5	Ea	\$1,100,000	\$5,500,000
Engineering and Contingencies (35%)					\$17,563,000
Segment 1 Total					\$67,743,000
Segment 2 (Chapman to Lavon - Capacity = 435 mgd)					
Lake Chapman Pump Station	28,300 HP	1	LS	\$22,300,000	\$22,300,000
Engineering and Contingencies (35%)					\$7,805,000
Segment 2 Total					\$30,105,000
Segment 3 (Lavon to Lewisville - Capacity = 326 mgd)					
Lake Lavon Pump Station	13,000 HP	1	LS	\$14,180,000	\$14,180,000
Engineering and Contingencies (35%)					\$4,963,000
Segment 3 Total					\$19,143,000
Phase 1 Pump Station Total					\$116,991,000

Table A-9, Continued

Pump Station Phase 2	Size	Quantity	Unit		Cost
Segment 1 (WP to Chapman - Capacity = 614 mgd)					
Lake Wright Patman Pump Station	28,000 HP	1	LS	\$22,200,000	\$22,200,000
Booster Pump Station 1	32,500 HP	1	Ea	\$17,600,000	\$17,600,000
Booster 1 Ground Storage Tanks	8 MG	5	Ea	\$1,100,000	\$5,500,000
Engineering and Contingencies (35%)					\$15,855,000
Segment 1 Total					\$61,155,000
Segment 2 (Chapman to Lavon - Capacity = 435 mgd)					
Lake Chapman Pump Station	28,300 HP	1	LS	\$22,300,000	\$22,300,000
Engineering and Contingencies (35%)					\$7,805,000
Segment 2 Total					\$30,105,000
Segment 3 (Lavon to Lewisville - Capacity = 326 mgd)					
Lake Lavon Pump Station	13,000 HP	1	LS	\$14,180,000	\$14,180,000
Engineering and Contingencies (35%)					\$4,963,000
Segment 3 Total					\$19,143,000
Phase 2 Pump Station Total					\$110,403,000
PUMP STATION TOTAL					\$227,394,000
CONSTRUCTION TOTAL					
Phase 1					\$824,874,000
Phase 2					\$715,721,000
TOTAL					\$1,540,595,000
Permitting and Mitigation (All Phase 1)					\$13,349,000
Interest During Construction (36 months)					
Phase 1					\$100,362,000
Phase 2					\$85,025,000
TOTAL					\$185,387,000
TOTAL COST					
Phase 1					\$938,585,000
Phase 2					\$800,746,000
TOTAL					\$1,739,331,000
ANNUAL COSTS - PHASE 1					
Debt Service (6% for 30 years)					\$68,187,000
Raw Water (100,000 Acre-Feet at \$0.31 per 1,000 gallons)					\$10,101,000
Electricity (\$0.06 kWh)					\$20,247,000
Operation & Maintenance					\$9,228,000
Total Annual Costs					\$107,763,000

Table A-9, Continued**ANNUAL COSTS - PHASE 2**

Debt Service (6% for 30 years)	\$58,173,000
Raw Water (100,000 Acre-Feet at \$0.31 per 1,000 gallons)	\$0
Electricity (\$0.06 kWh)	\$20,246,000
Operation & Maintenance	\$7,908,000
Total Annual Costs	\$86,327,000

ANNUAL COSTS - PHASES 1 & 2

Debt Service (6% for 30 years)	\$126,360,000
Raw Water (100,000 Acre-Feet at \$0.31 per 1,000 gallons)	\$10,101,000
Electricity (\$0.06 kWh)	\$40,493,000
Operation & Maintenance	\$17,136,000
Total Annual Costs	\$194,090,000

UNIT COSTS (Phase 1)**Per Acre-Foot**

Overall	\$553
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Per 1,000 Gallons

Overall	\$1.70
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UNIT COSTS (Phase 2)**Per Acre-Foot**

Overall	\$443
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Per 1,000 Gallons

Overall	\$1.36
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UNIT COSTS (Phases 1 & 2)**Per Acre-Foot**

Overall	\$498
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Per 1,000 Gallons

Overall	\$1.53
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UNIT COSTS AFTER AMORTIZATION (Phases 1 & 2)**Per Acre-Foot**

Overall	\$174
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Per 1,000 Gallons

Overall	\$0.53
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**Table
Toledo Bend to SRA Upper Basin, NTMWD, and TRWD**

Owners:	SRA, DWU, NTMWD, and TRWD	
Amount - Toledo Bend (total):	500,000	Ac-Ft/Yr
- SRA	100,000	Ac-Ft/Yr
- NTMWD	200,000	Ac-Ft/Yr
- TRWD	200,000	Ac-Ft/Yr

Segments:		Ownership			Flow (Ac-Ft)	Peak (MGD)
		SRA	NTMWD	TRWD		
Toledo Bend to Longview	TB1	20%	40%	40%	500,000	558
Longview to Lake Fork	TB2	11.10%	44.45%	44.45%	450,000	502
Lake Fork to Tawakoni	A1	0%	0%	100.0%	200,000	223
Lake Fork to Cooper	A4	0%	100%	0%	200,000	223
Cooper to Lake Lavon	A5	0%	100%	0%	200,000	223
Tawakoni to Cedar Creek	B1	0%	0%	100%	200,000	223
Cedar Creek to Ennis*	B2	0%	0%	100%	412,500	460
Ennis to TRWD Balancing reservoir*	B3	0%	0%	100%	670,500	748
TRWD Balancing reservoir to Fort Worth*	B4	0%	0%	100%	670,500	748

* Quantities for B2 include 212,500 acre-feet from Cedar Creek and reuse. Quantities for B3 and B4 include 470,500 acre-feet from Cedar Creek, Richalnd-Chambers, and reuse

CONSTRUCTION COSTS

TRANSMISSION FACILITIES

Pipeline	Size	Quantity	Unit	Unit Price	Cost
Pipeline - TB1	2-108 in.	366,400	LF	\$ 633.00	\$463,862,000
Pipeline - TB2	2-102 in.	240,800	LF	\$ 565.00	\$272,104,000
Pipeline - A1	2-78 in.	142,040	LF	\$ 364.00	\$103,405,000
Pipeline - A4	2-78 in.	186,400	LF	\$ 364.00	\$135,699,000
Pipeline - A5 (rural)	2-78 in.	95,450	LF	\$ 364.00	\$69,488,000
Pipeline - A5 (urban)	2-78 in.	14,000	LF	\$ 510.00	\$14,280,000
Pipeline - B1	2-78 in.	97,680	LF	\$ 364.00	\$71,111,000
Pipeline - B2	120 in.	134,500	LF	\$ 801.00	\$107,735,000
Pipeline - B3 (rural)	132 in.	158,680	LF	\$ 973.00	\$154,396,000
Pipeline - B3 (urban)	132 in.	65,320	LF	\$ 1,362.00	\$88,966,000
Pipeline - B4 (urban)	144 in.	31,000	LF	\$ 1,602.00	\$49,662,000
Right of Way Easements (rural)		2,073	Acre	\$3,000	\$6,219,000
Right of Way Easements (urban)		26	Acre	\$30,000	\$780,000
Less Cost of B2 without TB water (Table R-__)					-\$61,736,000
Less Cost of B3 without TB water (Table R-__)					-\$158,318,000
Less Cost of B4 without TB water (Table R-__)					-\$38,471,000

Table __, Continued

Toledo Bend to SRA Upper Basin, NTMWD, and TRWD

Permitting & Mitigation		LS		\$15,266,000
Engineering and Contingencies (30%)				\$383,755,000
Note - No easement needed for B2, B3, and B4.				
Subtotal of Pipeline				\$1,678,203,000
Pipeline Phase 1				\$943,737,000
Pipeline Phase 2				\$734,466,000
Pump Station(s)				Cost
Intake and Pump Station - TB1	44,000	HP		\$27,660,000
Booster Pump Station - TB1	44,000	HP		\$20,500,000
Booster Pump Station - TB2	20,000	HP		\$14,000,000
Intake and Pump Station - A1	12,600	HP		\$13,916,000
Intake and Pump Station - A4	19,000	HP		\$18,140,000
Intake and Pump Station - A5	14,600	HP		\$15,300,000
Pump Station - B1	4,300	HP		\$5,310,000
Intake and Pump Station - B2	23,000	HP		\$20,060,000
Ennis Booster Pump Station - B3	28,000	HP		\$16,400,000
Waxahachie Booster Pump Station - B3	28,000	HP		\$16,400,000
Less Cost of B2 without TB water (Table R-__)				-\$14,378,000
Less Cost of Boosters without TB water (Table R-__)				-\$29,160,000
Permitting and mitigation				\$1,490,000
Engineering and Contingencies (35%)				\$43,452,000
Subtotal of Pump Station(s)				\$169,090,000
Pump Station Phase 1				\$102,048,000
Pump Station Phase 2				\$67,042,000
Storage Tanks	Size	Quantity	Unit	Unit Price
				Cost
Storage - TB1	10 MG	7	Ea	\$1,400,000
Storage - TB2	10 MG	6	Ea	\$1,400,000
Storage - A5	10 MG	3	Ea	\$1,400,000
Storage - B1	10 MG	4	Ea	\$1,400,000
Storage - B3	10 MG	6	Ea	\$1,400,000
Permitting and mitigation				\$319,000
Engineering and Contingencies (35%)				\$9,310,000
Subtotal of Storage Tanks				\$46,029,000
Storage Tanks Phase 1				\$24,818,000
Storage Tanks Phase 2				\$21,211,000
CONSTRUCTION TOTAL				\$1,893,322,000
Construction Phase 1				\$1,070,603,000
Construction Phase 2				\$822,719,000
Interest During Construction		(36 months)		\$230,360,000
Interest Phase 1				\$130,261,000
Interest Phase 2				\$100,100,000

Toledo Bend to SRA Upper Basin, NTMWD, and TRWD

Table ____, Continued

TOTAL COST	\$2,123,682,000
Total Phase 1	\$1,200,864,000
Total Phase 2	\$922,819,000
TOTAL COST BY USER	
SRA	\$202,490,000
NTMWD	\$886,002,000
TRWD	\$1,035,188,000
PHASE 1 COST BY USER	
SRA	\$104,406,000
NTMWD	\$460,007,000
TRWD	\$636,451,000
PHASE 2 COST BY USER	
SRA	\$98,084,000
NTMWD	\$425,995,000
TRWD	\$398,737,000
ANNUAL COSTS Pre-Amortization	
Debt Service (6% for 30 years)	\$154,283,000
SRA	\$14,711,000
NTMWD	\$64,367,000
TRWD	\$75,204,000
Raw Water and Operating Costs	
Total	\$94,650,000
SRA	\$7,421,000
NTMWD	\$37,255,000
TRWD	\$49,974,000
Total Annual Costs	\$248,932,000
SRA	\$22,132,000
NTMWD	\$101,622,000
TRWD	\$125,178,000
UNIT COSTS - Pre Amortization	
Per Acre-Foot	
SRA	\$221
NTMWD	\$508
TRWD	\$626
Overall	\$498

Toledo Bend to SRA Upper Basin, NTMWD, and TRWD

Table ____, Continued

Per 1,000 Gallons

SRA	\$0.68
NTMWD	\$1.56
TRWD	\$1.92
Overall	\$1.53

Annual Costs After Amortization

Total	\$94,650,000
SRA	\$7,421,000
NTMWD	\$37,255,000
TRWD	\$49,974,000

UNIT COSTS - After Amortization

Per Acre-Foot

SRA	\$74
NTMWD	\$186
TRWD	\$250
Overall	\$189

Table ____, Continued

Per 1,000 Gallons

SRA	\$0.23
NTMWD	\$0.57
TRWD	\$0.77
Overall	\$0.58

PHASE 1 ANNUAL COSTS (Pre Amortization)

Debt Service (6% for 30 years)

	\$87,241,000
SRA	\$7,585,000
NTMWD	\$33,419,000
TRWD	\$46,237,000

Raw Water and Operating Costs

Total	\$48,592,000
SRA	\$3,747,000
NTMWD	\$18,834,000
TRWD	\$26,011,000

Total Annual Costs

	\$135,833,000
SRA	\$11,332,000
NTMWD	\$52,253,000
TRWD	\$72,248,000

Toledo Bend to SRA Upper Basin, NTMWD, and TRWD

Table ____, Continued

PHASE 1 UNIT COSTS - Pre Amortization

Per Acre-Foot

SRA	\$227
NTMWD	\$523
TRWD	\$722
Overall	\$543

Per 1,000 Gallons

SRA	\$0.70
NTMWD	\$1.60
TRWD	\$2.22
Overall	\$1.67

PHASE 2 ANNUAL COSTS (Pre Amortization)

Debt Service (6% for 30 years)

	\$67,042,000
SRA	\$7,126,000
NTMWD	\$30,948,000
TRWD	\$28,968,000

Raw Water and Operating Costs

Total	\$46,058,000
SRA	\$3,674,000
NTMWD	\$18,421,000
TRWD	\$23,963,000

Total Annual Costs

	\$113,100,000
SRA	\$10,800,000
NTMWD	\$49,369,000
TRWD	\$52,931,000

PHASE 2 UNIT COSTS - Pre Amortization

Per Acre-Foot

SRA	\$216
NTMWD	\$494
TRWD	\$529
Overall	\$452

Per 1,000 Gallons

SRA	\$0.66
NTMWD	\$1.52
TRWD	\$1.62
Overall	\$1.39

Table
Toledo Bend to SRA Upper Basin (100k), DWU(112.1k), NTMWD (287.9k), and TRWD (200k)

Owners:		SRA, DWU, NTMWD, and TRWD			
Amount - Toledo Bend (total):			700,000	Ac-Ft/Yr	
Amount - TB		SRA	100,000	Ac-Ft/Yr	
		DWU	112,100	Ac-Ft/Yr	
		NTMWD	287,900	Ac-Ft/Yr	
		TRWD	200,000	Ac-Ft/Yr	

Segments:		Ownership				Flow (Ac-Ft)
		SRA	DWU	NTMWD	TRWD	
Toledo Bend to Longview	TB1	14.29%	16.01%	41.13%	28.57%	700,000
Longview to Lake Fork	TB2	7.69%	17.25%	44.29%	30.77%	650,000
Lake Fork to Tawakoni	A1	0%	35.92%	0.00%	64.08%	312,100
Tawakoni to DWU Balancing reservoir	A2	0%	100%	0%	0%	112,100
Balancing reservoir to DWU treatment plant	A3	0%	100%	0%	0%	112,100
Lake Fork to Cooper	A4	0%	0%	100%	0%	287,900
Cooper to Lake Lavon	A5	0%	0%	100%	0%	287,900
Tawakoni to Cedar Creek	B1	0%	0%	0%	100%	200,000
Cedar Creek to Ennis*	B2	0%	0%	0%	100%	412,500
Ennis to TRWD Balancing reservoir*	B3	0%	0%	0%	100%	670,500
TRWD Balancing reservoir to Fort Worth*	B4	0%	0%	0%	100%	670,500

* Quantities for B2 include 212,500 acre-feet from Cedar Creek and reuse. Quantities for B3 and B4 include 470,500 acre-feet from Cedar Creek, Richalnd-Chambers, and reuse

CONSTRUCTION COSTS

Toledo Bend to SRA Upper Basin (100k), DWU(112.1k), NTMWD (287.9k), and TRWD (200k)

TRANSMISSION FACILITIES

Pipeline	Size	Quantity	Unit	Unit Price	Cost
Pipeline - TB1	2-120 in.	366,400	LF	\$ 801.00	\$586,973,000
Pipeline - TB2	2-120 in.	240,800	LF	\$ 801.00	\$385,762,000
Pipeline - A1	2-90 in.	142,040	LF	\$ 459.00	\$130,393,000
Pipeline - A2	84 in.	82,900	LF	\$ 409.00	\$33,906,000
Pipeline - A3 (rural)	84 in.	81,320	LF	\$ 409.00	\$33,260,000
Pipeline - A3 (urban)	84 in.	7,920	LF	\$ 573.00	\$4,538,000
Pipeline - A4	114 in.	186,400	LF	\$ 707.00	\$131,785,000
Pipeline - A5 (rural)	114 in.	95,450	LF	\$ 707.00	\$67,483,000
Pipeline - A5 (urban)	114 in.	14,000	LF	\$ 990.00	\$13,860,000
Pipeline - B1	96 in.	97,680	LF	\$ 510.00	\$49,817,000
Pipeline - B2	120 in.	134,500	LF	\$ 801.00	\$107,735,000
Pipeline - B3 (rural)	132 in.	158,680	LF	\$ 973.00	\$154,396,000
Pipeline - B3 (urban)	132 in.	65,320	LF	\$ 1,362.00	\$88,966,000
Pipeline - B4 (urban)	144 in.	31,000	LF	\$ 1,602.00	\$49,662,000
Right of Way Easements (rural)		1,853	Acre	\$3,000	\$5,559,000
Right of Way Easements (urban)		17	Acre	\$30,000	\$510,000
Less Cost of B2 without TB water (Table R-__)					-\$61,736,000
Less Cost of B3 without TB water (Table R-__)					-\$158,318,000
Less Cost of B4 without TB water (Table R-__)					-\$38,471,000
Permitting & Mitigation			LS		\$18,960,000
Engineering and Contingencies (30%)					\$475,824,000
Note - No easement needed for B2, B3, and B4.					
Subtotal of Pipeline					\$2,080,864,000
Pump Station(s)					Cost
Intake and Pump Station - TB1		66,000	HP		\$35,140,000
Booster Pump Station - TB1		66,000	HP		\$26,000,000
Booster Pump Station - TB2		35,000	HP		\$18,250,000
Intake and Pump Station - A1		21,200	HP		\$19,304,000
Booster Pump Station - A2		4,100	HP		\$5,170,000
Intake and Pump Station - A4		28,600	HP		\$22,412,000
Intake and Pump Station - A5		22,000	HP		\$19,640,000
Pump Station - B1		5,200	HP		\$8,020,000
Intake and Pump Station - B2		23,000	HP		\$20,060,000
Ennis Booster Pump Station - B3		28,300	HP		\$16,490,000
Waxahachie Booster Pump Station - B3		28,300	HP		\$16,490,000
Less Cost of B2 without TB water (Table R-__)					-\$14,378,000
Less Cost of Boosters without TB water (Table R-__)					-\$29,160,000
Permitting and mitigation					\$1,961,000
Engineering and Contingencies (35%)					\$57,203,000
Subtotal of Pump Station(s)					\$222,602,000

Toledo Bend to SRA Upper Basin (100k), DWU(112.1k), NTMWD (287.9k), and TRWD (200k)

Storage Tanks	Size	Quantity	Unit	Unit Price	Cost
Storage - TB1	10 MG	10	Ea	\$1,400,000	\$14,000,000
Storage - TB2	8 MG	10	Ea	\$1,100,000	\$11,000,000
Storage - A2	8 MG	2	Ea	\$1,100,000	\$2,200,000
Earthen Storage - A3	50 MG	1	Ea	\$2,000,000	\$2,000,000
Storage - A5	10 MG	4	Ea	\$1,400,000	\$5,600,000
Storage - B1	10 MG	3	Ea	\$1,400,000	\$4,200,000
Storage - B3	8 MG	10	Ea	\$1,100,000	\$11,000,000
Permitting and mitigation					\$432,000
Engineering and Contingencies (35%)					\$12,600,000
Subtotal of Storage Tanks					\$63,032,000
CONSTRUCTION TOTAL					\$2,366,498,000
Interest During Construction			(36 months)		\$287,932,000
TOTAL COST					\$2,654,430,000
TOTAL COST BY USER					
SRA					\$186,692,500
DWU					\$462,950,900
NTMWD					\$1,061,358,100
TRWD					\$943,432,500
ANNUAL COSTS Pre-Amortization					
Debt Service (6% for 30 years)					\$192,841,000
SRA					\$13,563,000
DWU					\$33,633,000
NTMWD					\$77,107,000
TRWD					\$68,538,000
Raw Water and Operating Costs					
Total					\$126,016,000
SRA					\$7,669,000
DWU					\$21,591,000
NTMWD					\$50,871,000
TRWD					\$45,885,000
Total Annual Costs					\$318,857,000
SRA					\$21,232,000
DWU					\$55,224,000
NTMWD					\$127,978,000
TRWD					\$114,423,000

Toledo Bend to SRA Upper Basin (100k), DWU(112.1k), NTMWD (287.9k), and TRWD (200k)

UNIT COSTS - Pre Amortization

Per Acre-Foot

SRA	\$212
DWU	\$276
NTMWD	\$640
TRWD	\$572
Overall	\$456

Per 1,000 Gallons

SRA	\$0.65
DWU	\$0.85
NTMWD	\$1.96
TRWD	\$1.76
Overall	\$1.40

Annual Costs After Amortization

Total	\$126,016,000
SRA	\$7,669,000
DWU	\$21,591,000
NTMWD	\$50,871,000
TRWD	\$45,885,000

UNIT COSTS - After Amortization

Per Acre-Foot

SRA	\$77
DWU	\$108
NTMWD	\$254
TRWD	\$229
Overall	\$180

Per 1,000 Gallons

SRA	\$0.24
DWU	\$0.33
NTMWD	\$0.78
TRWD	\$0.70
Overall	\$0.55

Table__
Substantial Additional Lake Texoma Supply with Desalination

Probable Owner: Multiple
Amount: 113,000 Acre-Feet/Year pumped.
Amount: 105,000 ac-ft/yr delivered after desalination.

CONSTRUCTION COSTS

TRANSMISSION FACILITIES

Pipeline	Size	Quantity	Unit	Unit Price	Cost
Pipeline (rural)	90 in.	223,959	LF	\$459	\$102,797,200
Pipeline (urban)	90 in.	109,375	LF	\$643	\$70,328,100
Right of Way Easements (Rural)	40 ft.	206	Acre	\$3,000	\$618,000
Right of Way Easements (Urban)	40 ft.	100	Acre	\$30,000	\$3,000,000
Engineering and Contingencies (30%)					\$51,938,000
Subtotal of Pipeline					\$228,681,300

Pump Station(s)

Lakeside Pump Station	9,000 HP	1	EA	\$11,500,000	\$11,500,000
Engineering and Contingencies (35%)					\$4,025,000
Subtotal of Pump Station(s)					\$15,525,000

Permitting and Mitigation

1 LS \$2,364,900

Two Day Terminal Storage (400 MG)

Compacted Fill		1,147,844	CY	\$5.00	\$5,739,000
12" Soil Cement		80,424	CY	\$50.00	\$4,021,000
HDPE Liner		241,272	SY	\$3.15	\$760,000
Roads		11,336	SY	\$15.00	\$170,000
Grassing		20	AC	\$3,000.00	\$60,000
Control structures		4	EA	\$250,000.00	\$1,000,000
Fencing		6,996	LF	\$15.00	\$105,000
Mobilization		1	LS	5.00%	\$593,000
Engineering and Contingencies (35%)					\$4,357,000
Subtotal Terminal Storage					\$16,805,000

WATER TREATMENT FACILITIES

Desalination

Treatment Plant with RO (70 MGD)		200	MGD		\$197,400,000
Brine disposal wells	200 gpm	30	EA	\$900,000	\$27,000,000
Disposal conveyance system		1	LS	\$4,050,000	\$4,050,000
Engineering and Contingencies (35%)					\$79,958,000
Subtotal of Desalination					\$308,408,000

Permitting of treatment plant and reject stream

\$2,741,400

Table R-__, Continued

CONSTRUCTION TOTAL		\$574,525,600
Interest During Construction	(24 months)	\$46,922,000
TOTAL CAPITAL COST		\$621,447,600
ANNUAL COSTS		
Debt Service (6% for 30 years)		\$45,147,000
Raw water purchase		\$2,300,000
Raw Water Electricity (\$0.06 kWh)		\$2,801,000
Facility Operation & Maintenance		\$3,494,000
Water Treatment		\$17,189,000
Reject water disposal		\$3,259,000
Total Annual Costs		\$74,190,000
UNIT COSTS (During Amortization)		
Per Acre-Foot of treated water		\$707
Per 1,000 Gallons of treated water		\$2.17
UNIT COSTS (After Amortization)		
Per Acre-Foot of treated water		\$277
Per 1,000 Gallons of treated water		\$0.85

