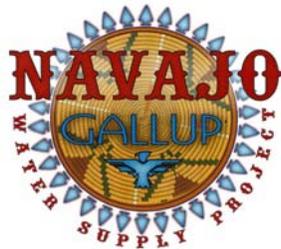


## APPENDIX D

- Part I* Allocation of Capital and OM&R Costs Among Project Participants (San Juan River - PNM Alternative)
- Part II* Economic Benefit/Cost Analysis
- Part III* Financial and Repayment Analysis
- Part IV* Social Impacts from the Navajo-Gallup Water Supply Project



## APPENDIX D

### *Part I*

Allocation of Capital and OM&R Costs  
Among Project Participants

**NAVAJO - GALLUP WATER SUPPLY PROJECT  
ALLOCATION OF CAPITAL AND OM&R COSTS  
AMONG PROJECT PARTICIPANTS  
SAN JUAN RIVER - PNM ALTERNATIVE**

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October 3, 2007**

## Executive Summary

This report is intended to describe the procedure used to allocate capital and operation, maintenance and replacement (O,M&R) costs for the preferred alignment and capacity scenario being considered for the Navajo-Gallup Water Supply Project (NGWSP). The report first explains the principles used for allocation, and then applies the principles to the 2040 version of the San Juan River PNM alternative. Costs are separated into capital costs, fixed O,M&R costs and variable O,M&R costs. Each of these cost categories is further divided into specific project reaches and then allocated to the participating parties. The allocation for the Gallup Regional System is included in the summary table but is developed separately in the detailed tables. The report assumes that construction would begin in 2011, with a construction budget of approximately \$60 million per year (2007\$). Full project completion would be January 1, 2027.

## Allocation Principles

The purpose of cost allocation is to assign shares of the overall project costs to the various participants. This project will provide municipal water supplies to three groups of participants -- the Navajo Nation, the City of Gallup and the Jicarilla Apache Nation. The overriding philosophy in allocating project costs is that the three participants are equal partners in the project. Alternative allocation approaches NOT adopted include (1) assigning the same cost per gallon to all project participants regardless of their location (a "postage stamp" approach), or (2) assuming that one participant was primary and that the other two should pay only the additional costs incurred due to their participation (a "marginal cost" approach).

In allocating costs we first separated specific project components that will be dedicated for the exclusive use by any single participant, and we assigned the cost of those *dedicated components* to the beneficiary participant. These dedicated components typically include water storage tanks and pressurization pumps at most of the major delivery points. The bulk of the project cost, however, is for components that will benefit more than one participant. These *joint costs* were allocated among the project participants to derive each participant's share of the total costs.

Joint costs were allocated according to the following principles:

- ***Capital costs were allocated according to each participant's share of design capacity.*** The idea is that the size and cost of the facilities depend upon each participant's desired capacity and not on average use or use in any particular period.
- ***Fixed O,M&R costs were also allocated according to each participant's share of design capacity.*** Here again, the fixed O,M&R costs (staff size, dredging, equipment replacement, pump maintenance) are primarily a function of the design capacity, not of flows in any particular period.
- ***Variable O,M&R costs were allocated according to each participant's share of annual water deliveries.*** The variable O,M&R costs consist mainly of

energy and water treatment chemical costs. These costs vary according to the water flows in any period, so the method used to allocate these costs assigns cost shares in each year according to the projected use in that year.

The project envisions water deliveries at many locations along (in this alignment alternative) two main branches. Every delivery to one party changes the relative shares of the water flow that continues along the pipeline beyond the delivery point. Because, as described above, the relative share of design capacity and projected flow serve as the basis for the cost allocation, the cost allocation changes after every delivery point. Therefore, we have separated each pipeline branch into specific *reaches* that are defined as the intervals between each two succeeding delivery points. The diversion structure and water treatment plant on each branch is also treated as a separate segment or reach. We computed each participant's share of design capacity on each reach in order to serve as the basis for allocating capital and fixed O,M&R costs (Table A1).

### **Capital Costs**

All of the capital construction costs were assigned to specific reaches and then split into dedicated costs and joint costs. Specific types of costs were allocated as follows: Pumping plant costs were itemized by the Bureau of Reclamation and we assigned each cost to its specific reach (Table B4). We assigned pipeline costs to each reach by accumulating the linear feet of each pipeline diameter and head class designed for each reach, then multiplying the accumulated length of each pipeline diameter and head class by its respective cost per foot (Table B5). Electric and communication facilities were distributed to the reaches per the design, while transmission lines were allocated according to the miles of new transmission line required for each reach (Table B6). Diversion structures, river pumping plants and water treatment plant costs were assigned to the initial reach of each branch (Table B7).

The various components of joint capital costs were added together for each reach and then allocated to the participants using the design capacities (Table B3). We then added the allocated joint capital costs to the dedicated capital costs for each party in each reach (Table B2).

Finally, we added unlisted items (10% of listed items), mobilization costs (5% of listed plus unlisted items) and contingency costs (22.5% of listed items, unlisted items and mobilization costs) to derive the total construction cost, or field cost, for each participant. We then added non-contract cost (27% of field costs) to determine total construction cost before taxes, and then added taxes (9% of total construction cost for most costs and 6% of the construction cost for the Gallup Regional System) to arrive at total construction cost with taxes. Table B1 shows this total as allocated to each participant.

### **Fixed OM&R Costs**

The fixed O,M&R costs (we use "O,M&R" as shorthand for operation, maintenance and replacement) are comprised of the annual components that do not vary substantially with differences in flows through the system. These costs include staff costs, dredging,

equipment maintenance and annualized cost for equipment replacement. Allocation of fixed O,M&R costs was done analogously to the allocation of capital costs: the costs were assigned to the different reaches and then the O,M&R cost for each reach was apportioned among the participants according to their respective share of design capacity. About one-half of the fixed O,M&R cost was associated with the water treatment plants, so those costs were assigned entirely to the first reach of each branch, which contained the treatment plants. The remainder of the fixed O,M&R costs were pumping plant maintenance costs, and these costs were assigned to the reaches containing the pumping plants. Table D2 shows the fixed O,M&R costs for each reach, and allocates the costs to the participants.

### **Variable O,M&R Costs**

The variable O,M&R costs are those annual operating costs that vary significantly with changes in system flows. These costs are primarily comprised of energy and water treatment chemical costs. Because these costs by definition change with changes in system flows we projected system flows over the 50-year life of the project (Table D3). The projected annual flows are based on the following assumptions:

- peak flows will be proportional to total water flows
- peak flows for Gallup and for the Jicarilla Apache Tribe would remain constant over the life of the project.
- peak flows for the Navajos would reach design capacity in the year designated in the Scenario: 2040.
- peak flows for the Navajos would remain constant following the year in which peak flows first reached design capacity
- peak flows for the Navajos would increase at a growth rate of 2.48% per year up to the year in which design capacity was first reached.

The Bureau of Reclamation provided energy and chemical costs associated with build-out project flows. We assumed that these costs would remain constant per unit of flow and then calculated the energy and chemical costs associated with each year's total flow. These total costs were allocated among the participants based on each year's respective shares of total flow. We performed these calculations for two different energy rate structures: Colorado River Storage Project (CRSP) rates (Table D6) and Navajo Tribal Utility Authority (NTUA) rates (Table D7). The applicable energy rates are shown as footnotes in Tables D6 and D7. Deliveries from Navajo Dam are subject to an estimated \$1.00 per acre-foot O&M charge by the Bureau of Reclamation. This cost is included as a variable O,M&R cost in Tables D6 and D7.

### **Gallup Regional System Costs**

The design work and cost estimates for the Gallup Regional System were first prepared by DePauli Engineering. The Bureau of Reclamation used the DePauli design but re-estimated much of the cost. Some of the Gallup System components were included in the Bureau's cost estimate worksheets for the overall system (eg. Navajo Chapter water storage tanks), but most components were listed separately on a Gallup-specific

worksheet. We treated the components included with the other Bureau elements as part of the overall system cost allocation. We allocated the remaining items (all joint facilities) by allocating their cost to participants based on their respective shares of design capacity (Table C1).

O,M&R costs were estimated by the Bureau as a lump sum (one each for the CRSP and NTUA energy rates). We allocated this overall annual O,M&R cost to the participants based on their respective shares of design capacity (Table C2).

### **Water Costs**

Table C3 estimates the City of Gallup's cost of purchasing 7,500 acre-feet per year of water that would be conveyed by the project. At this point Gallup has not reached an agreement with any water supplier, so the cost estimates included in these tables may change. We used the terms of a possible agreement with the Jicarilla Apache Nation as the basis for our cost estimates, but they have not yet been agreed to.

In the absence of a water rights settlement that establishes different terms the Navajo Nation would pay for water from Navajo Reservoir used for non-agricultural purposes. These payments were estimated by the Bureau of Reclamation to have a present value of \$108.45 per acre-foot. We amortized that present value over the Navajo water deliveries using the CRSP interest rate of 2.875%. This cost is shown in Table D8.

We did not include any financial cost for the water to be delivered to the Jicarilla Apache Nation, pursuant to the terms of the Jicarilla Apache Tribe Water Rights Settlement Act (P.L. 102-441, section 8(d)(1)).

### **Overall Summation**

Table 1 summarizes the above analysis. The table addresses the capital, annual O,M&R and present value of O,M&R costs for a scenario that assumes a construction budget of \$60 million per year in 2007\$. The table combines total construction cost including taxes for the Bureau-designed system and for the Gallup Regional System, developed separately in Tables B1 and C1. We added costs for environmental mitigation, cultural resources and right-of-way acquisition that were allocated in Table B8. We then added interest during construction that was calculated in Table B9. We calculated the present value of the annual fixed plus variable O,M&R costs (discounted at 4.875%), estimated under both the CRSP and NTUA energy rates. All financial costs are expressed as of the beginning of the year in which the project is completed: 2027. Interest during construction and interest on pre-project completion water purchase fees are compiled up to January 1, 2027, and post-completion O,M&R and post-completion water purchase fees are discounted to January 1, 2027. We then show the total present value of all costs, including capital, fixed O,M&R and variable O,M&R costs. Table 1 allocates these costs to each of the participants. All costs are based on January, 2007, price levels.

Figures 1 and 2 illustrate the components of overall cost. Figure 1 shows how total project costs are split among capital cost, interest during construction, the present value

of future OM&R costs and the present value of water cost. Figure 2 shows how total project costs are allocation to the three project participants. Figures 3, 4 and 5 show how the cost allocated to each project participant are composed of capital, interest during construction, OM&R and water costs. Finally, Figure 6 shows what the levelized cost per thousand gallons (in 2007\$) would be to each project participant, assuming full self-funding.

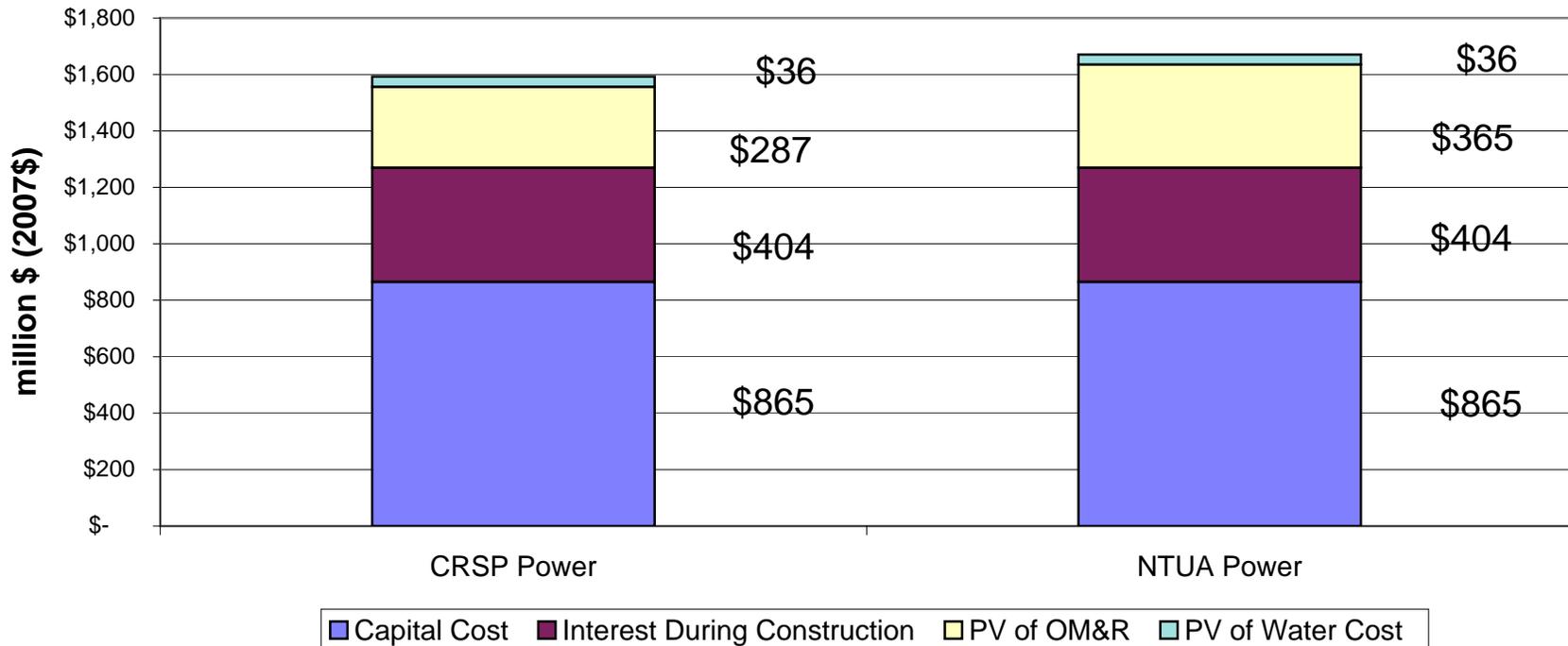
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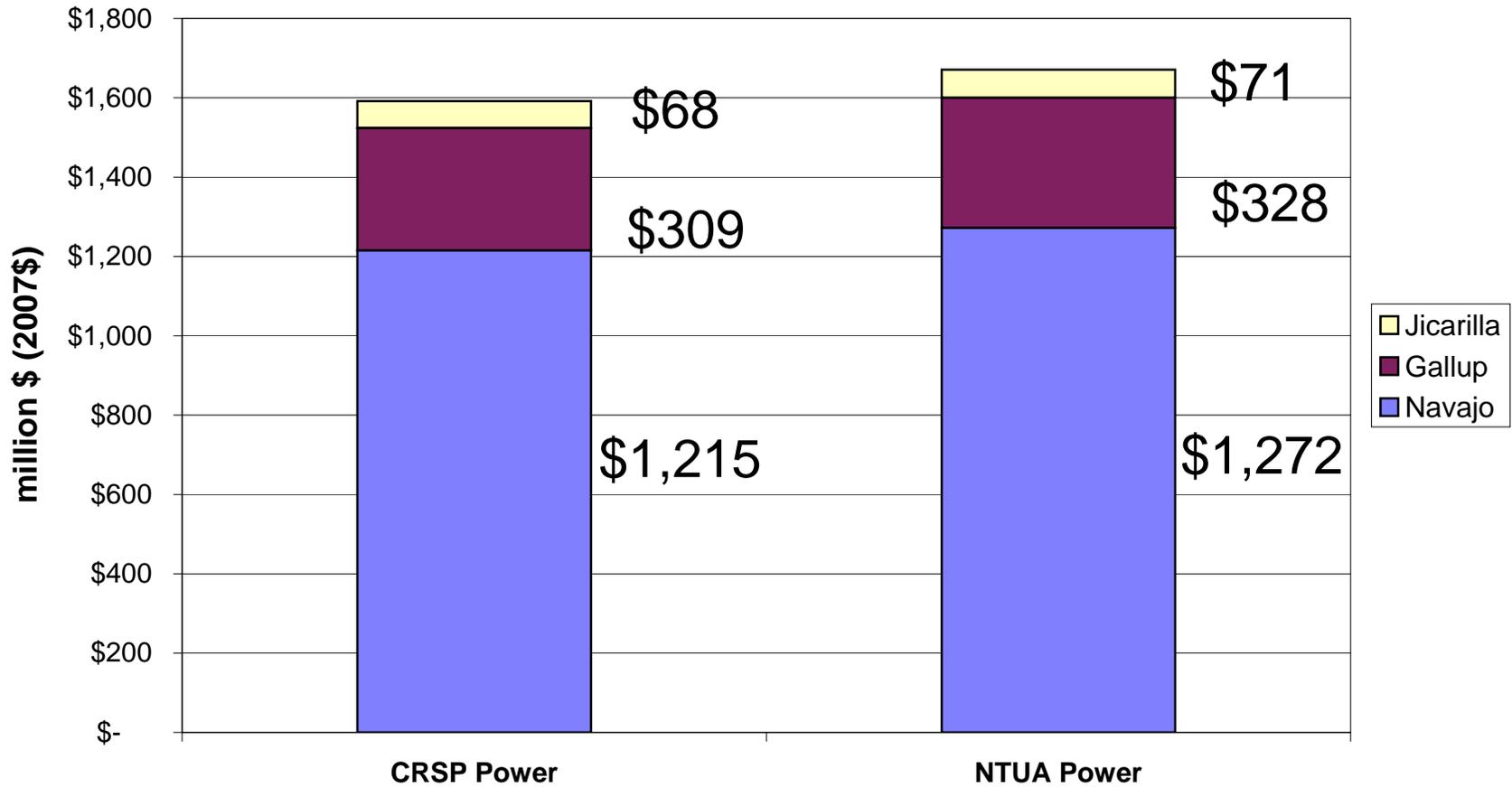
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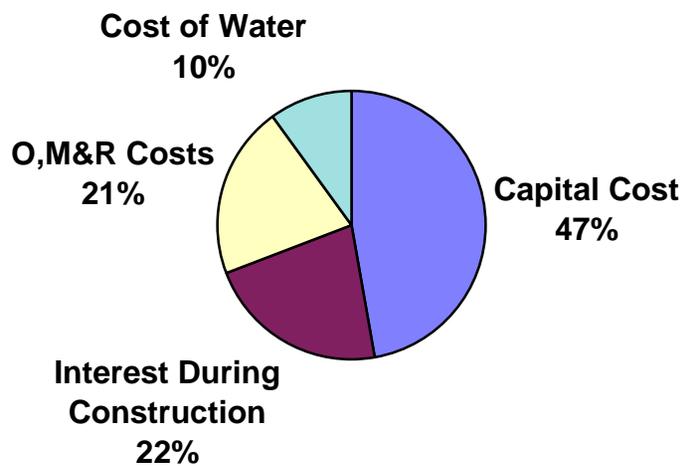
**Figure 1**  
**Navajo-Gallup Water Supply Project**  
**Total Project Cost by Category**  
 Millions 2007\$, 4.875% discount rate, 50 year project life



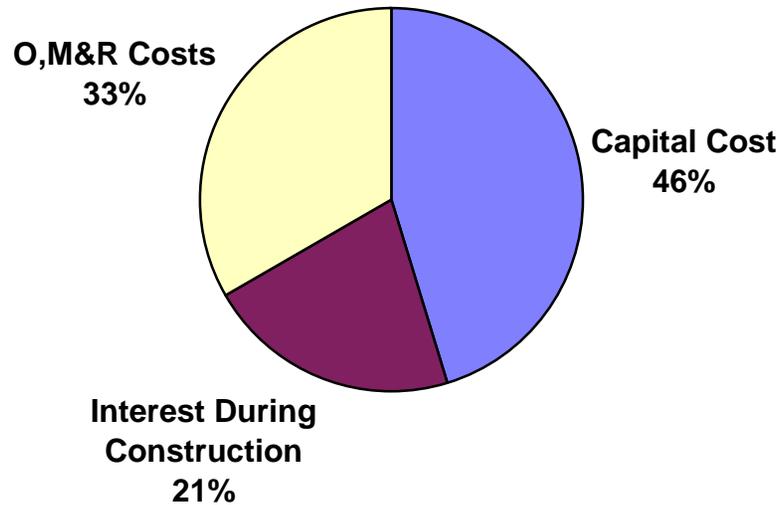
### Figure 2 Navajo-Gallup Water Supply Project Allocation of Total Costs to Participants



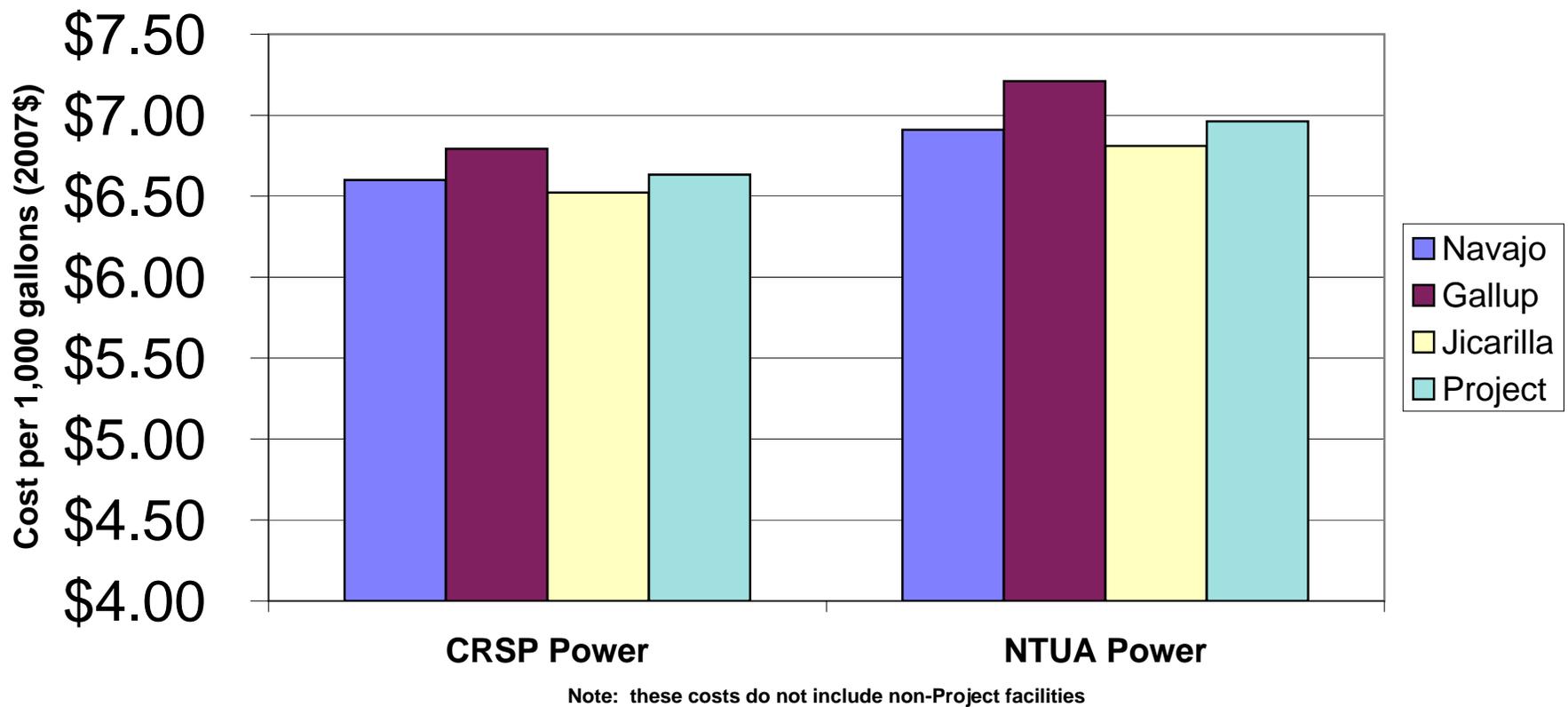
# Figure 4 Navajo-Gallup Water Supply Project NTUA Power Rates Breakdown of Gallup Costs



# Figure 5 Navajo-Gallup Water Supply Project NTUA Power Rates Breakdown of Jicarilla Costs



**Figure 6**  
**Navajo-Gallup Water Supply Project**  
**Cost per Thousand Gallons**  
**Federal Financing at 4.875%, Full Repayment**



**Navajo - Gallup Water Supply Project 2040**  
**San Juan PNM Alternative - \$60 million/year Construction Schedule**  
**Present Value of Total Costs (2007\$)**  
**4.875% Discount Rate, 50 Year Project Life**

<i>Total Capital Costs By User</i>	Navajo	Gallup	Jicarilla	Total
Allocated Construction Costs - Main System	\$620,700,000	\$115,800,000	\$30,400,000	\$766,900,000
Allocated Capital Costs - Gallup Regional	\$18,600,000	\$29,900,000	\$0	\$48,500,000
Allocated Environmental Mitigation Cost	\$4,700,000	\$1,100,000	\$200,000	\$6,000,000
Allocated Cultural Resources Cost	\$27,100,000	\$6,200,000	\$1,300,000	\$34,600,000
Allocated Right-of-Way Cost	\$7,100,000	\$1,600,000	\$300,000	\$9,000,000
Total Project Capital Cost before Interest	\$678,200,000	\$154,600,000	\$32,200,000	\$865,000,000
Allocated Interest During Construction	\$317,000,000	\$72,300,000	\$15,100,000	\$404,300,000
Total Project Capital Cost	\$995,200,000	\$226,900,000	\$47,300,000	\$1,269,400,000
Rounded Values	\$995,000,000	\$227,000,000	\$47,000,000	\$1,269,000,000

*Annual O,M&R Costs By User (at Design Capacity)*

<i>CRSP Rates</i>	Navajo	Gallup	Jicarilla	Total
Allocated O,M&R Costs - Main System	\$9,542,654	\$2,075,238	\$743,636	\$12,361,528
Allocated O,M&R Costs - Gallup Regional	\$311,000	\$500,000	\$0	\$811,000
Annual Cost of Water	\$177,317	\$1,751,636	\$0	\$1,928,953
Total Allocated O,M&R Costs	\$10,030,971	\$4,326,874	\$743,636	\$15,101,481
Rounded Values	\$10,000,000	\$4,300,000	\$700,000	\$15,100,000

<i>NTUA Rates</i>	Navajo	Gallup	Jicarilla	Total
Allocated O,M&R Costs - Main System	\$12,594,137	\$2,977,044	\$846,194	\$16,417,375
Allocated O,M&R Costs - Gallup Regional	\$330,000	\$532,000	\$0	\$862,000
Annual Cost of Water	\$177,317	\$1,751,636	\$0	\$1,928,953
Total Allocated O,M&R Costs	\$13,101,454	\$5,260,681	\$846,194	\$19,208,328
Rounded Values	\$13,100,000	\$5,300,000	\$800,000	\$19,200,000

*Present Value of Total O,M&R Costs By User*

<i>CRSP Rates</i>	Navajo	Gallup	Jicarilla	Total
Allocated O,M&R Costs - Main System	\$210,482,000	\$40,512,000	\$20,843,000	\$271,837,000
Allocated O,M&R Costs - Gallup Regional	\$5,781,000	\$9,315,000	\$0	\$15,096,000
Cost of Water	\$3,300,617	\$32,605,398	\$0	\$35,906,016
Total Allocated O,M&R Costs	\$219,563,617	\$82,432,398	\$20,843,000	\$322,839,016
Rounded Values	\$220,000,000	\$82,000,000	\$21,000,000	\$323,000,000

<i>NTUA Rates</i>	Navajo	Gallup	Jicarilla	Total
Allocated O,M&R Costs - Main System	\$267,447,000	\$58,117,000	\$23,717,000	\$349,281,000
Allocated O,M&R Costs - Gallup Regional	\$6,145,000	\$9,901,000	\$0	\$16,046,000
Cost of Water	\$3,300,617	\$32,605,398	\$0	\$35,906,016
Total Allocated O,M&R Costs	\$276,892,617	\$100,623,398	\$23,717,000	\$401,233,016
Rounded Values	\$277,000,000	\$101,000,000	\$24,000,000	\$401,000,000

Note: Present value of O,M&R costs include fixed and variable O,M&R costs incurred for partial water delivery before project completion

*Present Value of Total Capital and O,M&R Costs By User*

<i>CRSP Rates</i>	Navajo	Gallup	Jicarilla	Total
Capital	\$995,000,000	\$227,000,000	\$47,000,000	\$1,269,000,000
O,M&R (including cost of water)	\$220,000,000	\$82,000,000	\$21,000,000	\$323,000,000
<b>Total All Costs</b>	<b>\$1,215,000,000</b>	<b>\$309,000,000</b>	<b>\$68,000,000</b>	<b>\$1,592,000,000</b>

<i>NTUA Rates</i>	Navajo	Gallup	Jicarilla	Total
Capital	\$995,000,000	\$227,000,000	\$47,000,000	\$1,269,000,000
O,M&R	\$277,000,000	\$101,000,000	\$24,000,000	\$401,000,000
<b>Total All Costs</b>	<b>\$1,272,000,000</b>	<b>\$328,000,000</b>	<b>\$71,000,000</b>	<b>\$1,670,000,000</b>

**Table A1**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Allocation of Flow Capacities to Participants by Reach**

<i>San Juan Branch</i>			Peak	Peak	Allocation of Peak Flows By Reach						
Number	Start	End	Pumping	Flow in	Deliveries	Navajo	Gallup	Jicarilla	Navajo	Gallup	Jicarilla
			Plants	Reach	in Reach	cfs	cfs	cfs	%	%	%
1	San Juan River	Water Treatment Plant (WTP)	River	59.18	0.00	45.71	13.47	0.00	0.7724	0.2276	0.0000
2	WTP	NAPI turnout	01	59.18	0.97	45.71	13.47	0.00	0.7724	0.2276	0.0000
3	NAPI	Shiprock Junction		58.21	6.72	44.74	13.47	0.00	0.7686	0.2314	0.0000
4	Shiprock J.	Sanostee turnout	02, 03	51.49	2.00	38.02	13.47	0.00	0.7384	0.2616	0.0000
5	Sanostee	Burnham Junction		49.49	0.27	36.02	13.47	0.00	0.7278	0.2722	0.0000
6	Burnham J.	Newcomb turnout		49.22	1.52	35.75	13.47	0.00	0.7263	0.2737	0.0000
7	Newcomb	Sheepsprings turnout	04	47.70	0.70	34.23	13.47	0.00	0.7176	0.2824	0.0000
8	Sheepsprings	Naschitti turnout	05	47.00	1.54	33.53	13.47	0.00	0.7134	0.2866	0.0000
9	Naschitti	Tohatchi turnout	06	45.46	1.99	31.99	13.47	0.00	0.7037	0.2963	0.0000
10	Tohatchi	Coyote Canyon Junction		43.47	5.06	30.00	13.47	0.00	0.6901	0.3099	0.0000
11	Coyote Canyon J.	Twin Lakes turnout	07	38.41	1.88	24.94	13.47	0.00	0.6493	0.3507	0.0000
12	Twin Lakes	Ya-ta-hey Junction	08	36.53	14.70	23.06	13.47	0.00	0.6313	0.3687	0.0000
13	Ya-ta-hey J.	Gallup Junction		21.83	13.47	8.36	13.47	0.00	0.3830	0.6170	0.0000
14	Gallup J.	Navajo Chapters		8.36	8.36	8.36	0.00	0.00	1.0000	0.0000	0.0000
					59.18						
10.1	Coyote Canyon J.	Coyote Canyon turnout	11	5.06	1.25	5.06	0.00	0.00	1.0000	0.0000	0.0000
10.2	Coyote Canyon	Standing Rock turnout	12	3.81	0.13	3.81	0.00	0.00	1.0000	0.0000	0.0000
10.3	Standing Rock	Dalton Pass turnout	13	3.68	3.68	3.68	0.00	0.00	1.0000	0.0000	0.0000
					5.06						
12.1	Ya-ta-hey J.	Rock Springs turnout	09	14.70	3.19	14.70	0.00	0.00	1.0000	0.0000	0.0000
12.2	Rock Springs	Window Rock turnout	10	11.51	11.51	11.51	0.00	0.00	1.0000	0.0000	0.0000
					14.70						
<i>Cutter Branch</i>			Peak	Peak	Allocation of Peak Flows By Reach						
Number	Start	End	Pumping	Flow in	Deliveries	Navajo	Gallup	Jicarilla	Navajo	Gallup	Jicarilla
			Plants	Reach	in Reach	cfs	cfs	cfs	%	%	%
21	NIIP Canal	WTP	Reservoir	8.34	0.00	6.19	0.00	2.15	0.7422	0.0000	0.2578
22	WTP	Huerfano turnout	01, 02, 03	8.34	0.50	6.19	0.00	2.15	0.7422	0.0000	0.2578
23	Huerfano	Nageezi turnout	04	7.84	1.05	5.69	0.00	2.15	0.7258	0.0000	0.2742
24	Nageezi	Jicarilla turnout	05	6.79	2.15	4.64	0.00	2.15	0.6834	0.0000	0.3166
25	Jicarilla	Counselor turnout	06	4.64	2.63	4.64	0.00	0.00	1.0000	0.0000	0.0000
26	Counselor	Torreon turnout		2.01	2.01	2.01	0.00	0.00	1.0000	0.0000	0.0000
					8.34						

**Table B1**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Total Capital Costs - Main System**  
**Jan-07 \$**

		<b>Navajo</b>	<b>Gallup</b>	<b>Jicarilla</b>	<b>Total</b>
Allocated Capital Costs		\$322,589,765	\$60,174,615	\$15,785,594	\$398,549,974
Mobilization @	5%	\$16,129,488	\$3,008,731	\$789,280	\$19,927,499
Subtotal		\$338,719,253	\$63,183,346	\$16,574,874	\$418,477,473
Unlisted Items @	10%	\$33,871,925	\$6,318,335	\$1,657,487	\$41,847,747
Subtotal		\$372,591,178	\$69,501,681	\$18,232,361	\$460,325,220
Contingencies @	22.5%	\$83,833,015	\$15,637,878	\$4,102,281	\$103,573,175
Total Field Costs		\$456,424,193	\$85,139,559	\$22,334,642	\$563,898,395
Non-Contract Costs @	27%	\$123,234,532	\$22,987,681	\$6,030,353	\$152,252,567
Total Construction Costs		\$579,658,725	\$108,127,240	\$28,364,996	\$716,150,961
Taxes on Field Cost @	9%	\$41,078,177	\$7,662,560	\$2,010,118	\$50,750,856
Total with Taxes		\$620,736,903	\$115,789,800	\$30,375,114	\$766,901,817
Rounded Total		\$620,700,000	\$115,800,000	\$30,400,000	\$766,900,000

Note: The costs in this table exclude the cost for the Gallup Regional System, which are shown in Table C1. The costs also exclude the environmental mitigation, cultural resources, right-of-way acquisition and interest during construction costs, which are shown in Table 1.

**Table B2**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Allocation of Total Capital Costs by Participant**  
**Jan-07 \$**

<i>San Juan Branch</i>		<i>Joint Costs</i>							<i>Dedicated Costs</i>			<i>Total Costs</i>			
		Total Joint Costs	Allocation Ratios			Allocated Joint Costs			Navajo	Gallup	Jicarilla	Navajo	Gallup	Jicarilla	
			Navajo	Gallup	Jicarilla	Navajo	Gallup	Jicarilla							
Reach	End														
1	Water Treatment Plant (WTP)	\$48,074,490	0.7724	0.2276	-	\$37,132,223	\$10,942,267	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
2	NAPI turnout	\$6,759,977	0.7724	0.2276	-	\$5,221,334	\$1,538,643	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
3	Shiprock Junction	\$25,518,556	0.7686	0.2314	-	\$19,613,472	\$5,905,084	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
4	Sanostee turnout	\$33,451,997	0.7384	0.2616	-	\$24,700,814	\$8,751,183	\$0	\$3,560,000	\$0	\$0	\$0	\$0	\$0	
5	Burnham Junction	\$14,001,664	0.7278	0.2722	-	\$10,190,744	\$3,810,920	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
6	Newcomb turnout	\$6,952,463	0.7263	0.2737	-	\$5,049,788	\$1,902,675	\$0	\$2,840,000	\$0	\$0	\$0	\$0	\$0	
7	Sheepsprings turnout	\$17,525,961	0.7176	0.2824	-	\$12,576,806	\$4,949,155	\$0	\$1,610,000	\$0	\$0	\$0	\$0	\$0	
8	Naschitti turnout	\$12,813,913	0.7134	0.2866	-	\$9,141,500	\$3,672,413	\$0	\$3,140,000	\$0	\$0	\$0	\$0	\$0	
9	Tohatchi turnout	\$26,981,230	0.7037	0.2963	-	\$18,986,572	\$7,994,658	\$0	\$3,560,000	\$0	\$0	\$0	\$0	\$0	
10	Coyote Canyon Junction	\$7,849,753	0.6901	0.3099	-	\$5,417,359	\$2,432,394	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
11	Twin Lakes turnout	\$7,044,603	0.6493	0.3507	-	\$4,574,132	\$2,470,471	\$0	\$3,360,000	\$0	\$0	\$0	\$0	\$0	
12	Ya-ta-hey Junction	\$9,510,653	0.6313	0.3687	-	\$6,003,713	\$3,506,939	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
13	Gallup Junction	\$3,723,923	0.3830	0.6170	-	\$1,426,111	\$2,297,812	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
14	Navajo Chapters	\$450,000	1.0000	-	-	\$450,000	\$0	\$0	\$15,360,000	\$0	\$0	\$0	\$0	\$0	
10.1	Coyote Canyon turnout	\$5,209,982	1.0000	-	-	\$5,209,982	\$0	\$0	\$2,830,000	\$0	\$0	\$0	\$0	\$0	
10.2	Standing Rock turnout	\$9,896,322	1.0000	-	-	\$9,896,322	\$0	\$0	\$685,000	\$0	\$0	\$0	\$0	\$0	
10.3	Dalton Pass turnout	\$3,286,818	1.0000	-	-	\$3,286,818	\$0	\$0	\$5,020,000	\$0	\$0	\$0	\$0	\$0	
12.1	Rock Springs turnout	\$6,245,235	1.0000	-	-	\$6,245,235	\$0	\$0	\$5,000,000	\$0	\$0	\$0	\$0	\$0	
12.2	Window Rock turnout	\$10,584,015	1.0000	-	-	\$10,584,015	\$0	\$0	\$17,340,000	\$0	\$0	\$0	\$0	\$0	
<i>Cutter Branch</i>															
21	WTP	\$9,350,145	0.7422	-	0.2578	\$6,939,736	\$0	\$2,410,409	\$0	\$0	\$0	\$0	\$0	\$0	
22	Huerfano turnout	\$28,101,842	0.7422	-	0.2578	\$20,857,363	\$0	\$7,244,480	\$1,350,000	\$0	\$0	\$0	\$0	\$0	
23	Nageezi turnout	\$7,740,850	0.7258	-	0.2742	\$5,618,040	\$0	\$2,122,810	\$2,130,000	\$0	\$0	\$0	\$0	\$0	
24	Jicarilla turnout	\$12,657,494	0.6834	-	0.3166	\$8,649,598	\$0	\$4,007,896	\$0	\$0	\$0	\$0	\$0	\$0	
25	Counselor turnout	\$6,661,780	1.0000	-	-	\$6,661,780	\$0	\$0	\$3,580,000	\$0	\$0	\$0	\$0	\$0	
26	Torrecon turnout	\$3,231,307	1.0000	-	-	\$3,231,307	\$0	\$0	\$3,560,000	\$0	\$0	\$0	\$0	\$0	
Total		\$323,624,974				\$247,664,765	\$60,174,615	\$15,785,594	\$74,925,000	\$0	\$0	\$0	\$322,589,765	\$60,174,615	\$15,785,594
												Grand Total	\$398,549,974		

This table allocates the capital costs shown in Table B3 using the allocation percentages developed in Table A1.

**Table B3**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Allocation of Total Capital Costs by Reach**  
**Jan-07 \$**

<i>San Juan Branch</i>		<i>Joint Costs</i>					<i>Dedicated Costs</i>		
		Diversion Str. & Water Treatment	Pipeline	Tanks & Pumping Plants	Transm. Lines	Total	Navajo	Gallup	Jicarilla
Reach	End								
1	Water Treatment Plant (WTP)	\$46,363,890	\$0	\$1,200,000	\$510,600	\$48,074,490	\$0	\$0	\$0
2	NAPI turnout	\$0	\$2,447,977	\$4,135,000	\$177,000	\$6,759,977	\$0	\$0	\$0
3	Shiprock Junction	\$0	\$25,138,556	\$380,000	\$0	\$25,518,556	\$0	\$0	\$0
4	Sanostee turnout	\$0	\$26,737,997	\$6,270,000	\$444,000	\$33,451,997	\$3,560,000	\$0	\$0
5	Burnham Junction	\$0	\$14,001,664	\$0	\$0	\$14,001,664	\$0	\$0	\$0
6	Newcomb turnout	\$0	\$5,284,637	\$0	\$1,667,826	\$6,952,463	\$2,840,000	\$0	\$0
7	Sheepsprings turnout	\$0	\$13,710,604	\$2,635,000	\$1,180,357	\$17,525,961	\$1,610,000	\$0	\$0
8	Naschitti turnout	\$0	\$7,431,902	\$2,335,000	\$3,047,011	\$12,813,913	\$3,140,000	\$0	\$0
9	Tohatchi turnout	\$0	\$22,672,956	\$3,035,000	\$1,273,273	\$26,981,230	\$3,560,000	\$0	\$0
10	Coyote Canyon Junction	\$0	\$7,369,175	\$0	\$480,578	\$7,849,753	\$0	\$0	\$0
11	Twin Lakes turnout	\$0	\$3,282,094	\$2,535,000	\$1,227,509	\$7,044,603	\$3,360,000	\$0	\$0
12	Ya-ta-hey Junction	\$0	\$6,498,653	\$2,835,000	\$177,000	\$9,510,653	\$0	\$0	\$0
13	Gallup Junction	\$0	\$3,283,923	\$350,000	\$90,000	\$3,723,923	\$0	\$0	\$0
14	Navajo Chapters	\$0	\$0	\$0	\$450,000	\$450,000	\$15,360,000	\$0	\$0
10.1	Coyote Canyon turnout	\$0	\$4,047,982	\$895,000	\$267,000	\$5,209,982	\$2,830,000	\$0	\$0
10.2	Standing Rock turnout	\$0	\$8,444,322	\$1,185,000	\$267,000	\$9,896,322	\$685,000	\$0	\$0
10.3	Dalton Pass turnout	\$0	\$2,074,818	\$945,000	\$267,000	\$3,286,818	\$5,020,000	\$0	\$0
12.1	Rock Springs turnout	\$0	\$4,613,235	\$1,365,000	\$267,000	\$6,245,235	\$5,000,000	\$0	\$0
12.2	Window Rock turnout	\$0	\$7,494,698	\$1,495,000	\$1,594,316	\$10,584,015	\$17,340,000	\$0	\$0
<i>Cutter Branch</i>									
Reach	End								
21	WTP	\$9,016,545	\$0	\$0	\$333,600	\$9,350,145	\$0	\$0	\$0
22	Huerfano turnout	\$0	\$15,865,627	\$3,615,000	\$8,621,215	\$28,101,842	\$1,350,000	\$0	\$0
23	Nageezi turnout	\$0	\$6,408,850	\$1,065,000	\$267,000	\$7,740,850	\$2,130,000	\$0	\$0
24	Jicarilla turnout	\$0	\$8,012,636	\$1,445,000	\$3,199,858	\$12,657,494	\$0	\$0	\$0
25	Counselor turnout	\$0	\$4,598,723	\$1,285,000	\$778,057	\$6,661,780	\$3,580,000	\$0	\$0
26	Torreon turnout	\$0	\$3,141,307	\$0	\$90,000	\$3,231,307	\$3,560,000	\$0	\$0
Total		\$55,380,435	\$202,562,339	\$39,005,000	\$26,677,200	\$323,624,974	\$74,925,000	\$0	\$0

This table summarizes Joint and Dedicated Costs detailed in Tables B4, B5, B6 and B7.

**Table B4**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Allocation of Pumping Plant and Tank Costs by Reach**  
**Jan-07 \$**

					<i>Joint Costs</i>					<i>Dedicated Costs</i>									
					Pipeline		Water			Storage Tanks		Service Area Pumping Plants			Total				
Reach	End	No. WTP	No. Turnouts	No. Pump P.	Pumping Plants	Forebay Tanks	Air Chambers	Regulating Tanks	Total	Navajo	Gallup	Jicarilla	Navajo	Gallup	Jicarilla	Navajo	Gallup	Jicarilla	
1	Water Treatment Plant (WTP)	1	0	0	\$1,200,000	\$0	\$0		\$1,200,000							\$0	\$0	\$0	
2	NAPI turnout	0	0	1	\$3,500,000	\$260,000	\$375,000		\$4,135,000							\$0	\$0	\$0	
3	Shiprock Junction	0	0	0		\$0	\$0	\$380,000	\$380,000							\$0	\$0	\$0	
4	Sanostee turnout	0	1	2	\$5,000,000	\$520,000	\$750,000		\$6,270,000	\$3,400,000			\$160,000			\$3,560,000	\$0	\$0	
5	Burnham Junction	0	0	0		\$0	\$0		\$0							\$0	\$0	\$0	
6	Newcomb turnout	0	1	0		\$0	\$0		\$0	\$2,700,000			\$140,000			\$2,840,000	\$0	\$0	
7	Sheepsprings turnout	0	1	1	\$2,000,000	\$260,000	\$375,000		\$2,635,000	\$1,500,000			\$110,000			\$1,610,000	\$0	\$0	
8	Naschitti turnout	0	1	1	\$1,700,000	\$260,000	\$375,000		\$2,335,000	\$3,000,000			\$140,000			\$3,140,000	\$0	\$0	
9	Tohatchi turnout	0	1	1	\$2,400,000	\$260,000	\$375,000		\$3,035,000	\$3,400,000			\$160,000			\$3,560,000	\$0	\$0	
10	Coyote Canyon Junction	0	0	0		\$0	\$0		\$0							\$0	\$0	\$0	
11	Twin Lakes turnout	0	1	1	\$1,900,000	\$260,000	\$375,000		\$2,535,000	\$3,200,000			\$160,000			\$3,360,000	\$0	\$0	
12	Ya-ta-hey Junction	0	0	1	\$2,200,000	\$260,000	\$375,000		\$2,835,000							\$0	\$0	\$0	
13	Gallup Junction	0	1	0		\$0	\$0	\$350,000	\$350,000							\$0	\$0	\$0	
14	Navajo Chapters	0	5	0		\$0	\$0		\$0	\$14,600,000			\$760,000			\$15,360,000	\$0	\$0	
10.1	Coyote Canyon turnout	0	1	1	\$260,000	\$260,000	\$375,000		\$895,000	\$2,700,000			\$130,000			\$2,830,000	\$0	\$0	
10.2	Standing Rock turnout	0	1	1	\$270,000	\$260,000	\$375,000	\$280,000	\$1,185,000	\$600,000			\$85,000			\$685,000	\$0	\$0	
10.3	Dalton Pass turnout	0	1	1	\$310,000	\$260,000	\$375,000		\$945,000	\$4,800,000			\$220,000			\$5,020,000	\$0	\$0	
12.1	Rock Springs turnout	0	1	1	\$730,000	\$260,000	\$375,000		\$1,365,000	\$4,800,000			\$200,000			\$5,000,000	\$0	\$0	
12.2	Window Rock turnout	0	1	1	\$570,000	\$260,000	\$375,000	\$290,000	\$1,495,000	\$16,900,000			\$440,000			\$17,340,000	\$0	\$0	
<b>Cutter Branch</b>																			
21	WTP	1	0	0		\$0	\$0		\$0							\$0	\$0	\$0	
22	Huerfano turnout	0	1	3	\$1,710,000	\$780,000	\$1,125,000		\$3,615,000	\$1,250,000			\$100,000			\$1,350,000	\$0	\$0	
23	Nageezi turnout	0	1	1	\$430,000	\$260,000	\$375,000		\$1,065,000	\$2,000,000			\$130,000			\$2,130,000	\$0	\$0	
24	Jicarilla turnout	0	0	1	\$530,000	\$260,000	\$375,000	\$280,000	\$1,445,000							\$0	\$0	\$0	
25	Counselor turnout	0	1	1	\$370,000	\$260,000	\$375,000	\$280,000	\$1,285,000	\$3,400,000			\$180,000			\$3,580,000	\$0	\$0	
26	Torrecon turnout	0	1	0		\$0	\$0		\$0	\$3,400,000			\$160,000			\$3,560,000	\$0	\$0	
		2	21	19	Total	\$25,080,000	\$4,940,000	\$7,125,000	\$1,860,000	\$39,005,000	\$71,650,000	\$0	\$0	\$3,275,000	\$0	\$0	\$74,925,000	\$0	\$0

**Cost per Unit**

Forebay Tanks \$260,000  
 Air Chambers \$375,000

**Table B5**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Allocation of Pipeline Costs by Reach**  
**Jan-07 \$**

<i>San Juan Branch</i>				<i>Joint Costs</i>						
				Total Excavation	Soil Cement Embedment	Backfill	Butterfly Valves	Pipeline	Total	
Reach	End	cubic yards	cubic yards	cubic yards	\$	\$	\$	\$	\$	\$
1	Water Treatment Plant (WTP)				\$0	\$0	\$0	\$0	\$0	\$0
2	NAPI turnout	22,720	4,385	13,991	\$119,094	\$394,631	\$90,943	\$78,000	\$1,765,309	\$2,447,977
3	Shiprock Junction	258,690	49,923	159,300	\$1,356,005	\$4,493,038	\$1,035,452	\$702,000	\$17,552,060	\$25,138,556
4	Sanostee turnout	267,961	51,713	165,008	\$1,404,602	\$4,654,140	\$1,072,554	\$741,000	\$18,865,700	\$26,737,997
5	Burnham Junction	145,024	27,987	89,305	\$760,189	\$2,518,873	\$580,479	\$390,000	\$9,752,123	\$14,001,664
6	Newcomb turnout	54,217	10,463	33,387	\$284,196	\$941,663	\$217,016	\$156,000	\$3,685,762	\$5,284,637
7	Sheepsprings turnout	135,808	26,168	85,199	\$711,881	\$2,355,144	\$553,792	\$390,000	\$9,699,788	\$13,710,604
8	Naschitti turnout	70,620	15,148	42,763	\$370,177	\$1,363,299	\$277,961	\$234,000	\$5,186,465	\$7,431,902
9	Tohatchi turnout	241,956	45,020	154,240	\$1,268,289	\$4,051,767	\$1,002,562	\$630,000	\$15,720,338	\$22,672,956
10	Coyote Canyon Junction	80,687	15,480	51,629	\$422,946	\$1,393,169	\$335,591	\$189,000	\$5,028,469	\$7,369,175
11	Twin Lakes turnout	35,803	6,815	23,397	\$187,673	\$613,378	\$152,078	\$81,000	\$2,247,965	\$3,282,094
12	Ya-ta-hey Junction	71,559	13,621	46,762	\$375,099	\$1,225,853	\$303,956	\$162,000	\$4,431,745	\$6,498,653
13	Gallup Junction	37,248	6,904	25,973	\$195,247	\$621,327	\$168,827	\$56,000	\$2,242,521	\$3,283,923
14	Navajo Chapters				\$0	\$0	\$0	\$0	\$0	\$0
10.1	Coyote Canyon turnout	52,013	9,309	37,829	\$272,643	\$837,823	\$245,888	\$63,000	\$2,628,629	\$4,047,982
10.2	Standing Rock turnout	108,432	19,695	80,284	\$568,381	\$1,772,527	\$521,848	\$144,000	\$5,437,566	\$8,444,322
10.3	Dalton Pass turnout	28,983	4,295	22,932	\$151,924	\$386,518	\$149,060	\$32,000	\$1,355,316	\$2,074,818
12.1	Rock Springs turnout	53,238	9,868	37,124	\$279,064	\$888,133	\$241,305	\$84,000	\$3,120,733	\$4,613,235
12.2	Window Rock turnout	95,688	17,455	68,047	\$501,579	\$1,570,954	\$442,305	\$138,000	\$4,841,860	\$7,494,698
		1,760,647	334,247	1,137,172	\$9,228,988	\$30,082,239	\$7,391,617	\$4,270,000	\$113,562,350	\$164,535,195
<i>Cutter Branch</i>										
21	WTP				\$0	\$0	\$0	\$0	\$0	\$0
22	Huerfano turnout	192,709	34,512	137,970	\$835,554	\$3,106,064	\$896,806	\$236,000	\$10,791,204	\$15,865,627
23	Nageezi turnout	88,749	15,884	63,162	\$384,801	\$1,429,576	\$410,552	\$108,000	\$4,075,921	\$6,408,850
24	Jicarilla turnout	110,898	18,269	80,964	\$480,835	\$1,644,179	\$526,268	\$169,000	\$5,192,354	\$8,012,636
25	Counselor turnout	66,894	9,912	51,239	\$290,041	\$892,105	\$333,052	\$72,000	\$3,011,525	\$4,598,723
26	Torreon turnout	55,295	7,754	44,158	\$239,750	\$697,829	\$287,029	\$68,000	\$1,848,699	\$3,141,307
<b>Total</b>		2,275,192	420,578	1,514,665	\$11,459,968	\$37,851,993	\$9,845,324	\$4,923,000	\$138,482,053	\$202,562,339

**Cost per Unit**

Rock Excavation, per cy	\$16.00	Average Excavtn cost/cy PMN	\$5.24	Average Excavtn cost/cy Cutter	\$4.34
Common Excavation, per cy	\$4.00	Total Excavation, cy PNM	1,760,647	Total Excavation, cy Cutter	514,545
Backfill, per cy	\$6.50	Rock Excavation, cy PNM	182,200	Rock Excavation, cy Cutter	14,400
Embedment, soil cement, per cy	\$90.00	Rock/Total, ratio PNM	0.1035	Rock/Total, ratio Cutter	0.0280

**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Allocation of Transmission Line Costs by Reach**  
**Jan-07 \$**

<i>San Juan Branch</i>					<i>Joint Costs</i>							Total
					Trans. Ln	Elect. Equip	SCADA	Comm.	Security	Pwr Tap	Other	
Reach	End	No. WTP	No. Turnouts	No. Pump P.	Miles Trans Ln							
1	Water Treatment Plant (WTP)	1	0	1		\$0	\$264,000	\$18,000	\$64,800	\$19,800	\$144,000	\$510,600
2	NAPI turnout	0	0	1		\$0	\$84,000	\$7,200	\$28,800	\$9,000	\$48,000	\$177,000
3	Shiprock Junction	0	0	0		\$0	\$0	\$0	\$0	\$0	\$0	\$0
4	Sanostee turnout	0	1	2		\$0	\$192,000	\$21,600	\$86,400	\$24,000	\$120,000	\$444,000
5	Burnham Junction	0	0	0		\$0	\$0	\$0	\$0	\$0	\$0	\$0
6	Newcomb turnout	0	1	0	10.11	\$1,577,826	\$24,000	\$7,200	\$28,800	\$6,000	\$24,000	\$1,667,826
7	Sheepsprings turnout	0	1	1	5.85	\$913,357	\$108,000	\$14,400	\$57,600	\$15,000	\$72,000	\$1,180,357
8	Naschitti turnout	0	1	1	17.82	\$2,780,011	\$108,000	\$14,400	\$57,600	\$15,000	\$72,000	\$3,047,011
9	Tohatchi turnout	0	1	1	6.45	\$1,006,273	\$108,000	\$14,400	\$57,600	\$15,000	\$72,000	\$1,273,273
10	Coyote Canyon Junction	0	0	0	3.08	\$480,578	\$0	\$0	\$0	\$0	\$0	\$480,578
11	Twin Lakes turnout	0	1	1	6.16	\$960,509	\$108,000	\$14,400	\$57,600	\$15,000	\$72,000	\$1,227,509
12	Ya-ta-hey Junction	0	0	1		\$0	\$84,000	\$7,200	\$28,800	\$9,000	\$48,000	\$177,000
13	Gallup Junction	0	1	0		\$0	\$24,000	\$7,200	\$28,800	\$6,000	\$24,000	\$90,000
14	Navajo Chapters	0	5	0		\$0	\$120,000	\$36,000	\$144,000	\$30,000	\$120,000	\$450,000
10.1	Coyote Canyon turnout	0	1	1		\$0	\$108,000	\$14,400	\$57,600	\$15,000	\$72,000	\$267,000
10.2	Standing Rock turnout	0	1	1		\$0	\$108,000	\$14,400	\$57,600	\$15,000	\$72,000	\$267,000
10.3	Dalton Pass turnout	0	1	1		\$0	\$108,000	\$14,400	\$57,600	\$15,000	\$72,000	\$267,000
12.1	Rock Springs turnout	0	1	1		\$0	\$108,000	\$14,400	\$57,600	\$15,000	\$72,000	\$267,000
12.2	Window Rock turnout	0	1	1	5.82	\$907,316	\$108,000	\$14,400	\$57,600	\$15,000	\$72,000	\$1,594,316
<i>Cutter Branch</i>												
21	WTP	1	0	0		\$0	\$180,000	\$10,800	\$36,000	\$10,800	\$96,000	\$333,600
22	Huerfano turnout	0	1	3	42.05	\$6,560,215	\$276,000	\$28,800	\$115,200	\$33,000	\$168,000	\$8,621,215
23	Nageezi turnout	0	1	1		\$0	\$108,000	\$14,400	\$57,600	\$15,000	\$72,000	\$267,000
24	Jicarilla turnout	0	0	1	19.38	\$3,022,858	\$84,000	\$7,200	\$28,800	\$9,000	\$48,000	\$3,199,858
25	Counselor turnout	0	1	1	3.28	\$511,057	\$108,000	\$14,400	\$57,600	\$15,000	\$72,000	\$778,057
26	Torrecon turnout	0	1	0	0.00	\$0	\$24,000	\$7,200	\$28,800	\$6,000	\$24,000	\$90,000
Total		2	21	20	120.00	\$18,720,000	\$2,544,000	\$316,800	\$1,252,800	\$327,600	\$1,656,000	\$26,677,200

<i>Cost per unit</i>		
Transmission line per mile	\$130,000	Comm. equipment per WTP \$30,000
Electrical equipment per pumping plant	\$70,000	Security system per pp \$7,500
Electrical equipment per WTP	\$150,000	Security system per turnout \$5,000
Electrical equipment per turnout	\$20,000	Security system per WTP \$9,000
SCADA equipment per pp and turnout	\$6,000	Substation near Huerfano \$1,200,000
SCADA equipment per WTP	\$9,000	Power tap poles per pp \$40,000
SCADA system for Ft. Defiance	\$350,000	Power tap poles per turnout \$20,000
Comm. equipment per pp and turnout	\$24,000	Power tap poles per WTP \$80,000
		Prime contractor OH & P allowance 120%

**Table B7**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Allocation of Dam, Diversion Structure, Wells and Water Treatment Costs by Reach**  
**Jan-07 \$**

		<i>Joint Costs</i>				
		Dams	Diversion Structures	Wells	Water Treatment Plants	Total
<b><i>San Juan Branch</i></b>						
Reach	End					
1	Water Treatment Plant (WTP)		\$1,707,380		\$44,656,510	\$46,363,890
2	NAPI turnout					\$0
3	Shiprock Junction					\$0
4	Sanostee turnout					\$0
5	Burnham Junction					\$0
6	Newcomb turnout					\$0
7	Sheepsprings turnout					\$0
8	Naschitti turnout					\$0
9	Tohatchi turnout					\$0
10	Coyote Canyon Junction					\$0
11	Twin Lakes turnout					\$0
12	Ya-ta-hey Junction					\$0
13	Gallup Junction					\$0
14	Navajo Chapters					\$0
10.1	Coyote Canyon turnout					\$0
10.2	Standing Rock turnout					\$0
10.3	Dalton Pass turnout					\$0
12.1	Rock Springs turnout					\$0
12.2	Window Rock turnout					\$0
<b><i>Cutter Branch</i></b>						
Reach	End					
21	WTP				\$9,016,545	\$9,016,545
22	Huerfano turnout					\$0
23	Nageezi turnout					\$0
24	Jicarilla turnout					\$0
25	Counselor turnout					\$0
26	Torreon turnout					\$0
<b>Total</b>		\$0	\$1,707,380	\$0	\$53,673,055	\$55,380,435

**Table B8****Navajo - Gallup Water Supply Project****San Juan River PNM Alternative - 2020****Allocation of Environmental Mitigation, Cultural Resources and Right-of-Way Costs**

Jan-07 \$

	<b>Main Navajo-Gallup Pipeline Project</b>				<b>Gallup Regional Water Supply System</b>				<b>Total</b>
	<b>Navajo</b>	<b>Gallup</b>	<b>Jicarilla</b>	<b>Total</b>	<b>Navajo</b>	<b>Gallup</b>	<b>Jicarilla</b>	<b>Total</b>	
Total Field Costs	\$456,400,000	\$85,100,000	\$22,300,000	\$563,900,000	\$14,000,000	\$22,500,000	\$0	\$36,500,000	\$600,400,000
% Distribution of Field Costs	76.02%	14.17%	3.71%	93.92%	2.33%	3.75%	0.00%	6.08%	100.00%
Environmental Mitigation Costs	\$4,560,959	\$850,433	\$222,851	\$5,635,243	\$139,907	\$224,850	\$0	\$364,757	\$6,000,000
Cultural Resources Costs	\$26,301,532	\$4,904,164	\$1,285,110	\$32,496,569	\$806,795	\$1,296,636	\$0	\$2,103,431	\$34,600,000
Right-of-Way Costs	\$6,841,439	\$1,275,650	\$334,277	\$8,452,865	\$209,860	\$337,275	\$0	\$547,135	\$9,000,000
Total	\$37,703,931	\$7,030,247	\$1,842,239	\$46,584,677	\$1,156,562	\$1,858,761	\$0	\$3,015,323	\$49,600,000
Total (rounded)	\$37,700,000	\$7,030,000	\$1,840,000	\$46,580,000	\$1,160,000	\$1,860,000	\$0	\$3,020,000	\$49,600,000

Notes: Environmental mitigation costs estimated at \$6,000,000 (Jan. 07 \$) and allocated between systems and among users by share of field costs.  
Cultural resources costs estimated at 4% of total project cost and allocated between systems and among users by share of field costs.  
Right-of-way costs consist of land purchased from private parties for the water treatment plants, cost of relocating Navajo families who live in the pipeline route, and administration costs, totalling \$9,000,000 (Jan. 07 \$). These costs are allocated between systems and among users by share of field costs. It is assumed that both the Navajo Nation and the City of Gallup will contribute any other land needed for their respective systems.  
Environmental mitigation costs, cultural resource costs and right-of-way costs include allowances for contingencies, non-contract costs and taxes.

**Table B9**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Interest During Construction**  
**4.875% Discount Rate**  
**Jan-07 \$**

<b>CONSTRUCTION SCHEDULE</b>																	
<b>Costs in millions</b>																	
<b>Year</b>																	
<i>Scenario 1 - \$60 million/year Schedule</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
NGWSP Project	\$2.35	\$4.29	22.316	\$11.91													\$40.86
Cutter Lateral	\$5.99	\$7.53	\$4.27	\$16.20	\$16.14	\$21.72	\$21.70	\$17.19	\$7.41								\$118.14
Twin Lakes/ Window Rock	\$0.78	\$0.21				\$19.94	\$30.76	\$2.23									\$53.92
Cutter Power	\$0.72	\$0.73	\$0.73		\$3.00	\$3.27	\$6.60	\$9.59									\$24.63
San Juan Power		\$0.78	\$1.57					\$6.00	\$18.26	\$0.00							\$26.61
Gallup Regional System	\$0.40	\$4.37	\$20.33	\$26.66	\$28.09												\$79.85
San Juan Lateral		\$8.47	\$3.63		\$7.78	\$15.07	\$0.94			\$33.18	\$32.74	\$53.00	\$60.00	\$54.31	\$57.03	\$34.91	\$361.04
San Juan Pumping Plant		\$3.51	\$1.16					\$8.16	\$16.00		\$8.48	\$7.00		\$5.69	2.971		\$52.97
San Juan Water Treatment Plant	\$5.33	\$2.48						\$16.85	\$18.33	\$26.83	\$18.78						\$88.59
Cutter Water Treatment Plant	\$1.11	\$0.46	\$6.00	\$5.23	\$4.99												\$17.79
TOTAL Allocated Spending	\$16.67	\$32.82	\$60.00	\$60.00	\$60.00	\$60.00	\$60.00	\$60.00	\$60.00	\$60.00	\$60.00	\$60.00	\$60.00	\$60.00	\$60.00	\$34.91	\$864.40
Percent Distribution	1.93%	3.80%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	6.94%	4.04%	100.00%
Overall Spending	\$16.68	\$32.84	\$60.04	\$60.04	\$60.04	\$60.04	\$60.04	\$60.04	\$60.04	\$60.04	\$60.04	\$60.04	\$60.04	\$60.04	\$60.04	\$34.94	\$865.00
Interest During Construction to January 1 of year 14	\$18.20	\$32.65	\$54.12	\$48.81	\$43.75	\$38.93	\$34.33	\$29.94	\$25.76	\$21.77	\$17.97	\$14.34	\$10.88	\$7.59	\$4.44	\$0.84	\$404.34

Note: The construction schedule assumes that annual appropriations will be indexed to keep in step with construction cost trends.

**Table C1**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Allocation of Gallup Regional System Capital Costs**  
**Jan-07 \$**

Category	Total Cost	Joint Cost	Allocation Factors		Allocated Joint Costs		Total Costs	
			Gallup	Navajo	Gallup	Navajo	Gallup	Navajo
Excavation, common	\$542,400	\$542,400	0.6170	0.3830	\$334,683	\$207,717	\$334,683	\$207,717
Excavation, rock	\$384,000	\$384,000	0.6170	0.3830	\$236,944	\$147,056	\$236,944	\$147,056
Backfill	\$797,550	\$797,550	0.6170	0.3830	\$492,121	\$305,429	\$492,121	\$305,429
Soil Cement Embedment	\$2,097,000	\$2,097,000	0.6170	0.3830	\$1,293,934	\$803,066	\$1,293,934	\$803,066
Pipeline	\$7,658,550	\$7,658,550	0.6170	0.3830	\$4,725,638	\$2,932,912	\$4,725,638	\$2,932,912
Crossings and borings	\$1,100,000	\$1,100,000	0.6170	0.3830	\$678,745	\$421,255	\$678,745	\$421,255
Water Storage Tanks	\$10,900,000	\$10,900,000	0.6170	0.3830	\$6,725,744	\$4,174,256	\$6,725,744	\$4,174,256
Pumping Plants	\$1,100,000	\$1,100,000	0.6170	0.3830	\$678,745	\$421,255	\$678,745	\$421,255
Valve & Metering Sta.	\$800,000	\$800,000	0.6170	0.3830	\$493,633	\$306,367	\$493,633	\$306,367
Surge Control	\$375,000	\$375,000	0.6170	0.3830	\$231,390	\$143,610	\$231,390	\$143,610
Subtotal	\$25,754,500	\$25,754,500			\$15,891,577	\$9,862,923	\$15,891,577	\$9,862,923
Mobilization @5%	\$1,287,725						\$794,579	\$493,146
Subtotal	\$27,042,225						\$16,686,155	\$10,356,070
Unlisted @10%	\$2,704,223						\$1,668,616	\$1,035,607
Subtotal	\$29,746,448						\$18,354,771	\$11,391,677
Contingency @22.5%	\$6,692,951						\$4,129,823	\$2,563,127
Total Field Cost	\$36,439,398						\$22,484,594	\$13,954,804
Non-Contract Costs @27%	\$9,838,638						\$6,070,840	\$3,767,797
Total Construction Costs	\$46,278,036						\$28,555,435	\$17,722,601
Taxes @6% of Field Cost	\$2,186,364						\$1,349,076	\$837,288
Total with Taxes	\$48,464,400						\$29,904,510	\$18,559,889
Rounded Total	\$48,500,000						\$29,900,000	\$18,600,000

Note: The costs in this table include only the cost for the Gallup Regional System. The costs for the main water supply pipeline are shown in Table B1. The costs also exclude the environmental mitigation, cultural resources, right-of-way acquisition and interest during construction costs, which are shown in Table 1.

**Table C2**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Allocation of Gallup Regional System O,M & R Costs**  
**Jan-07 \$**

		Allocation Factors		Allocated Annual Cost		Present Value @ 4.875%		
	Annual Cost	Gallup	Navajo	Gallup	Navajo	Gallup	Navajo	Total
<b>CRSP Rates</b>	\$811,000	0.6170	0.3830	\$500,420	\$310,580	\$9,314,944	\$5,781,213	\$15,096,157
				rounded \$500,000	rounded \$311,000	rounded \$9,315,000	rounded \$5,781,000	rounded \$15,096,000
<b>NTUA Rate</b>	\$862,000	0.6170	0.3830	\$531,889	\$330,111	\$9,900,718	\$6,144,766	\$16,045,484
				rounded \$532,000	rounded \$330,000	rounded \$9,901,000	rounded \$6,145,000	rounded \$16,045,000

Table C3 - Scenario 1 \$60 million/yr Construction Schedule  
 Navajo - Gallup Water Supply Project  
 San Juan River PNM Alternative - 2040  
 Cost of Water to City of Gallup  
 Jan-07 \$

Event	Year	Cost to Gallup \$/af	PV @ 4.875%
	2006	\$0	\$0
	2007	\$42	\$110
	2008	\$45	\$110
	2009	\$47	\$110
	2010	\$49	\$110
Construction Begins	2011	\$51	\$110
	2012	\$54	\$110
	2013	\$56	\$110
	2014	\$59	\$110
	2015	\$62	\$110
	2016	\$65	\$110
	2017	\$68	\$110
	2018	\$72	\$110
	2019	\$75	\$110
	2020	\$79	\$110
	2021	\$83	\$110
	2022	\$87	\$110
	2023	\$91	\$110
	2024	\$95	\$110
	2025	\$100	\$110
	2026	\$105	\$110
Project Completion	2027	\$110	\$110
Full Gallup Water Use	2028	\$110	\$105
	2029	\$110	\$100
	2030	\$110	\$95
	2031	\$110	\$91
	2032	\$110	\$87
	2033	\$110	\$83
	2034	\$110	\$79
	2035	\$110	\$75
	2036	\$110	\$72
	2037	\$110	\$68
	2038	\$110	\$65
	2039	\$110	\$62
	2040	\$110	\$59
	2041	\$110	\$56
	2042	\$110	\$54
	2043	\$110	\$51
	2044	\$110	\$49
	2045	\$110	\$47
	2046	\$110	\$45
	2047	\$110	\$42
	2048	\$110	\$40
	2049	\$110	\$39
	2050	\$110	\$37
	2051	\$110	\$35
	2052	\$110	\$33
	2053	\$110	\$32
	2054	\$110	\$30
	2055	\$110	\$29
	2056	\$110	\$28
	2057	\$110	\$26
	2058	\$110	\$25
	2059	\$110	\$24
	2060	\$110	\$23
	2061	\$110	\$22
	2062	\$110	\$21
	2063	\$110	\$20
	2064	\$110	\$19
	2065	\$110	\$18
	2066	\$110	\$17
	2067	\$110	\$16
	2068	\$110	\$16
	2069	\$110	\$15
	2070	\$110	\$14
	2071	\$110	\$14
	2072	\$110	\$13
	2073	\$110	\$12
	2074	\$110	\$12
	2075	\$110	\$11
	2076	\$110	\$11
	2077	\$0	\$0
	2078	\$0	\$0
	2079	\$0	\$0
	2080	\$0	\$0
		Total PV per acre-foot	\$4,347
		Total PV for 7500 af	\$32,605,398

Present Values as of 2027

Note: The City of Gallup has not yet reached an agreement with the Jicarilla Apache Nation on the terms of a long-term water lease. For purposes of this report we have assumed that the price will be \$110 per acre-foot (in 2007\$), beginning when the City begins taking water in the year 2027. We also assume that prior to that time the City will pay an annual option fee equivalent in present value to the price for water in 2027. The City and the Jicarilla Nation may agree on terms very different from these.

**Table D1- Scenario 1 - \$60 million/year Construction Schedule**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Summary of Annual O,M&R Charges by User**  
**Project Completion In 2027**  
**Jan-07 \$**

<i>CRSP Power Rate</i>													
	Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Navajo	Fixed	\$0	\$0	\$638,599	\$638,599	\$638,599	\$638,599	\$2,674,341	\$2,674,341	\$2,674,341	\$2,674,341	\$2,674,341	\$2,674,341
	Variable	\$0	\$0	\$35,447	\$35,251	\$35,049	\$34,843	\$225,397	\$229,890	\$234,494	\$239,212	\$244,047	\$249,002
	Total	\$0	\$0	\$674,046	\$673,850	\$673,648	\$673,442	\$2,899,738	\$2,904,231	\$2,908,835	\$2,913,553	\$2,918,388	\$2,923,343
Gallup	Fixed	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Variable	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Total	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Jicarilla	Fixed	\$0	\$0	\$0	\$0	\$0	\$0	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852
	Variable	\$0	\$0	\$0	\$0	\$0	\$0	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784
	Total	\$0	\$0	\$0	\$0	\$0	\$0	\$743,636	\$743,636	\$743,636	\$743,636	\$743,636	\$743,636
<b>Total</b>	Fixed	\$0	\$0	\$638,599	\$638,599	\$638,599	\$638,599	\$3,319,193	\$3,319,193	\$3,319,193	\$3,319,193	\$3,319,193	\$3,319,193
	Variable	\$0	\$0	\$35,447	\$35,251	\$35,049	\$34,843	\$324,181	\$328,674	\$333,278	\$337,996	\$342,831	\$347,786
	Total	\$0	\$0	\$674,046	\$673,850	\$673,648	\$673,442	\$3,643,374	\$3,647,867	\$3,652,471	\$3,657,189	\$3,662,024	\$3,666,979
	Rounded	\$0	\$0	\$674,000	\$674,000	\$674,000	\$673,000	\$3,643,000	\$3,648,000	\$3,652,000	\$3,657,000	\$3,662,000	\$3,667,000
<i>NTUA Power Rate</i>													
	Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Navajo	Fixed	\$0	\$0	\$638,599	\$638,599	\$638,599	\$638,599	\$2,674,341	\$2,674,341	\$2,674,341	\$2,674,341	\$2,674,341	\$2,674,341
	Variable	\$0	\$0	\$95,540	\$95,011	\$94,469	\$93,914	\$493,021	\$502,290	\$511,789	\$521,524	\$531,501	\$541,725
	Total	\$0	\$0	\$734,139	\$733,610	\$733,068	\$732,513	\$3,167,362	\$3,176,631	\$3,186,131	\$3,195,866	\$3,205,842	\$3,216,066
Gallup	Fixed	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Variable	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Total	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Jicarilla	Fixed	\$0	\$0	\$0	\$0	\$0	\$0	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852
	Variable	\$0	\$0	\$0	\$0	\$0	\$0	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342
	Total	\$0	\$0	\$0	\$0	\$0	\$0	\$846,194	\$846,194	\$846,194	\$846,194	\$846,194	\$846,194
<b>Total</b>	Fixed	\$0	\$0	\$638,599	\$638,599	\$638,599	\$638,599	\$3,319,193	\$3,319,193	\$3,319,193	\$3,319,193	\$3,319,193	\$3,319,193
	Variable	\$0	\$0	\$95,540	\$95,011	\$94,469	\$93,914	\$694,362	\$703,632	\$713,131	\$722,866	\$732,842	\$743,066
	Total	\$0	\$0	\$734,139	\$733,610	\$733,068	\$732,513	\$4,013,556	\$4,022,825	\$4,032,325	\$4,042,060	\$4,052,036	\$4,062,260
	Rounded	\$0	\$0	\$734,000	\$734,000	\$733,000	\$733,000	\$4,014,000	\$4,023,000	\$4,032,000	\$4,042,000	\$4,052,000	\$4,062,000

**Table D1- Scenario 1 - \$60 million/year Construction Schedule**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Summary of Annual O,M&R Charges by User**  
**Project Completion In 2027**

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2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060	2065-76
\$2,674,341	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483
\$254,080	\$1,989,609	\$2,038,781	\$2,089,172	\$2,140,813	\$2,418,875	\$2,733,171	\$2,733,171	\$2,733,171	\$2,733,171	\$2,733,171	\$2,733,171
\$2,928,421	\$8,799,092	\$8,848,264	\$8,898,655	\$8,950,296	\$9,228,358	\$9,542,654	\$9,542,654	\$9,542,654	\$9,542,654	\$9,542,654	\$9,542,654
\$0	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776
\$0	\$774,462	\$774,462	\$774,462	\$774,462	\$774,462	\$774,462	\$774,462	\$774,462	\$774,462	\$774,462	\$774,462
\$0	\$2,075,238	\$2,075,238	\$2,075,238	\$2,075,238	\$2,075,238	\$2,075,238	\$2,075,238	\$2,075,238	\$2,075,238	\$2,075,238	\$2,075,238
\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852
\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784
\$743,636	\$743,636	\$743,636	\$743,636	\$743,636	\$743,636	\$743,636	\$743,636	\$743,636	\$743,636	\$743,636	\$743,636
\$3,319,193	\$8,755,111	\$8,755,111	\$8,755,111	\$8,755,111	\$8,755,111	\$8,755,111	\$8,755,111	\$8,755,111	\$8,755,111	\$8,755,111	\$8,755,111
\$352,864	\$2,862,855	\$2,912,027	\$2,962,418	\$3,014,059	\$3,292,121	\$3,606,417	\$3,606,417	\$3,606,417	\$3,606,417	\$3,606,417	\$3,606,417
\$3,672,057	\$11,617,966	\$11,667,138	\$11,717,529	\$11,769,170	\$12,047,232	\$12,361,528	\$12,361,528	\$12,361,528	\$12,361,528	\$12,361,528	\$12,361,528
\$3,672,000	\$11,618,000	\$11,667,000	\$11,718,000	\$11,769,000	\$12,047,000	\$12,362,000	\$12,362,000	\$12,362,000	\$12,362,000	\$12,362,000	\$12,362,000
2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060	2065-76
\$2,674,341	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483	\$6,809,483
\$552,202	\$4,212,017	\$4,316,016	\$4,422,594	\$4,531,814	\$5,119,918	\$5,784,654	\$5,784,654	\$5,784,654	\$5,784,654	\$5,784,654	\$5,784,654
\$3,226,543	\$11,021,500	\$11,125,499	\$11,232,077	\$11,341,298	\$11,929,401	\$12,594,137	\$12,594,137	\$12,594,137	\$12,594,137	\$12,594,137	\$12,594,137
\$0	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776	\$1,300,776
\$0	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268
\$0	\$2,977,044	\$2,977,044	\$2,977,044	\$2,977,044	\$2,977,044	\$2,977,044	\$2,977,044	\$2,977,044	\$2,977,044	\$2,977,044	\$2,977,044
\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852	\$644,852
\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342
\$846,194	\$846,194	\$846,194	\$846,194	\$846,194	\$846,194	\$846,194	\$846,194	\$846,194	\$846,194	\$846,194	\$846,194
\$3,319,193	\$8,755,112	\$8,755,112	\$8,755,112	\$8,755,112	\$8,755,112	\$8,755,112	\$8,755,112	\$8,755,112	\$8,755,112	\$8,755,112	\$8,755,112
\$753,544	\$6,089,627	\$6,193,626	\$6,300,203	\$6,409,424	\$6,997,528	\$7,662,264	\$7,662,264	\$7,662,264	\$7,662,264	\$7,662,264	\$7,662,264
\$4,072,737	\$14,844,739	\$14,948,737	\$15,055,315	\$15,164,536	\$15,752,639	\$16,417,375	\$16,417,375	\$16,417,375	\$16,417,375	\$16,417,375	\$16,417,375
\$4,073,000	\$14,845,000	\$14,949,000	\$15,055,000	\$15,165,000	\$15,753,000	\$16,417,000	\$16,417,000	\$16,417,000	\$16,417,000	\$16,417,000	\$16,417,000

**Table D2 - 2040**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Allocation of Annual Fixed O,M&R Costs by User**  
**Jan-07 \$**

<i>San Juan Branch</i>		<i>Joint Costs</i>									
		<b>Pumping Plants</b>		<b>Pipelines</b>	<b>Elec.Trans. Line</b>	<b>NIIP Canal</b>	<b>Water Treatment Plant Fixed O,M&amp;R</b>				
		Pumping Plants	Annual Maintenance	Annual Maintenance	Annual Maintenance	Annual Maintenance	Annual Maintenance	Operators	Equipment Replacement	Dredging	Misc. @ 10%
Reach	End										
1	Water Treatment Plant (WTP)	River	\$153,101	\$0	\$6,699		\$845,000	\$605,000	\$212,000	\$166,200	\$1,828,200
2	NAPI turnout	01	\$302,893	\$12,240	\$2,322						
3	Shiprock Junction		\$0	\$125,693	\$0						
4	Sanostee turnout	02, 03	\$532,344	\$133,690	\$5,825						
5	Burnham Junction		\$0	\$70,008	\$0						
6	Newcomb turnout		\$0	\$26,423	\$21,882						
7	Sheepsprings turnout	04	\$248,187	\$68,553	\$15,486						
8	Naschitti turnout	05	\$232,852	\$37,160	\$39,976						
9	Tohatchi turnout	06	\$270,720	\$113,365	\$16,705						
10	Coyote Canyon Junction		\$0	\$36,846	\$6,305						
11	Twin Lakes turnout	07	\$255,331	\$16,410	\$16,105						
12	Ya-ta-hey Junction	08	\$269,788	\$32,493	\$2,322						
13	Gallup Junction		\$0	\$16,420	\$1,181						
14	Navajo Chapters		\$0	\$0	\$5,904						
					\$0						
10.1	Coyote Canyon turnout	11	\$141,952	\$20,240	\$3,503						
10.2	Standing Rock turnout	12	\$173,953	\$42,222	\$3,503						
10.3	Dalton Pass turnout	13	\$188,735	\$10,374	\$3,503						
					\$0						
12.1	Rock Springs turnout	09	\$206,164	\$23,066	\$3,503						
12.2	Window Rock turnout	10	\$193,980	\$37,473	\$20,917						
<i>Cutter Branch</i>											
Reach	End										
21	WTP	Reservoir	\$0	\$0	\$4,377	\$35,000	\$845,000	\$85,000	\$1,000	\$93,100	\$1,024,100
22	Huerfano turnout	01, 02, 03	\$637,697	\$79,328	\$113,109						
23	Nageezi turnout	04	\$192,144	\$32,044	\$3,503						
24	Jicarilla turnout	05	\$215,611	\$40,063	\$41,982						
25	Counselor turnout	06	\$199,548	\$22,994	\$10,208						
26	Torreón turnout		\$0	\$15,707	\$1,181						
<b>Total</b>			<b>\$4,415,000</b>	<b>\$1,012,812</b>	<b>\$350,000</b>	<b>\$35,000</b>	<b>\$1,690,000</b>	<b>\$690,000</b>	<b>\$213,000</b>	<b>\$259,300</b>	<b>\$2,852,300</b>

Annual pipeline OM&R estimated at 0.5% of capital cost  
 Pumping plant maintenance estimated at \$3,170,000 for San Juan Branch, & \$1,245,000 for Cutter Branch, per Bob Brown, BOR, 9/27/07  
 Annual electric transmission line OM&R estimated at \$350,000

**Table D2 - 2040, page 2**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Allocation of Annual Fixed O,M&R Costs by User**

<i>Allocated Joint Costs</i>						
Total Joint Costs	Allocation Ratios			Allocated Joint Costs		
	Navajo	Gallup	Jicarilla	Navajo	Gallup	Jicarilla
\$1,988,000	0.7724	0.2276	-	\$1,535,510	\$452,490	\$0
\$317,455	0.7724	0.2276	-	\$245,199	\$72,256	\$0
\$125,693	0.7686	0.2314	-	\$96,607	\$29,086	\$0
\$671,859	0.7384	0.2616	-	\$496,098	\$175,761	\$0
\$70,008	0.7278	0.2722	-	\$50,954	\$19,055	\$0
\$48,305	0.7263	0.2737	-	\$35,085	\$13,220	\$0
\$332,226	0.7176	0.2824	-	\$238,409	\$93,817	\$0
\$309,988	0.7134	0.2866	-	\$221,147	\$88,841	\$0
\$400,790	0.7037	0.2963	-	\$282,034	\$118,756	\$0
\$43,151	0.6901	0.3099	-	\$29,780	\$13,371	\$0
\$287,846	0.6493	0.3507	-	\$186,902	\$100,945	\$0
\$304,603	0.6313	0.3687	-	\$192,284	\$112,319	\$0
\$17,600	0.3830	0.6170	-	\$6,740	\$10,860	\$0
\$5,904	1.0000	-	-	\$5,904	\$0	\$0
\$165,695	1.0000	-	-	\$165,695	\$0	\$0
\$219,678	1.0000	-	-	\$219,678	\$0	\$0
\$202,612	1.0000	-	-	\$202,612	\$0	\$0
\$232,733	1.0000	-	-	\$232,733	\$0	\$0
\$252,371	1.0000	-	-	\$252,371	\$0	\$0
\$1,063,477	0.7422	-	0.2578	\$789,319	\$0	\$274,158
\$830,134	0.7422	-	0.2578	\$616,130	\$0	\$214,003
\$227,692	0.7258	-	0.2742	\$165,251	\$0	\$62,441
\$297,656	0.6834	-	0.3166	\$203,405	\$0	\$94,250
\$232,749	1.0000	-	-	\$232,749	\$0	\$0
\$16,887	1.0000	-	-	\$16,887	\$0	\$0
\$8,665,112				\$6,719,483	\$1,300,776	\$644,852

<i>Dedicated Costs</i>		
Service Area Pumping Plants		
Annual Maintenance		
Navajo	Gallup	Jicarilla
\$3,774		
\$3,774		
\$3,774		
\$3,774		
\$3,774		
\$3,774		
\$3,774		
\$18,871		
\$3,774		
\$3,774		
\$3,774		
\$3,774		
\$21,387		
\$3,000		
\$3,000		
\$3,000		
\$3,000		
\$90,000		

Total Annual Fixed OM&R Costs		
Dedicated Costs Plus		
Allocated Joint Costs		
Navajo	Gallup	Jicarilla
\$1,535,510	\$452,490	\$0
\$245,199	\$72,256	\$0
\$96,607	\$29,086	\$0
\$499,872	\$175,761	\$0
\$50,954	\$19,055	\$0
\$38,859	\$13,220	\$0
\$242,183	\$93,817	\$0
\$224,921	\$88,841	\$0
\$285,808	\$118,756	\$0
\$29,780	\$13,371	\$0
\$190,676	\$100,945	\$0
\$192,284	\$112,319	\$0
\$6,740	\$10,860	\$0
\$24,775	\$0	\$0
\$169,469	\$0	\$0
\$223,452	\$0	\$0
\$206,386	\$0	\$0
\$236,507	\$0	\$0
\$273,758	\$0	\$0
\$789,319	\$0	\$274,158
\$619,130	\$0	\$214,003
\$168,251	\$0	\$62,441
\$203,405	\$0	\$94,250
\$235,749	\$0	\$0
\$19,887	\$0	\$0
\$6,809,483	\$1,300,776	\$644,852

Booster station pumping plant maintenance estimated at \$78,000 for San Juan Lateral, &

\$12,000 for Cutter Lateral, per Bob Brown, BOR, 9/



**Table D3 - 2040**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Projection of Peak Flows by Reach, Annually 2014-2030 and then by 5-Year Period, 2035 - 2076**

<i>San Juan Branch</i>		Design Capacity by Reach cfs	Design Peak Deliveries by Reach cfs	Total Deliveries (peak flows)																								
				2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-76		
Number	End			cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs				
1	Water Treatment Plant (WTP)	59.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
2	NAPI turnout	59.18	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.72	0.74	0.76	0.86	0.97	0.97	0.97			
3	Shiprock Junction	58.21	6.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.89	5.01	5.13	5.26	5.95	6.72	6.72	6.72	6.72			
4	Sanostee turnout	51.49	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.45	1.49	1.53	1.57	1.77	2.00	2.00	2.00	2.00	2.00			
5	Burnham Junction	49.49	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.21	0.21	0.24	0.27	0.27	0.27	0.27	0.27			
6	Newcomb turnout	49.22	1.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.11	1.13	1.16	1.19	1.34	1.52	1.52	1.52	1.52	1.52			
7	Sheepsprings turnout	47.70	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51	0.52	0.53	0.55	0.62	0.70	0.70	0.70	0.70	0.70			
8	Naschitti turnout	47.00	1.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.12	1.15	1.18	1.21	1.36	1.54	1.54	1.54	1.54	1.54			
9	Tohatchi turnout	45.46	1.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.45	1.48	1.52	1.56	1.76	1.99	1.99	1.99	1.99	1.99			
10	Coyote Canyon Junction	43.47	5.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.68	3.77	3.86	3.96	4.48	5.06	5.06	5.06	5.06	5.06			
11	Twin Lakes turnout	38.41	1.88	0.00	0.00	1.04	1.07	1.10	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.37	1.40	1.44	1.47	1.66	1.88	1.88	1.88	1.88			
12	Ya-ta-hey Junction	36.53	14.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.69	10.96	11.23	11.51	13.01	14.70	14.70	14.70	14.70	14.70			
13	Gallup Junction	21.83	13.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.47	13.47	13.47	13.47	13.47	13.47	13.47	13.47	13.47	13.47			
14	Navajo Chapters	8.36	8.36	0.00	0.00	2.55	2.52	2.49	2.47	2.44	2.41	2.38	2.35	2.32	2.29	2.26	6.08	6.23	6.39	6.54	7.40	8.36	8.36	8.36	8.36			
			59.18	0.00	0.00	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59	46.71	47.54	48.38	49.25	53.91	59.18	59.18	59.18	59.18			
10.1	Coyote Canyon turnout	5.06	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.91	0.93	0.95	0.98	1.11	1.25	1.25	1.25	1.25				
10.2	Standing Rock turnout	3.81	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.10	0.10	0.10	0.12	0.13	0.13	0.13	0.13				
10.3	Dalton Pass turnout	3.68	3.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.68	2.74	2.81	2.88	3.26	3.68	3.68	3.68	3.68				
			5.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.68	3.77	3.86	3.96	4.48	5.06	5.06	5.06	5.06				
12.1	Rock Springs turnout	14.70	3.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.32	2.38	2.44	2.50	2.82	3.19	3.19	3.19	3.19				
12.2	Window Rock turnout	11.51	11.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.37	8.58	8.79	9.01	10.18	11.51	11.51	11.51	11.51				
			14.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.69	10.96	11.23	11.51	13.01	14.70	14.70	14.70	14.70				
<i>Cutter Branch</i>						2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-76
21	WTP	8.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
22	Huerfano turnout	8.34	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.31	0.32	0.33	0.34	0.35	0.35	0.36	0.37	0.38	0.39	0.44	0.50	0.50	0.50	0.50	0.50	0.50	
23	Nageezi turnout	7.84	1.05	0.00	0.00	0.00	0.00	0.00	0.00	0.64	0.66	0.68	0.69	0.71	0.73	0.75	0.76	0.78	0.80	0.82	0.93	1.05	1.05	1.05	1.05	1.05	1.05	
24	Jicarilla turnout	6.79	2.15	0.00	0.00	0.00	0.00	0.00	0.00	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	
25	Counselor turnout	4.64	2.63	0.00	0.00	0.00	0.00	0.00	0.00	1.61	1.65	1.69	1.73	1.78	1.82	1.87	1.91	1.96	2.01	2.06	2.33	2.63	2.63	2.63	2.63	2.63	2.63	
26	Torreon turnout	2.01	2.01	0.00	0.00	0.00	0.00	0.00	0.00	1.23	1.26	1.29	1.33	1.36	1.39	1.43	1.46	1.50	1.54	1.57	1.78	2.01	2.01	2.01	2.01	2.01	2.01	
			8.34	0.00	0.00	0.00	0.00	0.00	0.00	5.94	6.04	6.13	6.23	6.33	6.44	6.54	6.65	6.76	6.88	7.00	7.63	8.34	8.34	8.34	8.34	8.34	8.34	

Note: Peak flows = average flows times 1.3 peaking factor

**Table D4, page 1**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Projection of Peak Flows in Each Reach Allocated to Each Party, Annually 2014-2030**  
**and then by 5-Year Period, 2035 - 2076**

Navajo																							
Reach	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-76
	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs													
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.24	34.07	34.91	35.78	40.44	45.71	45.71	45.71	45.71
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.24	34.07	34.91	35.78	40.44	45.71	45.71	45.71	45.71
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.54	33.34	34.17	35.02	39.58	44.74	44.74	44.74	44.74
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.65	28.34	29.04	29.76	33.64	38.02	38.02	38.02	38.02
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.20	26.85	27.51	28.19	31.87	36.02	36.02	36.02	36.02
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.00	26.64	27.31	27.98	31.63	35.75	35.75	35.75	35.75
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.89	25.51	26.14	26.79	30.28	34.23	34.23	34.23	34.23
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.39	24.99	25.61	26.24	29.66	33.53	33.53	33.53	33.53
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.27	23.84	24.43	25.04	28.30	31.99	31.99	31.99	31.99
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.82	22.36	22.91	23.48	26.54	30.00	30.00	30.00	30.00
11	0.00	0.00	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59	18.14	18.59	19.05	19.52	22.06	24.94	24.94	24.94	24.94	
12	0.00	0.00	2.55	2.52	2.49	2.47	2.44	2.41	2.38	2.35	2.32	2.29	2.26	16.77	17.19	17.61	18.05	20.40	23.06	23.06	23.06	23.06	
13	0.00	0.00	2.55	2.52	2.49	2.47	2.44	2.41	2.38	2.35	2.32	2.29	2.26	6.08	6.23	6.39	6.54	7.40	8.36	8.36	8.36	8.36	
14	0.00	0.00	2.55	2.52	2.49	2.47	2.44	2.41	2.38	2.35	2.32	2.29	2.26	6.08	6.23	6.39	6.54	7.40	8.36	8.36	8.36	8.36	
10.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.68	3.77	3.86	3.96	4.48	5.06	5.06	5.06	5.06	
10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.77	2.84	2.91	2.98	3.37	3.81	3.81	3.81	3.81	
10.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.68	2.74	2.81	2.88	3.26	3.68	3.68	3.68	3.68	
12.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.69	10.96	11.23	11.51	13.01	14.70	14.70	14.70	14.70	
12.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.37	8.58	8.79	9.01	10.18	11.51	11.51	11.51	11.51	
Navajo																							
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-76
21	0.00	0.00	0.00	0.00	0.00	0.00	3.79	3.89	3.98	4.08	4.18	4.29	4.39	4.50	4.61	4.73	4.85	5.48	6.19	6.19	6.19	6.19	6.19
22	0.00	0.00	0.00	0.00	0.00	0.00	3.79	3.89	3.98	4.08	4.18	4.29	4.39	4.50	4.61	4.73	4.85	5.48	6.19	6.19	6.19	6.19	6.19
23	0.00	0.00	0.00	0.00	0.00	0.00	3.49	3.57	3.66	3.75	3.84	3.94	4.04	4.14	4.24	4.35	4.45	5.03	5.69	5.69	5.69	5.69	5.69
24	0.00	0.00	0.00	0.00	0.00	0.00	2.84	2.91	2.99	3.06	3.14	3.21	3.29	3.37	3.46	3.54	3.63	4.11	4.64	4.64	4.64	4.64	4.64
25	0.00	0.00	0.00	0.00	0.00	0.00	2.84	2.91	2.99	3.06	3.14	3.21	3.29	3.37	3.46	3.54	3.63	4.11	4.64	4.64	4.64	4.64	4.64
26	0.00	0.00	0.00	0.00	0.00	0.00	1.23	1.26	1.29	1.33	1.36	1.39	1.43	1.46	1.50	1.54	1.57	1.78	2.01	2.01	2.01	2.01	2.01



Table D5, page 1  
 Navajo - Gallup Water Supply Project  
 San Juan River PNM Alternative - 2040  
 Projection of Flows by Reach  
 Projection of Peak Flows in Each Reach Allocated to Each Party, Annually 2014-2030  
 and then by 5-Year Period, 2035 - 2076

Reach	Navajo																							
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-76	
1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	71.16%	71.66%	72.16%	72.65%	75.01%	77.24%	77.24%	77.24%	77.24%	77.24%
2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	71.16%	71.66%	72.16%	72.65%	75.01%	77.24%	77.24%	77.24%	77.24%	77.24%
3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	70.72%	71.23%	71.73%	72.22%	74.61%	76.86%	76.86%	76.86%	76.86%	76.86%
4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	67.24%	67.78%	68.31%	68.84%	71.41%	73.84%	73.84%	73.84%	73.84%	73.84%
5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	66.04%	66.59%	67.13%	67.67%	70.29%	72.78%	72.78%	72.78%	72.78%	72.78%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	65.87%	66.42%	66.97%	67.50%	70.13%	72.63%	72.63%	72.63%	72.63%	72.63%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	64.89%	65.45%	66.00%	66.54%	69.21%	71.76%	71.76%	71.76%	71.76%	71.76%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	64.42%	64.98%	65.53%	66.08%	68.77%	71.34%	71.34%	71.34%	71.34%	71.34%
9	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	63.33%	63.90%	64.46%	65.02%	67.75%	70.37%	70.37%	70.37%	70.37%	70.37%
10	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	61.83%	62.40%	62.98%	63.55%	66.33%	69.01%	69.01%	69.01%	69.01%	69.01%
11	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	57.38%	57.98%	58.58%	59.17%	62.09%	64.93%	64.93%	64.93%	64.93%	64.93%
12	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	55.46%	56.06%	56.66%	57.26%	60.23%	63.13%	63.13%	63.13%	63.13%	63.13%
13	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	31.10%	31.63%	32.16%	32.70%	35.45%	38.30%	38.30%	38.30%	38.30%	38.30%
14	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
10.1	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
10.2	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
10.3	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
12.1	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
12.2	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Navajo																								
2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-76		
21	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	63.82%	64.38%	64.94%	65.50%	66.05%	66.60%	67.14%	67.68%	68.21%	68.74%	69.26%	71.81%	74.22%	74.22%	74.22%	74.22%	74.22%	74.22%
22	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	63.82%	64.38%	64.94%	65.50%	66.05%	66.60%	67.14%	67.68%	68.21%	68.74%	69.26%	71.81%	74.22%	74.22%	74.22%	74.22%	74.22%	74.22%
23	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	61.85%	62.43%	63.00%	63.57%	64.14%	64.70%	65.26%	65.81%	66.36%	66.90%	67.44%	70.07%	72.58%	72.58%	72.58%	72.58%	72.58%	72.58%
24	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	56.94%	57.54%	58.13%	58.73%	59.32%	59.91%	60.50%	61.08%	61.66%	62.24%	62.81%	65.63%	68.34%	68.34%	68.34%	68.34%	68.34%	68.34%
25	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
26	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%



Table D6, page 1  
 Navajo - Gallup Water Supply Project  
 San Juan River PNM Alternative - 2040  
 Allocation of Annual Variable O,M&R Costs by User  
 CRSP Power Rates  
 Jan-07 \$

San Juan Branch		Dedicated Variable OM&R Costs at Design Capacity (all Navajo)	Joint Variable O,M&R at Design Capacity					Projected Peak Flows as a Percentage of Design Flow by Year																								
			Pump Plant Energy	WTP Energy	WTP Chemicals	WTP Misc.	Sub Total	Navajo Dam OM&R	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-70	
1	Water Treatment Plant (WTP)		\$34,799	\$187,000	\$943,000	\$113,000	\$1,277,799	\$32,955	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	78.93%	80.33%	81.75%	83.22%	91.10%	100.00%	100.00%	100.00%	100.00%	100.00%
2	NAPI turnout		\$341,805				\$341,805		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	78.93%	80.33%	81.75%	83.22%	91.10%	100.00%	100.00%	100.00%	100.00%	100.00%
3	Shiprock Junction		\$0				\$0		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	79.14%	80.42%	81.84%	83.30%	91.14%	100.00%	100.00%	100.00%	100.00%	100.00%
4	Sarasotee turnout	\$4,234					\$4,234		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	79.86%	81.19%	82.56%	83.96%	91.49%	100.00%	100.00%	100.00%	100.00%	100.00%
5	Burnham Junction		\$0				\$0		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	80.15%	81.46%	82.81%	84.19%	91.61%	100.00%	100.00%	100.00%	100.00%	100.00%
6	Newcomb turnout	\$3,218					\$3,218		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	80.19%	81.50%	82.84%	84.22%	91.63%	100.00%	100.00%	100.00%	100.00%	100.00%
7	Sheepsprings turnout	\$1,482					\$1,482		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	80.43%	81.72%	83.05%	84.41%	91.73%	100.00%	100.00%	100.00%	100.00%	100.00%
8	Naschitti turnout	\$3,281					\$3,281		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	80.54%	81.83%	83.15%	84.50%	91.78%	100.00%	100.00%	100.00%	100.00%	100.00%
9	Tohatchi turnout	\$4,213					\$4,213		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	80.81%	82.08%	83.38%	84.71%	91.89%	100.00%	100.00%	100.00%	100.00%	100.00%
10	Coyote Canyon Junction		\$0				\$0		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	81.18%	82.42%	83.70%	85.01%	92.04%	100.00%	100.00%	100.00%	100.00%	100.00%
11	Twin Lakes turnout	\$3,980					\$3,980		0.00%	0.00%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	82.29%	83.46%	84.66%	85.89%	92.51%	100.00%	100.00%	100.00%	100.00%	100.00%
12	Ya-ta-hey Junction		\$199,530				\$199,530		0.00%	0.00%	6.97%	6.90%	6.83%	6.76%	6.68%	6.60%	6.52%	6.44%	6.35%	6.27%	6.18%	6.10%	82.78%	83.92%	85.09%	86.28%	92.72%	100.00%	100.00%	100.00%	100.00%	100.00%
13	Gallup Junction		\$0				\$0		0.00%	0.00%	11.67%	11.55%	11.43%	11.30%	11.18%	11.05%	10.91%	10.77%	10.63%	10.49%	10.34%	89.26%	90.25%	90.95%	91.68%	95.59%	100.00%	100.00%	100.00%	100.00%	100.00%	
14	Navajo Chapters	\$17,696					\$17,696		0.00%	0.00%	30.47%	30.16%	29.84%	29.52%	29.18%	28.84%	28.49%	28.13%	27.77%	27.39%	27.00%	0.00%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%
10.1	Coyote Canyon turnout	\$2,625					\$2,625		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%
10.2	Standing Rock turnout	\$296					\$296		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%
10.3	Dalton Pass turnout	\$7,790					\$7,790		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%
12.1	Rock Springs turnout	\$6,753					\$6,753		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%
12.2	Window Rock turnout	\$24,365					\$24,365		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%
	subtotal	\$79,933					\$79,933	\$32,955																								
<b>Cutter Branch</b>																																
21	WTP			\$22,000	\$133,000	\$15,500	\$170,500	\$4,644	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	71.25%	72.38%	73.53%	74.72%	75.93%	77.18%	78.45%	79.76%	81.10%	82.47%	83.87%	91.44%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
22	Huerfano turnout	\$1,058					\$1,058		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	71.25%	72.38%	73.53%	74.72%	75.93%	77.18%	78.45%	79.76%	81.10%	82.47%	83.87%	91.44%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
23	Nageezi turnout	\$2,223					\$2,223		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	71.89%	72.99%	74.12%	75.28%	76.47%	77.68%	78.93%	80.21%	81.51%	82.86%	84.23%	91.63%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
24	Jicarilla turnout						\$39,927		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	73.53%	74.57%	75.63%	76.72%	77.84%	78.99%	80.16%	81.36%	82.59%	83.86%	85.15%	92.12%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
25	Counselor turnout	\$5,546					\$5,546		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	61.27%	62.79%	64.34%	65.94%	67.57%	69.25%	70.97%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
26	Torecon turnout	\$4,255					\$4,255		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	61.27%	62.79%	64.34%	65.94%	67.57%	69.25%	70.97%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	subtotal	\$93,015		\$209,000	\$1,076,000	\$128,500	\$3,475,802	\$37,599																								

CRSP rates used in this table are \$0.01043 per KWH plus \$53.16 per year per KW.  
 Navajo Dam OM&R estimated at \$1.00 per acre-foot; Gallup's share assumed included in payments to Jicarilla Apache Nation; therefore Jicarilla assumed to pay both Jicarilla and Gallup OM&R directly to dam operator.

Table D6, page 2  
 Navajo - Gallup Water Supply Project  
 San Juan River PNM Alternative - 2040  
 Allocation of Annual Variable O,M&R Costs by User  
 CRSP Power Rates  
 Jan-07 \$

Navajo Share of Variable O,M&R Costs by Year																								
Reach	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-76	
1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$736,290	\$754,550	\$773,263	\$792,440	\$895,699	\$1,012,412	\$1,012,412	\$1,012,412	\$1,012,412	\$1,012,412
2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$192,002	\$196,764	\$201,644	\$206,644	\$233,571	\$264,007	\$264,007	\$264,007	\$264,007	\$264,007
3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$242,571	\$248,559	\$254,696	\$260,985	\$294,848	\$333,124	\$333,124	\$333,124	\$333,124	\$333,124
5	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
6	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,581	\$2,623	\$2,666	\$2,710	\$2,949	\$3,218	\$3,218	\$3,218	\$3,218	\$3,218
7	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$87,396	\$89,553	\$91,763	\$94,029	\$106,227	\$120,014	\$120,014	\$120,014	\$120,014	\$120,014
8	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$71,470	\$73,219	\$75,012	\$76,849	\$86,740	\$97,920	\$97,920	\$97,920	\$97,920	\$97,920
9	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$114,672	\$117,485	\$120,367	\$123,322	\$139,228	\$157,208	\$157,208	\$157,208	\$157,208	\$157,208
10	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
11	\$0	\$0	\$16,141	\$16,141	\$16,141	\$16,141	\$16,141	\$16,141	\$16,141	\$16,141	\$16,141	\$16,141	\$16,141	\$16,141	\$82,911	\$84,933	\$87,004	\$89,128	\$100,559	\$113,481	\$113,481	\$113,481	\$113,481	\$113,481
12	\$0	\$0	\$13,914	\$13,772	\$13,627	\$13,479	\$13,326	\$13,170	\$13,010	\$12,847	\$12,679	\$12,507	\$12,330	\$91,603	\$93,875	\$96,203	\$98,589	\$111,435	\$125,956	\$125,956	\$125,956	\$125,956	\$125,956	\$125,956
13	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
14	\$0	\$0	\$5,392	\$5,337	\$5,281	\$5,225	\$5,164	\$5,104	\$5,042	\$4,978	\$4,913	\$4,847	\$4,778	\$12,870	\$13,189	\$13,516	\$13,851	\$15,656	\$17,696	\$17,696	\$17,696	\$17,696	\$17,696	\$17,696
10.1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$9,988	\$10,235	\$10,489	\$10,749	\$12,150	\$13,733	\$13,733	\$13,733	\$13,733	\$13,733
10.2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$10,281	\$10,536	\$10,797	\$11,065	\$12,506	\$14,136	\$14,136	\$14,136	\$14,136	\$14,136
10.3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$19,024	\$19,496	\$19,980	\$20,475	\$23,143	\$26,159	\$26,159	\$26,159	\$26,159	\$26,159
12.1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$44,053	\$45,146	\$46,265	\$47,413	\$53,591	\$60,574	\$60,574	\$60,574	\$60,574	\$60,574
12.2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$45,612	\$46,744	\$47,903	\$49,091	\$55,488	\$62,718	\$62,718	\$62,718	\$62,718	\$62,718
21	\$0	\$0	\$0	\$0	\$0	\$0	\$79,641	\$81,616	\$83,640	\$85,715	\$87,840	\$90,019	\$92,251	\$94,539	\$96,884	\$99,286	\$101,749	\$115,007	\$129,993	\$129,993	\$129,993	\$129,993	\$129,993	\$129,993
22	\$0	\$0	\$0	\$0	\$0	\$0	\$59,328	\$60,793	\$62,294	\$63,832	\$65,408	\$67,024	\$68,679	\$70,375	\$72,114	\$73,896	\$75,722	\$85,553	\$96,665	\$96,665	\$96,665	\$96,665	\$96,665	\$96,665
23	\$0	\$0	\$0	\$0	\$0	\$0	\$14,216	\$14,554	\$14,899	\$15,254	\$15,617	\$15,989	\$16,371	\$16,762	\$17,162	\$17,573	\$17,993	\$20,258	\$22,819	\$22,819	\$22,819	\$22,819	\$22,819	\$22,819
24	\$0	\$0	\$0	\$0	\$0	\$0	\$16,716	\$17,131	\$17,555	\$17,991	\$18,437	\$18,894	\$19,363	\$19,843	\$20,335	\$20,839	\$21,356	\$24,139	\$27,284	\$27,284	\$27,284	\$27,284	\$27,284	\$27,284
25	\$0	\$0	\$0	\$0	\$0	\$0	\$18,257	\$18,709	\$19,173	\$19,649	\$20,136	\$20,635	\$21,147	\$21,672	\$22,209	\$22,760	\$23,324	\$26,364	\$29,799	\$29,799	\$29,799	\$29,799	\$29,799	\$29,799
26	\$0	\$0	\$0	\$0	\$0	\$0	\$2,607	\$2,672	\$2,738	\$2,806	\$2,875	\$2,947	\$3,020	\$3,095	\$3,171	\$3,250	\$3,330	\$3,764	\$4,255	\$4,255	\$4,255	\$4,255	\$4,255	\$4,255
Total	\$0	\$0	\$35,447	\$35,251	\$35,049	\$34,843	\$225,397	\$229,890	\$234,494	\$239,212	\$244,047	\$249,002	\$254,080	\$1,989,609	\$2,038,781	\$2,089,172	\$2,140,813	\$2,418,875	\$2,733,171	\$2,733,171	\$2,733,171	\$2,733,171	\$2,733,171	\$2,733,171

Table D6, page 3  
 Navajo - Gallup Water Supply Project  
 San Juan River PNM Alternative - 2040  
 Allocation of Annual Variable O,M&R Costs by User  
 CRSP Power Rates  
 Jan-07 \$

Gallup Share of Variable O,M&R Costs by Year																							
Reach	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-76
1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$298,342	\$298,342	\$298,342	\$298,342	\$298,342	\$298,342	\$298,342	\$298,342	\$298,342
2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$77,798	\$77,798	\$77,798	\$77,798	\$77,798	\$77,798	\$77,798	\$77,798	\$77,798
3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$116,522	\$116,522	\$116,522	\$116,522	\$116,522	\$116,522	\$116,522	\$116,522	\$116,522
5	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
6	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
7	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$46,644	\$46,644	\$46,644	\$46,644	\$46,644	\$46,644	\$46,644	\$46,644	\$46,644
8	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$38,019	\$38,019	\$38,019	\$38,019	\$38,019	\$38,019	\$38,019	\$38,019	\$38,019
9	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$64,421	\$64,421	\$64,421	\$64,421	\$64,421	\$64,421	\$64,421	\$64,421	\$64,421
10	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
11	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$59,141	\$59,141	\$59,141	\$59,141	\$59,141	\$59,141	\$59,141	\$59,141	\$59,141
12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$73,574	\$73,574	\$73,574	\$73,574	\$73,574	\$73,574	\$73,574	\$73,574	\$73,574
13	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
14	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
10.1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
10.2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
10.3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
12.1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
12.2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
21	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
22	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
23	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
24	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
25	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
26	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$774,462	\$774,462	\$774,462	\$774,462	\$774,462	\$774,462	\$774,462	\$774,462	\$774,462

Table D6, page 4  
 Navajo - Gallup Water Supply Project  
 San Juan River PNM Alternative - 2040  
 Allocation of Annual Variable O,M&R Costs by User  
 CRSP Power Rates  
 Jan-07 \$

Reach	Jicarilla Share of Variable O,M&R Costs by Year																							
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-76	
1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
5	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
6	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
7	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
8	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
9	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
10	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
11	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
13	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
14	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
10.1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
10.2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
10.3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
12.1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
12.2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
21	\$0	\$0	\$0	\$0	\$0	\$0	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151	\$45,151
22	\$0	\$0	\$0	\$0	\$0	\$0	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208	\$33,208
23	\$0	\$0	\$0	\$0	\$0	\$0	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782	\$7,782
24	\$0	\$0	\$0	\$0	\$0	\$0	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643	\$12,643
25	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
26	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$0	\$0	\$0	\$0	\$0	\$0	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784	\$98,784

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 Navajo - Gallup Water Supply Project  
 San Juan River PNM Alternative - 2040  
 Allocation of Annual Variable O,M&R Costs by User  
 NTUA Power Rates  
 Jan-07 \$

San Juan Branch		Dedicated Variable OM&R Costs at Design Capacity (all Navajo)	Joint Variable O,M&R at Design Capacity					Projected Flow as a Percentage of Design Flow by Year																								
			Pump Plant Energy	WTP Energy	WTP Chemicals	WTP Misc.	Sub Total	Navajo Dam OM&R	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-70	
1	Water Treatment Plant (WTP)		\$93,794	\$511,354	\$943,000	\$145,438	\$1,693,583	\$32,955	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	78.93%	80.33%	81.75%	83.22%	91.10%	100.00%	100.00%	100.00%	100.00%	100.00%
2	NAPI turnout		\$921,270				\$921,270		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	79.14%	80.42%	81.84%	83.30%	91.14%	100.00%	100.00%	100.00%	100.00%	100.00%
3	Shiprock Junction						\$0		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	79.86%	81.19%	82.56%	83.96%	91.49%	100.00%	100.00%	100.00%	100.00%	100.00%
4	Sarasotee turnout	\$11,411					\$1,200,523		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	80.15%	81.46%	82.81%	84.19%	91.61%	100.00%	100.00%	100.00%	100.00%	100.00%
5	Burnham Junction						\$0		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	80.19%	81.50%	82.84%	84.22%	91.63%	100.00%	100.00%	100.00%	100.00%	100.00%
6	Newcomb turnout	\$8,673					\$0		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	80.43%	81.72%	83.05%	84.41%	91.73%	100.00%	100.00%	100.00%	100.00%	100.00%
7	Sheepsprings turnout	\$3,994					\$445,199		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	80.54%	81.83%	83.15%	84.50%	91.78%	100.00%	100.00%	100.00%	100.00%	100.00%
8	Naschitti turnout	\$8,844					\$357,554		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	80.81%	82.08%	83.38%	84.71%	91.89%	100.00%	100.00%	100.00%	100.00%	100.00%
9	Tohatchi turnout	\$11,354					\$586,004		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	81.18%	82.42%	83.70%	85.01%	92.04%	100.00%	100.00%	100.00%	100.00%	100.00%
10	Coyote Canyon Junction						\$0		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	81.18%	82.42%	83.70%	85.01%	92.04%	100.00%	100.00%	100.00%	100.00%	100.00%
11	Twin Lakes turnout	\$10,727					\$454,541		0.00%	0.00%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	9.35%	82.29%	83.46%	84.66%	85.89%	92.51%	100.00%	100.00%	100.00%	100.00%	100.00%
12	Ya-ta-hey Junction						\$537,794		0.00%	0.00%	6.97%	6.90%	6.83%	6.76%	6.68%	6.60%	6.52%	6.44%	6.35%	6.27%	6.18%	6.10%	82.78%	83.92%	85.09%	86.28%	92.72%	100.00%	100.00%	100.00%	100.00%	100.00%
13	Gallup Junction						\$0		0.00%	0.00%	11.67%	11.55%	11.43%	11.30%	11.18%	11.05%	10.91%	10.77%	10.63%	10.49%	10.34%	10.20%	89.56%	90.25%	90.95%	91.68%	95.59%	100.00%	100.00%	100.00%	100.00%	100.00%
14	Navajo Chapters	\$47,698					\$0		0.00%	0.00%	30.47%	30.16%	29.84%	29.52%	29.18%	28.84%	28.49%	28.13%	27.77%	27.39%	27.00%	0.00%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%
10.1	Coyote Canyon turnout	\$7,075					\$29,940		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%
10.2	Standing Rock turnout	\$799					\$37,304		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%
10.3	Dalton Pass turnout	\$20,997					\$49,511		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%
12.1	Rock Springs turnout	\$18,201					\$145,064		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%
12.2	Window Rock turnout	\$65,672					\$103,373		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%
<b>Cutter Branch</b>									0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	71.25%	72.38%	73.53%	74.72%	75.93%	77.18%	78.45%	79.76%	81.10%	82.47%	83.87%	91.44%	100.00%	100.00%	100.00%	100.00%	100.00%	
21	WTP			\$63,030	\$133,000	\$19,603	\$215,633	\$4,644	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	71.25%	72.38%	73.53%	74.72%	75.93%	77.18%	78.45%	79.76%	81.10%	82.47%	83.87%	91.44%	100.00%	100.00%	100.00%	100.00%	100.00%	
22	Huerfano turnout	\$2,853					\$347,195		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	71.25%	72.38%	73.53%	74.72%	75.93%	77.18%	78.45%	79.76%	81.10%	82.47%	83.87%	91.44%	100.00%	100.00%	100.00%	100.00%	100.00%	
23	Nageezi turnout	\$5,991					\$76,487		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	71.89%	72.99%	74.12%	75.28%	76.47%	77.68%	78.93%	80.21%	81.51%	82.86%	84.23%	91.63%	100.00%	100.00%	100.00%	100.00%	100.00%	
24	Jicarilla turnout						\$107,615		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	73.53%	74.57%	75.63%	76.72%	77.84%	78.99%	80.16%	81.36%	82.59%	83.86%	85.15%	92.12%	100.00%	100.00%	100.00%	100.00%	100.00%	
25	Counselor turnout	\$14,949					\$65,368		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	61.27%	62.79%	64.34%	65.94%	67.57%	69.25%	70.97%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%	
26	Torecon turnout	\$11,468					\$0		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	61.27%	62.79%	64.34%	65.94%	67.57%	69.25%	70.97%	72.73%	74.53%	76.38%	78.27%	88.47%	100.00%	100.00%	100.00%	100.00%	100.00%	
		\$250,706					\$5,558,536	\$574,384	\$1,076,000	\$165,038	\$7,373,958	\$37,599																				

NTUA rates used in this table are \$0.200 per KWH plus \$198.00 per year per KW.  
 Navajo Dam OM&R estimated at \$1.00 per acre-foot; Gallup's share assumed included in payments to Jicarilla Apache Nation; therefore Jicarilla assumed to pay both Jicarilla and Gallup OM&R directly to dam operator.

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 Navajo - Gallup Water Supply Project  
 San Juan River PNM Alternative - 2040  
 Allocation of Annual Variable O,M&R Costs by User  
 NTUA Power Rates  
 Jan-07 \$

Navajo Share of Variable O,M&R Costs by Year																							
Reach	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-76
1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$969,849	\$993,901	\$1,018,550	\$1,043,810	\$1,179,823	\$1,333,560	\$1,333,560	\$1,333,560	\$1,333,560
2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$517,505	\$530,339	\$543,492	\$556,970	\$629,546	\$711,579	\$711,579	\$711,579	\$711,579
3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$653,803	\$669,944	\$686,484	\$703,435	\$794,707	\$897,872	\$897,872	\$897,872	\$897,872
5	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
6	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,955	\$7,069	\$7,185	\$7,304	\$7,947	\$8,673	\$8,673	\$8,673	\$8,673
7	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$235,558	\$241,372	\$247,330	\$253,435	\$286,312	\$323,473	\$323,473	\$323,473	\$323,473
8	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$192,634	\$197,348	\$202,180	\$207,131	\$233,791	\$263,925	\$263,925	\$263,925	\$263,925
9	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$309,075	\$316,657	\$324,426	\$332,389	\$375,262	\$423,722	\$423,722	\$423,722	\$423,722
10	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
11	\$0	\$0	\$43,506	\$43,506	\$43,506	\$43,506	\$43,506	\$43,506	\$43,506	\$43,506	\$43,506	\$43,506	\$43,506	\$223,470	\$228,919	\$234,503	\$240,225	\$271,038	\$305,865	\$305,865	\$305,865	\$305,865	\$305,865
12	\$0	\$37,501	\$37,501	\$37,501	\$37,501	\$37,501	\$37,501	\$37,501	\$37,501	\$37,501	\$37,501	\$37,501	\$37,501	\$246,898	\$253,021	\$259,296	\$265,726	\$300,552	\$339,489	\$339,489	\$339,489	\$339,489	\$339,489
13	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
14	\$0	\$0	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534	\$14,534
10.1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$26,920	\$27,587	\$28,271	\$28,973	\$32,748	\$37,015	\$37,015	\$37,015	\$37,015
10.2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$27,711	\$28,398	\$29,102	\$29,824	\$33,710	\$38,103	\$38,103	\$38,103	\$38,103
10.3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$51,278	\$52,550	\$53,853	\$55,188	\$62,380	\$70,508	\$70,508	\$70,508	\$70,508
12.1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$118,737	\$121,681	\$124,699	\$127,791	\$144,443	\$163,265	\$163,265	\$163,265	\$163,265
12.2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$122,940	\$125,989	\$129,114	\$132,316	\$149,557	\$169,045	\$169,045	\$169,045	\$169,045
21	\$0	\$0	\$0	\$0	\$0	\$0	\$100,164	\$102,648	\$105,194	\$107,803	\$110,476	\$113,216	\$116,024	\$118,901	\$121,850	\$124,872	\$127,968	\$144,643	\$163,491	\$163,491	\$163,491	\$163,491	\$163,491
22	\$0	\$0	\$0	\$0	\$0	\$0	\$159,909	\$163,856	\$167,902	\$172,047	\$176,296	\$180,650	\$185,112	\$189,684	\$194,370	\$199,172	\$204,093	\$230,592	\$260,543	\$260,543	\$260,543	\$260,543	\$260,543
23	\$0	\$0	\$0	\$0	\$0	\$0	\$38,316	\$39,226	\$40,158	\$41,113	\$42,092	\$43,095	\$44,123	\$45,177	\$46,256	\$47,363	\$48,497	\$54,602	\$61,503	\$61,503	\$61,503	\$61,503	\$61,503
24	\$0	\$0	\$0	\$0	\$0	\$0	\$45,055	\$46,172	\$47,317	\$48,490	\$49,693	\$50,925	\$52,188	\$53,483	\$54,809	\$56,168	\$57,561	\$65,062	\$73,540	\$73,540	\$73,540	\$73,540	\$73,540
25	\$0	\$0	\$0	\$0	\$0	\$0	\$49,207	\$50,427	\$51,678	\$52,959	\$54,273	\$55,619	\$56,998	\$58,412	\$59,860	\$61,345	\$62,866	\$71,058	\$80,317	\$80,317	\$80,317	\$80,317	\$80,317
26	\$0	\$0	\$0	\$0	\$0	\$0	\$7,026	\$7,200	\$7,379	\$7,562	\$7,749	\$7,941	\$8,138	\$8,340	\$8,547	\$8,759	\$8,976	\$10,146	\$11,468	\$11,468	\$11,468	\$11,468	\$11,468
Total	\$0	\$0	\$95,540	\$95,011	\$94,469	\$93,914	\$493,021	\$502,290	\$511,789	\$521,524	\$531,501	\$541,725	\$552,202	\$4,212,017	\$4,316,016	\$4,422,594	\$4,531,814	\$5,119,918	\$5,784,654	\$5,784,654	\$5,784,654	\$5,784,654	\$5,784,654

Table D7, page 3  
 Navajo - Gallup Water Supply Project  
 San Juan River PNM Alternative - 2040  
 Allocation of Annual Variable O,M&R Costs by User  
 NTUA Power Rates  
 Jan-07 \$

Gallup Share of Variable O,M&R Costs by Year																							
Reach	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-76
1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$392,979	\$392,979	\$392,979	\$392,979	\$392,979	\$392,979	\$392,979	\$392,979	\$392,979
2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$209,691	\$209,691	\$209,691	\$209,691	\$209,691	\$209,691	\$209,691	\$209,691	\$209,691
3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$314,062	\$314,062	\$314,062	\$314,062	\$314,062	\$314,062	\$314,062	\$314,062	\$314,062
5	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
6	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
7	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$125,720	\$125,720	\$125,720	\$125,720	\$125,720	\$125,720	\$125,720	\$125,720	\$125,720
8	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$102,473	\$102,473	\$102,473	\$102,473	\$102,473	\$102,473	\$102,473	\$102,473	\$102,473
9	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$173,636	\$173,636	\$173,636	\$173,636	\$173,636	\$173,636	\$173,636	\$173,636	\$173,636
10	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
11	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$159,403	\$159,403	\$159,403	\$159,403	\$159,403	\$159,403	\$159,403	\$159,403	\$159,403
12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$198,305	\$198,305	\$198,305	\$198,305	\$198,305	\$198,305	\$198,305	\$198,305	\$198,305
13	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
14	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
10.1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
10.2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
10.3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
12.1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
12.2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
21	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
22	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
23	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
24	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
25	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
26	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268	\$1,676,268

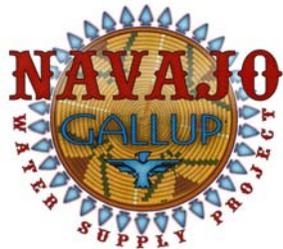
Table D7, page 4  
 Navajo - Gallup Water Supply Project  
 San Juan River PNM Alternative - 2040  
 Allocation of Annual Variable O,M&R Costs by User  
 NTUA Power Rates  
 Jan-07 \$

Reach	Jicarilla Share of Variable O,M&R Costs by Year																									
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	2055	2060-76			
1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
4	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
5	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
6	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
7	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
8	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
9	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
10	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
11	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
12	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
13	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
14	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
10.1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
10.2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
10.3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
12.1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
12.2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
21	\$0	\$0	\$0	\$0	\$0	\$0	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786	\$56,786		
22	\$0	\$0	\$0	\$0	\$0	\$0	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505	\$89,505		
23	\$0	\$0	\$0	\$0	\$0	\$0	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975	\$20,975		
24	\$0	\$0	\$0	\$0	\$0	\$0	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075	\$34,075		
25	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
26	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
Total	\$0	\$0	\$0	\$0	\$0	\$0	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342	\$201,342		

**Table D8 - 2040**  
**Navajo - Gallup Water Supply Project**  
**San Juan River PNM Alternative - 2040**  
**Cost of Water to Navajo Nation**  
 Discount rate = 2.875%

Year	peak cfs			Annual afy	Discounted		CRSP charge \$4.12/af	Discounted to 2027	
	Main Lateral	Cutter Lateral	Total		Peak cfs	Annual afy			
2014	1	-	-	-	-	-	\$0	\$0	
2015	2	-	-	-	-	-	\$0	\$0	
2016	3	3.59	-	3.59	2,000	4.91	2,732	\$8,231	\$11,242
2017	4	3.59	-	3.59	2,000	4.77	2,655	\$8,231	\$10,928
2018	5	3.59	-	3.59	2,000	4.64	2,581	\$8,231	\$10,623
2019	6	3.59	-	3.59	2,000	4.51	2,509	\$8,231	\$10,326
2020	7	3.59	3.70	7.29	4,061	8.89	4,952	\$16,711	\$20,379
2021	8	3.59	3.79	7.38	4,112	8.75	4,874	\$16,922	\$20,059
2022	9	3.59	3.89	7.48	4,164	8.62	4,798	\$17,137	\$19,747
2023	10	3.59	3.98	7.57	4,218	8.48	4,724	\$17,358	\$19,442
2024	11	3.59	4.08	7.67	4,273	8.35	4,652	\$17,585	\$19,145
2025	12	3.59	4.18	7.77	4,329	8.23	4,582	\$17,816	\$18,856
2026	13	3.59	4.29	7.88	4,387	8.10	4,513	\$18,054	\$18,573
2027	14	32.44	4.39	36.83	20,510	36.83	20,510	\$84,407	\$84,407
2028	15	33.24	4.50	37.74	21,018	36.69	20,431	\$86,500	\$84,083
2029	16	34.07	4.61	38.68	21,540	36.55	20,352	\$88,645	\$83,760
2030	17	34.91	4.73	39.64	22,074	36.41	20,274	\$90,844	\$83,438
2031	18	35.78	4.85	40.62	22,621	36.27	20,196	\$93,097	\$83,118
2032	19	36.67	4.97	41.63	23,182	36.13	20,119	\$95,405	\$82,799
2033	20	37.57	5.09	42.66	23,757	35.99	20,042	\$97,771	\$82,481
2034	21	38.51	5.21	43.72	24,346	35.85	19,965	\$100,196	\$82,164
2035	22	39.46	5.34	44.81	24,950	35.72	19,888	\$102,681	\$81,849
2036	23	40.44	5.48	45.92	25,569	35.58	19,812	\$105,227	\$81,534
2037	24	41.44	5.61	47.06	26,203	35.44	19,736	\$107,837	\$81,221
2038	25	42.47	5.75	48.22	26,853	35.31	19,660	\$110,511	\$80,909
2039	26	43.52	5.89	49.42	27,519	35.17	19,584	\$113,252	\$80,599
2040	27	45.71	6.19	51.90	28,900	35.90	19,993	\$118,939	\$82,280
2041	28	45.71	6.19	51.90	28,900	34.90	19,434	\$118,939	\$79,981
2042	29	45.71	6.19	51.90	28,900	33.92	18,891	\$118,939	\$77,746
2043	30	45.71	6.19	51.90	28,900	32.98	18,363	\$118,939	\$75,573
2044	31	45.71	6.19	51.90	28,900	32.06	17,850	\$118,939	\$73,461
2045	32	45.71	6.19	51.90	28,900	31.16	17,351	\$118,939	\$71,408
2046	33	45.71	6.19	51.90	28,900	30.29	16,866	\$118,939	\$69,412
2047	34	45.71	6.19	51.90	28,900	29.44	16,395	\$118,939	\$67,473
2048	35	45.71	6.19	51.90	28,900	28.62	15,937	\$118,939	\$65,587
2049	36	45.71	6.19	51.90	28,900	27.82	15,491	\$118,939	\$63,754
2050	37	45.71	6.19	51.90	28,900	27.04	15,058	\$118,939	\$61,972
2051	38	45.71	6.19	51.90	28,900	26.29	14,638	\$118,939	\$60,240
2052	39	45.71	6.19	51.90	28,900	25.55	14,228	\$118,939	\$58,557
2053	40	45.71	6.19	51.90	28,900	24.84	13,831	\$118,939	\$56,920
2054	41	45.71	6.19	51.90	28,900	24.14	13,444	\$118,939	\$55,330
2055	42	45.71	6.19	51.90	28,900	23.47	13,069	\$118,939	\$53,783
2056	43	45.71	6.19	51.90	28,900	22.81	12,703	\$118,939	\$52,280
2057	44	45.71	6.19	51.90	28,900	22.18	12,348	\$118,939	\$50,819
2058	45	45.71	6.19	51.90	28,900	21.56	12,003	\$118,939	\$49,399
2059	46	45.71	6.19	51.90	28,900	20.95	11,668	\$118,939	\$48,019
2060	47	45.71	6.19	51.90	28,900	20.37	11,342	\$118,939	\$46,677
2061	48	45.71	6.19	51.90	28,900	19.80	11,025	\$118,939	\$45,372
2062	49	45.71	6.19	51.90	28,900	19.25	10,717	\$118,939	\$44,104
2063	50	45.71	6.19	51.90	28,900	18.71	10,417	\$118,939	\$42,872
2064	51	45.71	6.19	51.90	28,900	18.18	10,126	\$118,939	\$41,674
2065	52	45.71	6.19	51.90	28,900	17.68	9,843	\$118,939	\$40,509
2066	53	45.71	6.19	51.90	28,900	17.18	9,568	\$118,939	\$39,377
2067	54	45.71	6.19	51.90	28,900	16.70	9,301	\$118,939	\$38,276
2068	55	45.71	6.19	51.90	28,900	16.24	9,041	\$118,939	\$37,207
2069	56	45.71	6.19	51.90	28,900	15.78	8,788	\$118,939	\$36,167
2070	57	45.71	6.19	51.90	28,900	15.34	8,542	\$118,939	\$35,156
2071	58	45.71	6.19	51.90	28,900	14.91	8,304	\$118,939	\$34,174
2072	59	45.71	6.19	51.90	28,900	14.50	8,072	\$118,939	\$33,219
2073	60	45.71	6.19	51.90	28,900	14.09	7,846	\$118,939	\$32,290
2074	61	45.71	6.19	51.90	28,900	13.70	7,627	\$118,939	\$31,388
2075	62	45.71	6.19	51.90	28,900	13.31	7,414	\$118,939	\$30,511
2076	63	45.71	6.19	51.90	28,900	12.94	7,206	\$118,939	\$29,658
2077	64	45.71	6.19	51.90	28,900	12.58	7,005	\$118,939	\$28,829
2078	65	45.71	6.19	51.90	28,900	12.23	6,809	\$118,939	\$28,024
2079	66	45.71	6.19	51.90	28,900	11.89	6,619	\$118,939	\$27,240
2080	67	45.71	6.19	51.90	28,900	11.55	6,434	\$118,939	\$26,479
2081	68	45.71	6.19	51.90	28,900	11.23	6,254	\$118,939	\$25,739
Total					1,440.25	802,003	\$6,426,324	\$3,300,617	
Annual Equivalent					54.65	30,434		30,434	
Total PV per acre foot								\$108.45	

Note: Navajo annual equivalent is calculated for the purpose of determining the leveled cost per acre foot to amortize the present value capital costs over the 61 year period of water deliveries. CRSP charge for water has a present value of \$108.45 per acre foot. This charge was amortized over 50 years at the CRSP interest rate of 2.875% to determine an annual charge of \$4.12 per acre foot. This charge is then applied to all water delivered to the Navajos.



## APPENDIX D

### *Part II*

### Economic Benefit/Cost Analysis

**ECONOMIC BENEFIT/COST ANALYSIS  
NAVAJO – GALLUP WATER SUPPLY PROJECT**

**James P. Merchant  
Dornbusch Associates  
Berkeley, CA**

**October 1, 2007**

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## **A. Executive Summary**

This report focuses on the economic benefits and costs associated with the proposed Navajo – Gallup Water Supply Project in northwestern New Mexico. The Project would be developed to deliver water for domestic, commercial, municipal and industrial use to the City of Gallup, to numerous Navajo Chapters and to an undeveloped section of the Jicarilla Apache Nation. Water is currently scarce in all of these areas, and the Project will ultimately deliver water to some individuals who presently drive many miles to haul water.

The economic analysis in this report is distinct from a financial analysis. While a financial analysis traces cash receipts and expenditure, the economic analysis is instead more concerned with the generation and use of societal resources. Because the U.S. Bureau of Reclamation is overseeing the planning of this Project, and because the Project participants are seeking monetary support from the Federal government, the society whose resources we are concerned about is the United States as a whole. The principal differences between this economic analysis and a financial analysis are (1) inclusion of non-cash Project costs that would affect third parties (diminished power generation and increased salinity effects), (2) exclusion of Project cash costs that do not represent use of scarce national resources (use of otherwise unemployed people for construction workforce), and (3) exclusion of Project transfer payments that do not represent use of scarce national resources (taxes paid on construction spending).

The Project will principally benefit people in the northwest corner of New Mexico by providing water to which they otherwise would not have access or could only have access at a relatively higher cost. The measure of the benefits to the City of Gallup and to the Navajo people who would be supplied by the Project is the willingness of these beneficiaries to pay for Project water. Gallup's willingness to pay was estimated from data on the current use of water by people in communities throughout the mountain states. The Navajo people's willingness to pay was estimated from data on their spending for piped water service when available and on spending to haul water when no service is available. Benefits to the Jicarilla Apache people were estimated from the cost of the next cheapest alternative source of water for the area of the Reservation to be served by the Project.

The Indian Health Service identifies the availability of a community water supply as critical for maintaining the health of Indian people. This report roughly estimates the indirect health benefits to Navajo people that would accrue from the provision of a clean water supply.

The completion of the water supply project will also provide infrastructure that is a necessary prerequisite to economic development and poverty relief on the Reservations. While it is uncertain how much economic development would be encouraged by the Project, it is clear that the lack of a reliable water supply presently poses a significant constraint to most types of economic development. Table ES-1 summarizes the economic costs and benefits associated with the Project.

**Table ES-1**

**Summary of Navajo-Gallup Water Supply Project Economic Benefits and Costs**

**Millions 2007\$, 4.875% Discount Rate, 50 year Project life**

<b>BENEFITS</b>	<b>Direct</b>	<b>Direct Plus Other</b>
Gallup Willingness to Pay	\$361	\$361
Navajo Willingness to Pay	\$1,488	\$1,488
Jicarilla Avoided Cost	\$57	\$57
Construction Employment Indirect and Induced Employment	\$231	\$231
Health Benefits	\$0	\$111
Reverse Outmigration	\$0	+
Economic Development	\$0	+
<b>Total Benefits</b>	<b>\$2,137</b>	<b>\$2,683</b>
<b>COSTS</b>		
Project Construction Distribution System Construction	\$1,192	\$1,192
O,M&R	\$48	\$48
Gallup Water Cost	\$368	\$368
Navajo Water Cost	\$33	\$33
Power Generating Cost	\$24	\$24
Salinity Increase Cost	\$19	\$19
<b>Total Costs</b>	<b>\$20</b>	<b>\$20</b>
<b>BENEFIT/COST RATIO</b>	<b>1.25</b>	<b>1.57</b>

The benefit/cost ratio greater than 1.0 indicates that the anticipated project benefits are greater than cost and thus, that the Project represents a beneficial use of national resources.

## **B. Analytical Framework**

Dornbusch Associates was engaged by the Bureau of Reclamation et al. to evaluate the economic feasibility of the proposed Navajo-Gallup Water Supply Project (NGWSP). This report summarizes the Dornbusch analysis findings as well as the supporting data and technical methodologies. While a Cost Allocation Report, under separate cover, analyzes the distribution of the Project's estimated *financial* cost between the Project's stakeholders, this report focuses on the Project's overall *economic* benefits and costs and thus economic feasibility. The Project's economic benefits and costs are compared to a base case that is expected to occur if the Project is not built (a "with vs. without" comparison).

An economic as opposed to a financial analysis approach is used to evaluate projects by international and federal agencies because those agencies are concerned with using a country's resources most effectively. The economic analysis approach considers the value to the country's overall economy of the resources potentially used and produced by a project, so that the sponsoring agency can determine whether that project represents a good investment of the country's resources. In general, if a substantial source of financing for a project is to be national government funds then it is appropriate to conduct a national level economic analysis to determine whether the project contributes to the country's overall economic well-being. This economic approach is also recommended by the Water Resource Council's Principles and Guidelines [Water Resource Council, p. iv], which the Bureau of Reclamation is required to follow.

In contrast, a financial analysis focuses only on whether a project is or will be a profitable investment for a participant. If, for example, a city were able to obtain private financing to develop a water project the city would use a financial analysis to determine what the project would cost and how to pay for it. Depending on some of the factors discussed below, such as subsidies or the cost of money, financial and economic analyses may reach similar or diverse conclusions as to the feasibility of a project.

The approach in this report is to use an economic rather than a financial perspective to evaluate the potential benefits and costs from the proposed NGWSP. The primary source of funding for the NGWSP would most likely be the federal government; hence it is appropriate to assess the Project's feasibility from the perspective of the U.S. as a whole. The remainder of this section discusses the important differences between economic and financial analyses and explains several key aspects of the economic analysis methodology used to evaluate the proposed project.

The primary technical differences between an economic and a financial analysis relate to valuing commodity prices, investment subsidies, taxes, discount rates, labor and water. Each of these is explained as follows:

### **1. Commodity prices**

In a financial analysis it would be appropriate to use whatever prices a project paid for materials and services or would receive for water sold. The actual prices (including any subsidies) would accurately reflect the cash flow from the perspective of the project participants. The objective of an economic analysis, however, is to price commodities at a level that indicates their value to the economy. Government subsidies are a type of transfer payment as they represent payments from the government without the government receiving any goods or services in return. Accordingly, in an economic analysis subsidies paid within the economy are removed from commodity prices. If a participating agency chooses to subsidize water sales, for example, an economic analysis would impute a price reflective of the water's value to the economy and disregard the subsidized price. In contrast, a financial analysis would use the subsidized price to reflect actual revenues realized by the direct participants from the sale of water.

### **2. Investment costs**

Investment costs are treated in a similar fashion to commodity prices (as discussed above). In an economic analysis, even if a project's investment costs are subsidized by a federal

program, the full costs of the resources used to build the project are counted. Costs for goods and services used to build a project are measured by their value in other uses that would be displaced by the project (opportunity cost). This concept is discussed in greater detail below, in the sections addressing labor and water costs.

### **3. Taxes**

Most taxes are levied simply to raise general revenues and are not payments that are directly exchanged for something of value. Taxes levied to raise general revenues include, for example, income and sales taxes. Income tax payments go into a general fund and do not pay for specific goods or services that the taxpayer only receives if he pays taxes. Because taxes are not usually linked to an exchange of goods or services they are excluded from an economic analysis. Such general taxes can be thought of not as determining whether a project is feasible but as determining how the benefits from a project are split between the project participants and the government. These taxes are a type of transfer payment because they “transfer” resources from one entity (a taxpayer) to another (the government) without the direct exchange of goods or services.

A use tax is one of the few examples of a tax levied in exchange for goods or services. In the case of use taxes a government entity levies the tax as a fee for services rendered, such as payments for the use of a public facility like a park. In this case value is being received (enjoyment of a park) that is linked directly to the payment of the tax. In an economic analysis such a use tax payment would be recognized as a purchase of goods or services and would be counted as a cost or a benefit.

Both general taxes and use taxes are included in a financial analysis because both represent cash outflows that increase the cost of a project. Only the use tax would be included in an economic analysis, however, because the general tax is a transfer payment that does not represent a purchase of specific goods and services.

For the NGWSP analysis, we consider taxes on field costs to be a type of transfer payment and accordingly we exclude them from our estimates of the Project’s economic cost.

#### 4. Discount rate

A development project is considered to be economically feasible when its potential benefits are equal to or exceed its estimated costs. A problem in comparing a project's benefits with its costs is that those benefits and costs do not typically occur at the same point in time. Construction costs are incurred only during the development phase of a project, whereas replacement of equipment occurs periodically throughout a project's life, and operating costs and economic benefits occur annually throughout a project's life.

To relate the stream of benefits and costs to each other, it is necessary to recognize that money has a "time value". A dollar today has a greater value than a dollar in the future – a reality that is recognized in every loan transaction. To illustrate, if Party A loans \$100 to Party B for ten years, Party A will require Party B to repay something more than \$100 at the end of the ten year period. The additional amount that must be paid reflects the "time value" of the \$100 loan. Or, looking at it another way, if someone is offered a choice between \$100 today or \$100 in ten years, he or she will certainly prefer receiving the \$100 today, recognizing that the money can be invested and subsequently yield more than \$100 at the end of the ten-year period.

For the purpose of discounting future benefits and costs for the NGWSP we have used the federal rate of 4.875% that is applicable during FY2007 to water resource projects [U.S. Bureau of Reclamation, 2006]. This federal rate is a constrained, lagged, nominal (includes inflation) rate computed annually from U.S. Treasury security yields. It reflects average yields on marketable securities with a term of 15 years or more, but is constrained from changing more than .25% per year. The rate is then rounded to the nearest one-eighth of one percent. Absent these constraints the 2007 rate would be 4.9351% [*Ibid.*]. For sensitivity analysis we have also evaluated the Project's economic feasibility applying a real (inflation removed) discount rate of 3%. This real rate is based on an average between inflation-free rates of return on long-term federal bonds and inflation-free returns that have been obtained historically by all taxpayers, including all industrial and commercial sectors, households, and institutions [Fraumeni, pp. 161-244].

A financial analysis would use an actual market rate of interest, adjusted so to be consistent with the inflation assumption built into the benefit and cost projections for the project. For example, if the project benefits were projected in inflation-free (constant) dollars, then the interest rate should be net of the expected inflation rate.

## **5. Labor**

In an economic analysis the cost of labor is determined based on its value as a productive resource. This means that in a national economic analysis the cost of labor for the subject project depends on how much it would contribute to the national economy if that labor was not used for the project being evaluated. This cost is measured by labor's opportunity cost, which is its value in its next best use. For that portion of the labor pool that would be otherwise fully employed in another project, the labor cost is its value as reflected in the full wage rate. However, for that portion of the labor pool that would be otherwise unemployed, and for whom no alternative employment opportunities would be available in the absence of the proposed development project, the opportunity cost of that labor is assumed to be zero. The implication of a zero opportunity cost in analyzing the proposed NGWSP is that in the absence of the project the workers would be unlikely to otherwise be employed in some type of work that added to the nation's supply of goods and services.

This method of using the opportunity cost to reflect the cost of labor in an economic analysis is standard practice among international development agencies such as the World Bank and the U.S. Agency for International Development. The Principles and Guidelines recommend using this method of labor valuation in assessing the costs of a project's construction phase but not its operational phase [Water Resource Council, section 2.11.2(b)].

A financial analysis would account for all wage costs that may be incurred by a project regardless of whether the workers would otherwise be employed or not.

## **6. Water**

In a financial analysis the water used in a project would be valued at whatever dollar cost was paid for the use of water by the project participants. In an economic analysis the water is valued at its opportunity cost, or its value in its next best use. To the extent that project participants pay market prices for the water then the two approaches (financial and economic) should converge. If a participant already owns rights to water, however, then its financial cost would be zero while its economic cost would be the value in whatever other uses were precluded by the project.

### **C. Project Benefits**

In an economic analysis the basis for estimating benefits from a water project is the *Willingness to Pay* for the “increase in value of goods and services attributable to the [project] water supply.” [see Water Resource Council, section 2.2.2(a)]. In a municipal water use setting it is impractical to measure the increase in value for each use of water (bathing, toilet flushing, cooking, drinking washing, lawn and garden watering, etc.) Instead we try to estimate what users are willing to pay for the water itself, assuming they are best placed to know the value of water’s various uses. This estimated willingness to pay is the amount of money that water users would be willing to pay for project water; it reflects the economic value of the water to the users and thereby to society as a whole. In performing an economic feasibility analysis of the NGWSP, we estimated this willingness to pay separately for the three project participants: the City of Gallup, the Navajo Nation and the Jicarilla Apache Nation.

#### **1. City of Gallup Willingness to Pay**

Willingness to pay is commonly estimated in one of two ways: deducing what people are willing to pay by analyzing their actual payment patterns (revealed preference) or by asking them what they would pay in a structured hypothetical situation (stated preference). We have used a revealed preference approach to estimate a water demand function for 79 mountain states mid-sized communities, including Gallup. Towards this end, we compiled data on each communities water use during 2000, price for water, median income levels,

household size and average rainfall. From this data we estimated a generalized demand curve that relates these variables to the demand for water. This approach implicitly assumes that water use patterns are substantially similar among the communities in the database, except for those differences accounted for by the explanatory variables (see also the discussion of other variables in part C.1.e, below). Equation (1) shows the estimated relationships. The data and regression results are shown in Appendices A and B.

$$(1) \ln\text{GPCD} = 2.913 + .372 * \ln\text{HHY} - 1.348 * \ln\text{HHS} - .554 * \ln\text{P}$$

$$(2.258)** \quad (2.805)** \quad (-5.680)** \quad (-10.878)**$$

where GPCD = water use in gallons per capita per day

HHY = median household income

HHS = average household size

P = average price for water

Numbers in parentheses are t-statistics. All coefficients are different from zero at 90% (\*) or 95% (\*\*) level of confidence.

Adjusted R<sup>2</sup> = .630

Observations = 79

Degrees of freedom = 75

Converting the logarithmic equation (1) to an exponential equation form gives equation (2), which was used to estimate the demand for water in Gallup.

$$(2) \text{GPCD} = 18.405 * \text{HHY}^{.372} * \text{HHS}^{-1.348} * \text{P}^{-.554}$$

#### *a. Household Income*

Our expectation is that increasing income will lead to increasing water use, and the estimated exponent in equation (2) is consistent with that expectation. The exponent of the income term can be interpreted as the *Income Elasticity* of demand for water, that is, the amount by which the demand for water will increase given an increase in household income. The estimated income elasticity of .372 in equation (2) is similar to other income elasticities reported in the literature. Table 1 shows examples of reported income elasticities for water.

**Table 1**  
**Income Elasticities Reported in the Economics Literature**

<b>STUDY</b>	<b>INCOME ELASTICITY</b>
Jones & Morris	0.40 to 0.55
Martin & Wilder	0.04 to 0.27
Nieswiadomy & Cobb	0.64
Nieswiadomy	0.28 to 0.44
Schneider & Whitlatch	0.207
Morgan	0.33 to 0.39

The income elasticity was used in the willingness to pay analysis to estimate how the demand for water in Gallup (willingness to pay for water) would increase in the future with increases in median household income. Median household income was assumed to continue growing at a real (adjusted for inflation) rate of slightly above 1.0% per year, which was the rate of growth in McKinley County personal income from 1969 to 1999 [US Census Bureau, 2004].

***b. Household Size***

Some researchers have observed that per capita water use is inversely related to household size [see eg. Brown]. This inverse relationship seems logical, as outdoor use in particular should not increase linearly with the number of people in a household. Our data analysis did find a strong inverse correlation between household size and per capita water use. The estimated exponent in equation (2) is negative 1.348, which is substantially larger than some other values reported in the literature. Nieswiadomy reports a household size water use elasticity of .69 for western cities, on a dependent variable defined as total household use. Converting the dependent variable in Nieswiadomy's estimate to per capita terms would reduce the exponent of the household size independent variable to negative .31. Jones and Morris report a household size elasticity of 0.17 (also on total household use), which converts to an elasticity estimate of negative .83 for per capita use.

This household size variable is used in the willingness to pay analysis to adjust per capita water demand in accordance with the expected future decrease in average Gallup

household size. Gallup presently has an average household size of 2.85 persons per household, compared to the national average of 2.63 persons per household, and Gallup's average household size has been declining. For the analysis, we assumed that Gallup's household size would continue to decline at 0.005 persons per household per year until it converged with the 2000 national average, and then would remain at that level.

*c. Price for Water*

Economic theory suggests that, if all else is equal, people demand less of most goods and services the more expensive they are. Our data analysis showed a strong inverse correlation between per capita water use and the price for water. The estimate exponent of the water price term in equation (2) is negative 0.554. This estimate is generally consistent with other price elasticity results reported in the literature, examples of which are shown in Table 2.

**Table 2**  
**Price Elasticities Reported in the Economics Literature**

<b>STUDY</b>	<b>PRICE ELASTICITY</b>
Jones & Morris	-0.34
Nieswiadomy	-0.22 to -0.60
Agthe & Billings	-0.595 to -0.624
Billings & Agthe	-0.267
Martin & Wilder	-0.49 to -0.70
Nieswiadomy & Cobb	-0.63
Schneider & Whitlatch	-0.63
Weber	-0.202
Nieswiadomy & Molina	-0.36 to -0.86
Hasson	-0.22 to -0.34
Young	-0.41 to -0.60
Foster & Beattie	-0.27 to -0.76
Brookshire et al. (summarizing other studies)	-0.11 to -1.59 (average -0.49)

The estimated price elasticity, income elasticity and household size elasticity of water consumption are used in the willingness to pay analysis to estimate the implicit price associated with various quantities of water use. These price estimates are necessary in order to calculate the total willingness to pay by Gallup residents for different quantities of water. These elasticity estimates are used in conjunction with the assumptions about future changes in income and household size levels, previously discussed. Table 3 shows for various future years the implicit price per thousand gallons for total average water use of 160 gpcd. This price represents the amount that average Gallup water users would be willing to pay for water, at the 160 gpcd level of average consumption. The price that we expect Gallup water users to be willing to pay for water increases over time as incomes rise and household size decreases.

**Table 3**  
**Estimated Willingness to Pay for Domestic Water (160 gpcd)**  
**Price Per Thousand Gallons of Water, Gallup, New Mexico (2007\$)**

YEAR	PRICE PER THOUSAND GALLONS
2020	\$2.44
2030	\$2.65
2040	\$2.88
2050	\$3.08
2060	\$3.16
2070	\$3.27

*d. Climate variables*

Some researchers have found a significant relationship between per capita water use in an area and climatic variables for that area, such as rainfall or growing season temperatures. We compiled data on average annual rainfall and average annual growing degree hours<sup>1</sup> for each community in our data set. While we found plausible results from statistical analyses (linear regression) that included those variables the coefficients were not significant at reasonable levels (less than 80% likely different from zero and they did not add to the overall explanatory power of the overall equation. Accordingly, the linear regression

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<sup>1</sup> “Growing degree hours” is a measure of the temperature above a certain threshold multiplied by the hours at that temperature, accumulated throughout the growing season. It is an indication of how vigorously plants will grow and is generally correlated with water use by plants.

equation used to estimate Gallup's willingness to pay for water does not include those variables.

*e. Other Variables*

Although our demand equation includes water price, household income, household size and rainfall variables, other factors may also influence per capita water use in different cities. Differences in water quality and reliability, for example, may affect per capita water use. We have no reason to suspect that these and other omitted variables significantly affect our results, and we expect that any bias from omitting these variables would be small. However, to the extent that an omitted water quality variable would be significant we have probably underestimated the project benefits because the project will provide very high quality water to its users.

*f. Gallup Without-Project Condition*

Gallup currently relies on groundwater pumping to supply water to its residents. The water levels have been falling by 7 to 29 feet per year over an extended period, and at some point the production capacity of the current well system is expected to diminish. For purposes of our analysis we have assumed that annual production capacity will peak at 5MGD (5600 afy) in the year 2010, and that the production capacity will decline linearly to 1439 afy by the year 2040 [Navajo Nation et al., "Technical Memorandum", Table 4.2]. The production capacity of 5600 afy exceeds the City's projected water needs of about 4500 afy in 2010, but the progressively increasing needs and diminishing capacity indicate that Gallup will need a supplemental water supply to meet demand by the year 2016. Gallup is currently investigating a water reuse facility to treat effluent as a source for this supplemental supply. For purpose of our analyses we have assumed that by 2012 Gallup will construct such a reuse facility that will supply one MGD (1,120 afy) to help meet forecasted water needs [Allgood]. Once the Project is operating, Gallup plans to shut down its wells and rely entirely on water from the Project and from the planned reuse facility.

Even following implementation of the assumed additional water reuse facility, due to population growth the City of Gallup cannot continue to supply its residents with their current level of average per capita water use (171 gpcd) beyond the year 2018. Absent

the Project, therefore, Gallup would be faced with some combination of the following scenarios: (1) development of alternative water supply projects, (2) diminishing per capita water supply, and/or (3) curtailment of population growth. Gallup has not been able to identify any other water supply project that is as cost-effective as the Navajo Gallup Water Supply Project. Without new water supplies in addition to the assumed water reuse facility it is estimated that the available water per capita would fall to about 100 gpcd by the year 2030, and continue to decline thereafter. Thus without the Project, Gallup would have to make major changes in water use patterns, with consequential negative implications for the city's economic well-being. While the Willingness to Pay approach does address the amount of money that Gallup residents would be willing to spend for a supplemental water supply, the approach does not address the overall economic losses to the City that would occur if future water shortages caused residents and businesses to locate elsewhere.

***g. Gallup With-Project Condition***

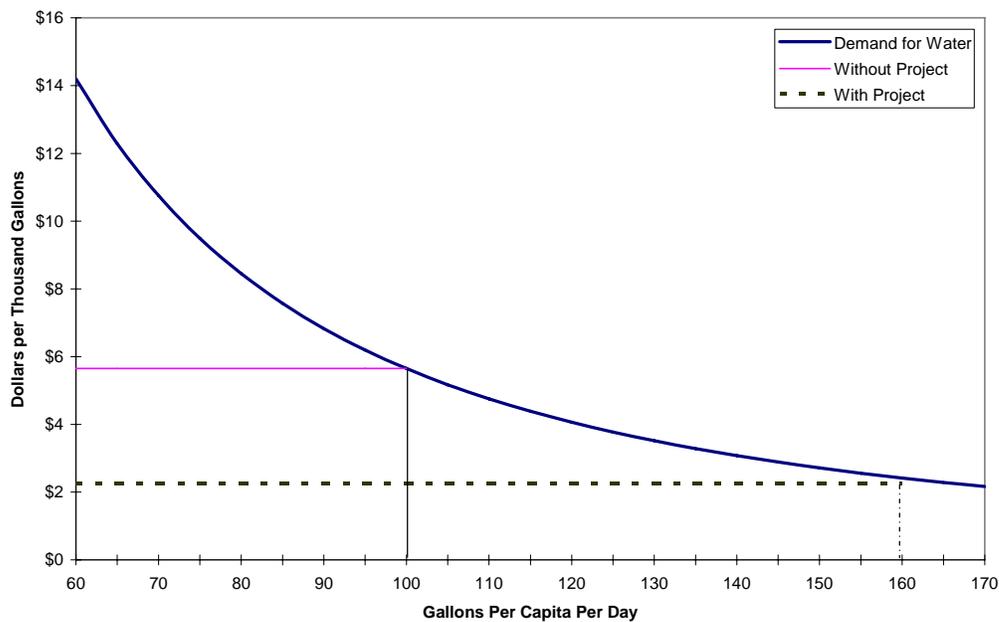
For purposes of the economic analysis we assume that the Project will be operational by January, 2027. We further assume that in the future, average Gallup water consumption per capita will decline slightly from today's 171 gpcd to 160 gpcd. Two factors should affect per capita water consumption in the future. First, water rates may be somewhat higher in the future in order to pay for a supplemental water supply, and higher rates should cause water use per capita to decline. Second, per capita water use may currently be somewhat elevated due to water use by non-Gallup residents who haul water from Gallup sources. When the Project is completed the need for water hauling should diminish.

***h. Calculation of Project Benefits for Gallup***

The potential economic benefits to Gallup from the Project can be measured by the area under the demand curve between (1) the projected use without the Project and (2) 160 gpcd. We measured this area for each year for the 50 year period beginning with planned Project completion in 2027. Each year's benefits are slightly different, due to decreasing household size and increasing population and income. Figure 1 shows Gallup's demand for water estimated for the year 2030 (curved line). The area below the demand curve

and to the left of 160 gpcd shows the total willingness to pay (WTP) for 160 gpcd. However, the area below the demand curve and to the left of 100 gpcd indicates WTP for water that could be supplied by Gallup in 2030 even in the absence of the Project; and that area is not included in the benefit calculation. In addition to the benefits from supplemental water Gallup residents will benefit from the cost savings generated by replacing expensive deep wells with Project water. Gallup estimates that the city will save approximately \$790,000 per year once the Project water supplies allow it to shut down deep wells [Munn]. Future benefits were discounted back to 2027, using the current (FY2007) federal discount rate of 4.875%. The discounted estimated annual benefits of the Project sum to a total present value of \$361 million (2007\$).

**Figure 1**  
**Demand for Water in 2030**  
**Gallup, New Mexico**



Note 1: The area under the demand curve was calculated by integrating equation (2) and solving for the area under the demand curve between the implicit price for projected water use without the project and the price at 160 gpcd water use with the project. This calculation is shown as equation (3).

$$(3) \text{ Area} = 18.405 * \text{HHY}^{.372} * \text{HHS}^{-1.348} * (\text{P1}^{(1-.554)} - \text{P0}^{(1-.554)}) / (1-.554),$$

where Area = area under demand curve between P1 and P0

HHY = household income

HHS = household size

P1 = price at 160 gpcd

P0 = price at base (without Project) per capita water use

Coefficients and exponents as estimated in equation (2)

The above calculation provides the area under the demand curve and to the right of the y-axis. Finally, to derive the economic benefits we adjust the above calculation to find the area below the demand curve but above the x-axis. This was done by subtracting the rectangle  $Q0 * (P1 - P0)$  and adding the rectangle  $P1 * (Q1 - Q0)$ , where Q0 is the base (without Project) per capita water use and Q1 is the per capita water use with the Project.

## 2. Navajo Nation Willingness to Pay

Water use patterns on the Navajo Indian Reservation are substantially different from that in most off-Reservation communities, including Gallup. Most notably, about 40 percent of Navajo Reservation residents have no piped water supply so they must haul water to their homes. Water hauling is time consuming and expensive, with the result that those Navajos who do haul water tend to consume far less water per capita than those who have piped water. The circumstances of water hauling (price and per capita water use) are completely outside the range of data for any community surveyed as part of the Gallup analysis. Hence we concluded that it would be questionable to apply the price elasticity used for Gallup or that for any other community with a predominantly piped water supply to an assessment of Navajo willingness to pay for water. Instead, because of the importance of

water hauling among the Navajo people we have estimated a Navajo-specific water demand function instead of using the demand curve developed for Gallup.

The Navajo water demand equation is based on fitting a log-log equation (similar to that used in the Gallup analysis) to the year 2005 water use and price data from Navajos who either (1) pay for water piped to their homes by the Navajo Tribal Utilities Authority (NTUA), or (2) purchase bulk water and haul it to their homes.<sup>2</sup> This estimated demand relationship is shown in equation (4).

$$(4) \ln \text{GPCD} = -.1454 + -.8402 * \ln P$$

where GPCD = water use in gallons per capita per day

$$P = \text{price for water}^3$$

Converting the logarithmic equation (4) to an exponential equation form gives equation (5):

$$(5) \text{GPCD} = .8646 * P^{-.8402}$$

The price elasticity of negative .8402 estimated in equation (5) is somewhat higher than the average reported for communities having piped water supplies but is within the range of reported results (shown in Table 2).

Because the Navajo water use data did not include income for the water users we could not estimate a Navajo-specific income elasticity for water use. Since the Navajo household income is within the range of incomes in our community survey, we used the income elasticity from that survey for that Navajos. Essentially, we assumed that the Navajo would exhibit the same income response to water use (income elasticity) as we found in our sample of 79 mountain state communities in equation (2). We therefore added the income

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<sup>2</sup> We recognize that piped and hauled water are dissimilar commodities. However, by including the cost of hauling to and storing at the household we attempted to define both as an “in-home water supply.” There remains the possibility that even after accounting for the difference in cost, people’s demand for hauled water would be less than that for piped water, due to the heightened awareness of resource scarcity. To the extent that this difference exists we may have underestimated the project benefits.

<sup>3</sup>The demand curve was estimated using 2005 prices. Once Willingness to Pay was determined from the demand curve we adjusted the valued to 2007\$ using the CPI.

elasticity term to equation (5) and solved for an adjusted constant term, deriving equation (6) that was used to estimate Navajo benefits from water use.

$$(6) \text{ GPCD} = .021 * P^{-.840} * \text{HHY}^{.372}$$

where HHY = median household income

#### *a. NTUA Water Use*

About 60 percent of Navajo Reservation households obtain piped water supplied by the NTUA. Average annual consumption is about 100 gpcd [Foley]. Average household size is 4.5 persons per household [U.S. Census Bureau], which translates to an average monthly household water consumption of 13,500 gallons (100 x 4.5 x 30 = 13,500). NTUA charges \$2.20 per thousand gallons for the first 3,000 gallons per month and \$3.35 per thousand gallons for additional use [Navajo Tribal Utility Authority]. NTUA also levies a monthly service charge of \$5.50 for each hook-up. Given the average monthly household water use of 13,500 gallons the average monthly household water bill is \$47.28 (3 x \$2.20 + 10.5 x \$3.35 + \$5.50 = \$47.28). Dividing the monthly bill by average monthly water use gives an average price of \$3.502 per thousand gallons.

#### *b. Water Hauling*

About 40 percent of Navajo Reservation households do not have water piped to their homes [Navajo Department of Water Resources, 2000, p. ES-3]. These households instead haul water from NTUA distribution points, from wells, from vending machines, or from other water sources. Data from a recent survey indicates that Navajo households without a piped water supply haul an average of 5.4 gpcd [Ecosystem, 2003]. We used data for about 45 households from the same survey to estimate a delivered cost for hauled water. The delivered cost is necessary for the demand analysis so the cost for hauled water can be put in comparable terms to the cost for piped (delivered) water. We estimated four components of the delivered cost of hauled water: (1) purchase cost, (2) container cost, (3) transportation cost and (4) the opportunity cost of time.

Navajos hauling water pay a range of prices for water, from zero for water obtained from wells to as much as \$0.25 per gallon for water purchased from vending machines. The survey average price paid for water in 2003 was \$0.032 per gallon, or \$32.00 per thousand gallons [*Ibid.*]. We used the Consumer Price Index (CPI) to convert this cost to a January, 2005 cost of \$33.17 per thousand gallons.

The cost of sanitary containers used to haul water averaged \$35.00 per household in 2003 [*Ibid.*]. Indexed by the CPI to 2005\$ this cost is \$36.27. We assume that the containers are replaced annually. Given water use of 5.4 gpcd and 4.5 persons per household, the 2005 container cost is \$4.09 per thousand gallons ( $\$36.27 \text{ per container per year} / 5.4 \text{ gpcd} \times 4.5 \text{ persons per household} \times 365 \text{ days/year} = \$4.09 \text{ per thousand gallons}$ ).

The Ecosystem survey found that the average distance per hauling trip was 14 miles each way, for a 28 mile round trip [*Ibid.*]. We value the economic cost of transportation at the marginal cost for a light truck or van. This marginal cost includes both variable operating costs (gasoline, oil, tires, repairs, etc.), as well as additional vehicle depreciation associated with excess vehicle mileage. The variable operating costs are estimated to average \$0.1755 per mile [Victoria Transport Policy Institute, indexed to 2005\$ by CPI]. Additional depreciation was estimated to average \$0.1085 per mile [Kelly Blue Book]. Total marginal cost per mile is thus estimated at \$0.2840. The Ecosystem report adds 25% to average vehicle operating costs to allow for the use of more expensive than average vehicle maintenance and for extra costs due to rough roads. We have addressed the first issue by using data for light trucks instead of for automobiles. Our resulting costs per vehicle-mile may still be conservative because we have not made any allowance for extra costs due to rough roads. Given an average roundtrip mileage of 28 miles and average haulage of 173 gallons per load, transportation costs are estimated to be \$45.97 per thousand gallons ( $28 \text{ miles per load} \times \$0.2840 \text{ per mile} / 173 \text{ gallons per load} = \$45.97 \text{ per thousand gallons}$ ).

Finally, we estimated the value of the time spent by Navajos who haul water. While in a financial analysis we would value their time only at whatever monetary compensation was sacrificed in order to haul water, in an economic analysis such as this it is important to consider the implicit value that people hauling water place on their time. [see, eg., Asian

Development Bank]. Economists recognize that people place a value on their time, even if they are unemployed. While employment status may affect the magnitude of the value that water haulers place on their time it does not affect the principle that people generally put some positive value on the time they spend doing chores. The value of time is recognized repeatedly as people make choices that trade off money against time. A good example is the premium people pay for convenience food over food needing preparation.

The value of time spent in transit is an issue that is commonly addressed in studies of recreational values. Many such studies simply assume that time spent traveling to a recreation site has some value relative to the wage rate, typically 25% to 50%, regardless of the employment status of those traveling [Cesario, Smith, Chia-Yu, Bhat, Bowder, Loomis]. Some recreational studies have attempted to calculate the value of time in transit in comparison to the wage rate [Bockstael (one to three times the wage rate), Feather (6% to 100% of the wage rate), Larson (48% to 79% of the wage rate), Shaikh (65% to 90% of the wage rate)]. A few studies have tried to estimate directly the value of time spent to haul water [World Bank (52% of wage rate), Whittington (100% or more of wage rate)]. For purposes of this economic analysis we have assumed that Navajo people value their time hauling water at 50 percent of the minimum wage rate. A Navajo survey cited in the Ecosystems report found that average hauling time was 52 minutes. Doubling that to allow for a round trip and rounding up to allow for filling and emptying time we assume that each load takes 2 hours. At one-half of the 2005 New Mexico minimum wage of \$5.15 per hour and 173 gallons per load, the estimated opportunity cost per thousand gallons is \$29.77 per thousand gallons ( $\$5.15 \text{ per hour} \times \text{one-half} \times 2 \text{ hours/load} / 173 \text{ gallons/load} = \$29.77 \text{ per thousand gallons}$ ).

This approach implicitly assumes that the sole purpose of the trips is for water hauling. Unfortunately, the survey did not collect trip purpose information, so we assumed that water hauling was the primary purpose of each trip and that other trip purposes were incidental. Given the importance of water hauling and the relatively small window of time that each household may have to schedule trip when their water containers are nearing empty, this assumption may be generally reasonable.

The total economic cost for hauling water is the sum of the costs for purchasing water, purchasing containers, operating a vehicle and allowing for the opportunity cost of the time required. This sum is \$113.00 per thousand gallons ( $\$33.17 + \$4.09 + \$45.97 + \$29.77 = \$113.00$ )(2005\$).

We also contacted two commercial water haulers who were prepared to deliver water to Navajo households. Including the cost of a 1,000 gallon cistern (amortized over 25 years) the delivered cost of water averaged about \$133 (2005\$) per thousand gallons, about 20% higher than the \$113 per TG used in this analysis.

Note 2: The water use and cost per thousand gallons data for NTUA customers and for water haulers, described above, was used to estimate the a and b parameters in equation (4).

$$Q = a * P^b$$

$$\text{NTUA customers: } Q1 = 100, P1 = 3.502$$

$$\text{Water haulers: } Q2 = 5.4, P2 = 113.00$$

$$\ln Q = \ln(a) + b * \ln P$$

$$\text{NTUA customers: } \ln Q1 = 4.605, \ln P1 = -5.654$$

$$\text{Water haulers: } \ln Q2 = 1.686, \ln P2 = -2.180$$

$$b = \frac{\ln Q1 - \ln Q2}{\ln P1 - \ln P2} = -0.8402$$

$$\ln P1 - \ln P2$$

$$\ln a = \ln Q1 - b * \ln P1 = -0.1454$$

### *c. Navajo Without-Project Condition*

In the absence of the Project the Navajo Nation will continue to extend piped water service to a portion of its growing population, but for this analysis we assume that in the future the proportion of Navajos who haul water will remain at today's 40 percent. We also assume that without water from the Project and the economic growth facilitated by the Project that per capita water use among NTUA customers will remain at 100 gpcd into the foreseeable future.

*d. Navajo With-Project Condition*

The Project will deliver water to two different areas of the Navajo Reservation. The Cutter Lateral will convey water to a corridor of communities on the far eastern edge of the Navajo Reservation, eventually delivering water to the Jicarilla Apache Nation as well. We assume that this lateral will be operational by 2019.

A western lateral (San Juan Lateral) will convey water from the San Juan River directly south to Gallup, serving Navajo chapters along the way, with a branch that delivers water as far west as Window Rock and Fort Defiance. This analysis assumes that the section of this lateral that serves the Twin Lakes Chapter and is connected to the Chapters around Gallup will be completed by 2016. A well field will supply up to 2,000 acf to these chapters until the entire San Juan Lateral is completed in 2027.

For purposes of this economic analysis we assume that Project water will go first to NTUA customers to supplement their existing water supplies, and then to Navajos who would otherwise be hauling water. The reason is that the delivery infrastructure is already largely in place for NTUA customers but still needs to be constructed for water haulers. Because of the remote location for some water haulers we assume that 10 percent of today's Navajo population will continue to haul water despite implementation of the Project.

*e. Calculation of Project Benefits for the Navajo Nation*

The calculation of Project benefits accruing to the Navajo Nation is similar to that for the City of Gallup in that Willingness to Pay is measured by the area under a demand curve. We used the demand curve shown as equation (6) to estimate these benefits. We assume that household use for NTUA customers will increase from 100 gpcd to 130 gpcd, and that household water use for people who would otherwise haul water would increase from 5.4 gpcd to 130 gpcd. We further assume that an additional 22.5 gpcd will be used to support increased commercial activity and non-metered productive uses, such as community landscaping, construction and fire protection. A final 7.5 gpcd will go to other non-metered uses and losses. Benefits for NTUA customers were measured as the willingness to pay for supplemental water to increase per capita consumption from 100 gpcd to 130 gpcd. Benefits to commercial and other productive uses were assumed proportional to

residential uses, so the final benefit is 152.5/130 times the residential-only benefit. No benefits were counted for system losses and any other non-productive uses. Per capita benefits were calculated for each year of the 50-year Project life, multiplied by the projected population in that year, and discounted using the current federal discount rate of 4.875% per year. Based on this calculation, the estimated present value of benefits of the Project to the Navajo Nation is \$1,488 million (2007\$).

Note 3: The area under the demand curve was calculated by integrating equation (6) and solving for the area under the demand curve between the implicit price for projected water use without the project and the price at 130 gpcd water use with the project. This calculation is shown as equation (7).

$$(7) \text{ Area} = .021 * \text{HHY}^{.372} * (\text{P1}^{(1-.846)} - \text{P0}^{(1-.846)}) / (1-.846),$$

where Area = area under demand curve between P1 and P0

HHY = household income

P1 = price at 130 gpcd

P0 = price at base (without Project) per capita water use

Coefficients and exponents as estimated in equation (6)

The above calculation provides the area under the demand curve and to the right of the y-axis. Finally, to derive the economic benefits we adjust the above calculation to find the area below the demand curve but above the x-axis. This was done by subtracting the rectangle  $Q0 * (P1 - P0)$  and adding the rectangle  $P1 * (Q1 - Q0)$ . The calculations were done separately for water haulers and for NTUA customers because their respective base prices (P) and quantities of water use (Q) were different.

### 3. Jicarilla Apache Nation Willingness to Pay

The Jicarilla Apache Nation has long-term plans to develop the southwest area of their reservation, which is not presently populated. The Nation's development plans include

housing and commercial projects, and are contingent on securing a reliable and high-quality water supply for the area [Jicarilla Apache Nation].

***a. Basis for Estimating Benefits***

The absence of a population base for which to estimate Willingness to Pay for the Navajo Gallup Water Supply Project makes it difficult to use a demand function to estimate benefits for the Jicarilla Apache Nation as was done for the City of Gallup and the Navajo Nation. Moreover, much of the anticipated Project benefit is expected to come from the commercial enterprises facilitated by the new water supply, rather than from household use. Under these circumstances, coupled with the articulated tribal policy to develop this area, we believe it is appropriate to estimate Project benefits by comparing the cost of the Project to the most likely alternative means of supplying water to the area. This method is a proxy for willingness to pay insofar as it reflects the amount the Apache Nation is willing to pay to secure a water supply, and is also consistent with the approach recommended by the Water Resource Council's Principles and Guidelines [Water Resource Council, section 2.2.2].

***b. Jicarilla Without-Project Condition***

As discussed above, The Jicarilla Apache Nation has adopted a policy of developing the southwest area of their reservation, and in case the Navajo Gallup Water Supply Project is not approved, they have investigated alternative means of conveying water to this area. We reviewed the associated project construction and operating cost estimates provided to the Nation [Frick (September) and Frick (October)], and adjusted those cost estimates to be comparable to the estimated costs for the NGWSP. These adjustments include (1) updating the costs to January, 2007 dollar terms, (2) making consistent assumptions regarding unlisted items (10% of listed items), contingencies (22.5% of listed plus unlisted items), engineering (27% of listed plus unlisted items plus contingencies), and cultural resource investigations (4.2% of listed plus unlisted items plus contingencies), and (3) adding interest during construction at the current federal rate for project analysis of 4.875%. Following these adjustments, we calculate that the average of the high and low cost estimates for the Jicarilla Nation's alternative water supply project is approximately \$57 million (2007\$).

***c. Jicarilla With-Project Condition***

The Jicarilla Apache Nation would be full partners in the Navajo Gallup Water Supply Project. They would receive 1,200 afy through the Cutter Lateral, which is assumed to be operational by 2020. The costs for the Jicarilla Apache Nation are included in the construction cost estimates discussed below.

***d. Calculation of Project Benefits for Jicarilla Apache Nation***

The Jicarilla Apache Nation would receive Project benefits of \$57 million (2007\$), measured by the cost of constructing and operating an alternative water supply project, discussed in section b, above.

**4. Comparison of benefits per thousand gallons**

Because Project benefits were estimated for the three participants using separate analytical techniques we believe it useful to compare the per unit benefits for the participants. Table 4 shows that the benefits are in fact reasonably similar. This table shows only direct benefits and does not include regional benefits such as unemployment relief or health care efficiency improvement.

**Table 4**

**Comparison of Benefits per Thousand Gallons among Project Participants**

	<b>Navajo</b>	<b>Gallup</b>	<b>Jicarilla Apache</b>
Present Value of Benefits	\$1,488,000,000	\$361,000,000	\$57,000,000
Annualized Benefits	\$79,939,000	\$19,394,000	\$3,062,000
Levelized Water Use (TG/yr)	9,890,000	2,444,000	560,000
Benefits / TG	\$8.08	\$7.94	\$5.47

**5. Unemployment Relief Benefits – Construction Employment**

As discussed in section A.5, above, in an economic analysis the measured cost of employing labor is less than the wage rate if the labor would otherwise be unemployed. The Principles and Guidelines recognize this principle [Water Resource Council, section

2.11] and recommend applying a zero opportunity cost to construction phase labor that would otherwise be unemployed.

Unemployment is well above the national average in the Project area. Table 5 shows recent unemployment rates for the two counties and two Indian reservations in the Project area, as well as nationally. Most of the Project would be constructed on Navajo Reservation land to serve Navajo chapters, and we are assuming that a local hire rule encouraging Indian employment would be in effect. The very high unemployment rates on the Indian reservations clearly support the conclusion that much of the labor force used to construct the Project would come from the ranks of the otherwise unemployed.

**Table 5**

**Unemployment Rates in United States and Vicinity of Navajo Gallup Water Supply Project**

<b>Year</b>	<b>United States</b>	<b>San Juan County, NM</b>	<b>McKinley County, NM</b>	<b>Navajo Reservation</b>	<b>Jicarilla Apache Reservation</b>
1999	4.2%	7.5%	7.1%	34%	40%
2000	4.0%	5.8%	6.6%		
2001	4.7%	6.2%	6.2%	52%	33%
2002	5.8%	6.9%	6.2%		
2003	6.0%	7.6%	7.4%		
2004	5.5%	6.1%	7.6%		
2005	5.1%	5.5%	6.8%		
2006	4.8%	4.3%	5.6%		

Sources: National and county unemployment rates from U.S. Bureau of Labor Statistics, "Local Area Unemployment Statistics;" Reservation unemployment rates from U.S. Bureau of Indian Affairs, "American Indian Population and Labor Force Report," 1999 and 2001.

The Principles and Guidelines recommend that in an area of substantial and persistent unemployment and in the case of a local hire rule we assume for the economic analysis that 43% of skilled workers and 58% of unskilled workers be considered as otherwise unemployed during the construction phase of the Project [Water Resource Council, section 2.11.4]. We used an IMPLAN input-output model [IMPLAN, "Professional 2.0;"]

IMPLAN, “County Data”]to estimate the average earnings of workers needed for the Project, and used Bureau of Reclamation data to split the total earnings estimate between earnings for skilled and unskilled workers [U.S. Bureau of Reclamation, 1988]. We estimated the earnings for each year of construction, and accumulated interest during construction until the year of completion (2027) using the federal discount rate of 4.875%. The estimated present value (as of 2027) of the construction earnings going to otherwise unemployed persons is \$231 million (in 2007\$).

## **6. Other Project Benefits**

### ***a. Unemployment Relief Benefits – Secondary Employment***

The wages and salaries paid to area construction employees will in turn provide a substantial boost to the local economy, known as an “induced” impact. The Principles and Guidelines suggest that because of measurement and identification problems and because unemployment is regarded as a temporary phenomenon that a project analysis should only account for the benefits from employing construction labor and not the associated induced employment [Water Resource Council, section 2.11.2]. However, high unemployment levels have been persistent on both the Navajo and Jicarilla Apache reservations for generations, directly contrary to the “full employment economy” premise of the Principles and Guidelines [Water Resource Council, section 1.7.2(e)(3)]. We have therefore estimated the value of earnings going to otherwise unemployed people in the non-construction industries stimulated by local construction spending, particularly for labor. We used the same methodology as in estimating earnings of construction workers, except that we did not assume any local hiring preference and assume that only 30 percent of skilled workers and 47 percent of unskilled workers would be otherwise unemployed [Water Resources Council, p. 94]. The present value of wages in non-construction industries that will go to otherwise unemployed persons is estimated at \$111 million (in 2007\$)

***b. Health Benefits***

A primary rationale for the public policy of providing clean and reliable water to all people in the United States is the resulting health benefit. For example, Congress has found specifically for Indians that a “major national goal of the United States is to provide the quantity and quality of health services which will permit the health status of Indians to be raised to the highest possible level ...” [25 USC 1601], and that “the provision of safe water supply systems and sanitary sewage and solid waste disposal systems is primarily a health consideration and function,” and that “it is in the interest of the United States, and it is the policy of the United States, that all Indian communities and Indian homes, new and existing, be provided with safe and adequate water supply systems... as soon as possible.” [25 USC 1632].

There is a clear connection between sanitation facilities (water & sewerage) and Indian health. The Indian Health Service considers the availability of essential sanitation facilities to be “critical to breaking the chain of waterborne communicable disease episodes... In addition, many other communicable diseases, including hepatitis A, shigella, and impetigo are associated with the limited hand washing and bathing practices often found in households lacking adequate water supplies. This is particularly true for families that haul water” [Indian Health Service, 2004]. The Indian Health Service reports that American Indian families living in homes with satisfactory environmental conditions required about one-fourth the medical services as those with unsatisfactory environmental conditions [ibid.].

Benefits from an improved water supply will accrue both to consumers and providers of health care. The Navajo people will enjoy better health as a result of their access to a clean and reliable water supply. Their benefit should be reflected in their willingness to pay for water and is already addressed in that analysis. The Indian Health Service, which provides health care to the Navajos, will also experience a reduction in their cost of providing health care services as a result of the reduced case load from water-related illness. This efficiency improvement is the focus of the present section.

The Indian Health Service concludes that the average annual cost for medical care in the Shiprock-Gallup-Fort Defiance area that would be equivalent to the Federal Employees Health Plan is \$3,415 per person in 2007\$ [Indian Health Service, 2002, US BLS, 2007]. If even 10% of this cost could be saved by the provision of a clean piped water supply to those households who would otherwise haul water, that savings would amount to a present value of as much as \$11,000 per person for those people connecting to the Project by 2016, or \$5,400 per person for those connecting by 2030. The Navajo-Gallup Water Supply Project will ultimately provide water to over 100,000 people who would otherwise haul water, for an estimated total savings in medical expenses of over \$435 million over the life of the Project (in 2007\$).

*c. Increase in Economic Activity*

The entire project area and the Navajo Reservation in particular are characterized by persistent poverty and above national average unemployment rates [USDA; Table 4, supra]. Over 40 percent of Navajo families have income below the poverty level, compared with less than 10 percent nationwide [Navajo Division of Community Development, 2004, p. 22], and median income for Navajo households is less than one-half of the national average [Ibid.].

Provision of a clean, reliable water supply can serve to promote economic activity in the project area. International agencies recognize that not only is water an important factor of production in some industries (eg. cooling water in a power plant), but that investments in water infrastructure can also serve as a catalyst for more general development [Lenton, p. 129]. A recent study of foreign aid focused on short-term projects (eg. roads, irrigation systems, electricity generators and ports) concluded that every \$1 invested in short-term aid returned a present value of \$1.64 in increased output and income [Clemens]. Although the study objective was to estimate the effect from short-term aid the results also suggest “an important long-run positive impact on growth from long-term aid” (such as a water supply project)[Clemens, p. 41 and Table 5].

Two recent studies in the United States examined the extent to which development of water projects stimulated the regional economy. The first study investigated the effects

of dams on local economic growth and development by analyzing the effects on county income, employment, population and earnings [Aleseyed]. Control group counties were paired with counties with new water projects. The study concluded that large dam reservoirs had a statistically significant positive effect on growth in the local areas, with the strongest positive effects from non-flood control projects, and weaker effects from regions without a large city [Aleseyed, pp. 17-18].

The second study focused on the extent to which water and sewer projects can save and/or create jobs, spur private investment, attract government funds and enlarge the property tax base [Bagi]. The study found that “[e]very dollar spent in constructing an average water/sewer project generated almost \$15 of private investment, leveraged \$2 of public funds, and added \$14 to the local property tax base” [Bagi, p. 46]. In addition, the study found that many more permanent jobs were either saved or created by the project than the number of construction jobs needed to build the project [Bagi, p. 49].

It is difficult to forecast the extent to which the NGWSP will promote economic growth in the region. The evidence cited above, however, clearly indicates that we should expect a substantial regional economic stimulus from the project. The Anderson School of Management at University of New Mexico recently evaluated the economic impacts from the proposed San Juan River Settlement Agreement and related NGWSP [UNM]. Their report discusses state and level construction impacts, tax revenues, social benefits and the effect on the regional economy from improving the water supply. The report concludes that “improving the water infrastructure in economically depressed areas can be the catalyst for the development of small economic clusters such as those centered around manufacturing” [Ibid., p. 34]. The report also makes the important point that the NGWSP will increase the flexibility of water use in northern New Mexico [Ibid., pp. 38-9], thereby potentially increasing the economic efficiency of water use.

#### *d. Curtailment of Navajo Outmigration*

Finally, the Project may indirectly help reduce the outmigration of Navajo people. The improved economic climate facilitated by the Project will provide more employment opportunities for the minority and low-income populations. This increased employment

opportunity, together with an improved water infrastructure, will make the area more attractive for young adults who might otherwise consider moving outside the area. This impact is discussed in the companion report “Social Impacts from the Navajo-Gallup Water Supply Project.” [Merchant, 2007b]

## **D. Economic Costs**

The Project’s economic costs were estimated using the same principles as in estimating project benefits. The primary categories of Project costs include (1) Project construction costs, (2) distribution line construction costs, (3) operation, maintenance and replacement costs, (4) costs for water, (5) downstream effects on power generation, and (6) downstream effects on salinity.

### **1. Project Construction Cost**

In a companion report we estimated the total financial Project costs and the respective shares of cost for each of the three Project participants [Merchant, 2007a]. The total project capital cost before interest during construction (IDC) is estimated at \$865 million. Two adjustments of this number are necessary to derive the Project’s economic cost. First, as explained in section A.3, above, the \$53 million of taxes included in this total are transfer payments and should be excluded [Ibid.], leaving a net cost before taxes of \$812 million.

The second adjustment necessary is to add IDC to reflect the cost to the economy of tying up resources used during construction of the Project and before the project begins to deliver water and to provide benefits. We assume that Project construction would begin in 2011, full Project operation would begin in 2027, and we compound IDC to the completion date at the rate of 4.875% per year. IDC based on a pre-tax construction cost of \$812 million amounts to \$380 million [Ibid., adjusted to remove IDC on taxes]. The total economic construction cost is thus estimated at \$1,192 million. This IDC calculation and the associated 16-year construction schedule is assumed to be limited to

constant dollar construction funding of \$60 million per year (2007\$). If the funding level were sufficient to sustain an 8-year construction schedule IDC would be about \$185 million, less than one-half of the amount used in this report.

## **2. Distribution Line Construction Cost**

The Project construction cost includes all costs necessary to build the main laterals that would convey water to each participant. It also includes the costs for water treatment, pumping plants and storage tanks. However, it does not include the cost for the distribution lines needed to deliver water to each connection. Because the benefits were estimated based on the assumption that nearly all residents would have a piped water supply, it is important that the costs include whatever additional facilities are needed to provide those connections. Each of the three participants begin with different circumstances.

### ***a. City of Gallup***

The Project capital cost estimates for the City of Gallup already includes a substantial portion of the distribution system necessary to deliver water within the City and to the neighboring Navajo Chapters. Additional costs incurred by the City to hook up new customers are normally passed on to the customers by means of a connection fee. These costs will therefore be covered by the water users and will not be charged to the Project.

### ***b. Navajo Nation***

Recall that the “Without-Project” condition described in section B.2.c, above, is that even in the absence of the Project the Navajo Nation will continue to extend piped water service to about 60% of a growing population. The Project will deliver supplemental water to these people. The Project will also deliver water to most of the remaining 40%, who are those who would otherwise be hauling water. We have included a cost allowance to provide distribution systems for the Navajos who would otherwise haul water. We estimated the number of connections added per year for the life of the Project and calculated an annual Project cost using a cost of \$669 per connection [MSE-HKM, indexed for inflation]. These annual totals were discounted to 2027 using the federal discount rate of 4.875%. The total discounted cost amounts to \$48 million (2007\$).

### *c. Jicarilla Apache Nation*

Although the Jicarilla Apache Nation will incur some cost for distribution lines they would incur the same cost if they were to develop an alternative water supply in lieu of the Navajo Gallup Water Supply Project. Because the benefits included in the economic analysis are based only on the cost savings of this Project compared to other projects, the added cost of distribution lines does not affect the difference and should therefore not be included as either a Project cost or the cost of any alternative projects.

### **3. Operation, Maintenance and Replacement Cost**

The Project's annual operation, maintenance and replacement (O,M&R) costs were estimated for each year of the Project and discounted to the assumed initial year of full Project operation, 2027. These costs were estimated for both commercial (NTUA) power rates and Colorado River Storage Project rates. A financial analysis would use whichever rates were ultimately charged to the Project. However, an economic analysis from the perspective of the federal government would use the market rate regardless of whether the Project qualified for a concessionary rate since the market rate presumably reflects the value to the Nation of power. (see discussion in section A.1, above). We therefore used the NTUA rates to determine the economic cost of Project O,M&R. This cost is \$368 million [Merchant, 2007a].

### **4. Cost of Water**

An economic analysis should address the cost of the water dedicated to the Project. While a financial analysis would consider only the actual payments for water an economic analysis evaluates the opportunity cost of water even in the absence of financial payments (see discussion in section A.6, above). The relevant perspective for the opportunity cost is that of the water rights holder because the uses of water are limited to whatever opportunities are available to whoever owns the water. The analysis is different for all three Project participants.

*a. City of Gallup*

The City of Gallup does not presently hold the water rights for its intended Project use. The City is negotiating with the Jicarilla Apache Nation and presumably will reach an arms length agreement to appropriately compensate the Jicarilla for Gallup use of Jicarilla water. This cost will reflect the market conditions for water and should offer a fair assessment of the opportunity cost of water for the Jicarillas. Pending completion of the negotiations we have assumed an annual price of \$110 per acre foot during Project operation, plus an option fee to hold the water until the Project is completed, which together have a present value over the life of the Project of \$33 million.

*b. Navajo Nation*

Absent a water rights settlement providing other terms, the Navajo Nation will pay an estimated \$4.12 per acre-foot for their non-agricultural use of water from Navajo Reservoir. This cost represents a financial cost to the Navajos, but because it is based on historical investment costs and not a current use of resources it is not an economic cost. The relevant economic cost is the lowest-returning opportunity available to the Navajos that would be displaced by dedicating water to the Project. For the Navajos we assume that this opportunity is probably growing irrigated alfalfa. We used New Mexico Cooperative Extension Service crop budgets [Libbins] and New Mexico Agricultural Statistics [New Mexico Agricultural Statistics Service] to estimate the returns to water used in growing alfalfa. The expected annual average return is \$178 per acre in 2007\$. Assuming 4 afy are diverted to grow each acre of alfalfa the opportunity cost for each acre-foot is \$45. The present value of the opportunity cost for the 28,900 afy of average Project water use is thus estimated at \$26 million in 2007\$.

*c. Jicarilla Apache Nation*

Although the Jicarilla Apache Nation will incur some opportunity cost for dedicating some of their water supply to the Project, the Jicarilla Nation would incur the same opportunity cost if they were to develop an alternative water supply besides the Navajo Gallup Water Supply Project. Because the benefits included in the economic analysis are based only on the cost savings of this Project compared to other projects, the added water

opportunity cost does not affect the difference and should therefore not be included as either a Project cost or the cost of any alternative projects.

## **5. Other Project Costs**

The Project will have some effect on downstream water users (externalities). These effects include a reduction in Colorado River power generation and increases in Colorado River salinity. Similar downstream effects would result from any depletion in the Upper Colorado River Basin. Because the Project water use will be within the scope of the water rights held (or leased) by Project participants, the participants can legitimately deplete water without regard to the impact on lower priority users. And since there is no mechanism for Lower Basin users (who would be most impacted by any increase in salinity) to compensate Upper Basin water rights holders for not using water, the Upper Basin water users have no financial opportunity cost that recognizes the impact of their water use on Lower Basin users. From a national perspective, however, we should recognize the broader effect of Upper Basin water rights holder exercising their water rights.

### ***a. Loss in Electrical Power Revenues***

Water diverted for the Project from the San Juan River will deplete Lake Powell inflow. This depletion could have a range of impacts on power generation at Glen Canyon Dam, depending on total flows into Lake Powell and on total water use in the Upper Basin. The Upper Basin is obligated to release a minimum amount of water from Lake Powell for the benefit of Lower Basin and Mexico users of the Colorado River. Diversions for the Navajo-Gallup Water Supply Project will not relieve the Upper Basin from this obligation, so at one extreme the total releases from Lake Powell may not change. On the other hand, until the Upper Basin uses its full water allocation and during periods of above-normal nature runoff in the Upper Basin, the Upper Basin may release more than its obligated minimum from Lake Powell. Under these circumstances the depletion from the Navajo-Gallup Water Supply Project will cause a reduction in power generation at Glen Canyon Dam. In order to determine the maximum impact of the Navajo-Gallup Project we have estimated the cost of diminished power generation under the second set of assumptions.

The estimated average flow of the Navajo-Gallup Water Supply Project will reach 51.94 cfs [Merchant]. A Bureau of Reclamation study reports that the power generation lost at Glen Canyon Dam amounts to .0408 MW/cfs [U.S. Bureau of Reclamation, 2000b], so the total capacity lost due to the Project would be 2.12 MW. At 8,760 hours per year the total electrical energy lost would be 18,563 MWh. We valued this lost energy at its estimated replacement cost of 55.68 mills per kwh (2007\$) [Energy Information Administration, p. 78]. At the federal discount rate of 4.875% the present value of these lost power benefits over the 50 year Project life is estimated to be \$19 million.

### *b. Downstream Salinity Effects*

The Navajo-Gallup Water Supply Project will have two effects on downstream salinity. First, the Project depletions will diminish the flow of relatively high quality water into Lake Powell, raising the average total dissolved solids (TDS) of Lake Powell inflows by an estimated approximately 0.7 mg/L. Second, the Project will produce some return flow that would enter Lake Powell. This return flow is higher in TDS than the average inflow and would raise the average TDS by an estimated about 0.8 mg/L [U.S. Bureau of Reclamation, 2004; Leach]. The total increase in TDS will thus be about 1.5 mg/L.

The cost of this 1.5 mg/L increase in salinity is the lesser of two factors. First, the Bureau of Reclamation has estimated that in 2000 the annual cost to Lower Basin water users for each 1.0 mg/L increase in salinity is about \$2,500,000 [U.S. Bureau of Reclamation, 2000a]. Updating this cost to 2007\$ [U.S. Bureau of Labor Statistics, CPI] and applying it to the 1.5 mg/L increase converts to an annual cost of \$4,000,000. The second factor is the cost of mitigating the increase in salinity. The Bureau of Reclamation is actively soliciting proposals from Colorado Basin water users to reduce the salinity load of the Colorado River. The average cost of this program is less than one-quarter of the cost of tolerating increased salinity loads [[U.S. Bureau of Reclamation, 2003]. The annual cost to mitigate the salinity increase due to the Project would therefore be about \$1,000,000. The present value of these mitigation costs over the 50 year Project life would be about \$20 million (2007\$) (again applying the federal discount rate of 4.875%).

## E. Benefit – Cost Summary

Table 6 summarizes the estimated benefits and costs from the Navajo-Gallup Water Supply Project.

**Table 6**  
**Summary of Navajo-Gallup Water Supply Project Economic Benefits and Costs**  
**(4.875% discount rate, 50 year project life)**  
**Millions 2007\$**

<i><b>BENEFITS</b></i>	<b>Direct</b>	<b>Direct plus Other</b>
Gallup Willingness to Pay	361	361
Navajo Willingness to Pay	1,488	1,488
Jicarilla Avoided Cost	57	57
Construction Employment	231	231
Induced Employment	-	111
Health Benefits	-	435
<i><b>Total Benefits</b></i>	2,137	2,683
<i><b>COSTS</b></i>		
Project Construction	1,192	1,192
Distribution System Construction	48	48
O,M&R	368	368
Gallup Water Cost	33	33
Navajo Water Cost	24	24
Power Generating Cost	19	19
Salinity Increase Cost	20	20
<i><b>Total Costs</b></i>	1,704	1,704
<b>BENEFIT/COST RATIO</b>	<b>1.25</b>	<b>1.57+</b>

## F. Discount Rate Sensitivity Analysis

Federal legislation requires an annual determination of a discount rate to be used by federal agencies in water resources planning. During fiscal year 2007 the federal rate is 4.875% [U.S.

Bureau of Reclamation, 2006]. This federal rate is a constrained, lagged, nominal (includes inflation) rate computed annually from U.S. Treasury security yields. The rate is constrained because it cannot move more than .25% per year regardless of how much market interest rates move between consecutive years. The rate is then rounded to the nearest one-eighth of one percent. Absent these constraints the 2007 rate would be 4.9351% [Ibid.]. The rate is lagged because it reflects *average* yields on marketable securities with a term of 15 years or more, not just the most recent yields on securities. The rate is nominal because no effort has been made to subtract the expected inflation that is built into the rate (lenders always ask for a premium above a real or inflation-free interest rate to compensate them for the expected loss in purchasing power that is caused by future inflation).

This federal rate is not well suited to cost-benefit analysis because its use violates a fundamental economic principle, *viz.* consistent treatment of inflation in both the discount rate and the estimation of future benefits and costs. The federal rate is based on nominal (inflation-including) rates because it does not attempt to adjust market rates for the expected inflation that is implicitly built into the rates. On the other hand, the federal rate is not an accurate measure of current nominal rates, either, because the rate is both lagged and constrained, as explained above.

In keeping with the Principles and Guidelines [Water Resources Council, section 1.4.10] all of the future costs and benefits for the Navajo-Gallup Water Supply Project have been estimated in constant 2007 price levels. To maintain consistency these constant dollar prices should be discounted at a rate that also assumes constant price levels, and as explained above, the federal rate does not meet that condition.

The real (net of inflation) cost of long-term federal funds is in the range of 2.0% to 4.0% per year. The Office of Management and Budget, for example, concludes that the real rate on 10-year bonds is 2.8% and the real rate on 30-year bonds is 3.5% [OMB]. For the purpose of evaluating the sensitivity of the benefit cost analysis results to the level of the discount rate we have recomputed all costs and benefits using a real discount rate of 3%. The results of this analysis are shown in Table 7.

Table 7 shows that using a real discount rate of 3% significantly increases the Benefit/Cost

ratio. The lower rate increases the importance of future events (predominantly benefits) relative to the near term events (predominantly costs), resulting in the increased ratio of benefits to costs.

**Table 7**  
**Summary of Navajo-Gallup Water Supply Project Benefits and Costs**  
**(3% discount rate, 50 year project life, millions 2007\$)**

<b>BENEFITS</b>	Direct	Direct Plus Other
Gallup Willingness to Pay	\$596	\$596
Navajo Willingness to Pay	\$2,137	\$2,137
Jicarilla Avoided Cost	\$58	\$58
Construction Employment	\$199	\$199
Indirect and Induced Employment	\$0	\$95
Health Benefits	\$0	\$630
<b><i>Total Benefits</i></b>	<b>\$2,990</b>	<b>\$3,715</b>
<b>COSTS</b>		
Project Construction	\$1,026	\$1,026
Distribution System Construction	\$53	\$53
O,M&R	\$486	\$486
Gallup Water Cost	\$38	\$38
Navajo Water Cost	\$34	\$34
Power Generating Cost	\$27	\$27
Salinity Increase Cost	\$27	\$27
<b><i>Total Costs</i></b>	<b>\$1,691</b>	<b>\$1,691</b>
<b>BENEFIT/COST RATIO</b>	<b>1.77</b>	<b>2.20</b>

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APPENDIX A DATA USED TO ESTIMATE WATER DEMAND FUNCTION									
City	State	1999 GPCD	1999 HH Inc	HH size	Cost/ 1000 gal.	In GPCD	In HH Inc	In HH size	In Cost
Camp Verde	AZ	80	\$31,868	2.57	\$6.88	4.382	10.369	0.944	1.929
Flagstaff	AZ	122	\$37,146	2.59	\$3.07	4.804	10.523	0.952	1.122
Page	AZ	141	\$46,935	3.26	\$2.01	4.950	10.757	1.182	0.700
Payson, AZ	AZ	95	\$33,638	2.25	\$4.20	4.554	10.423	0.811	1.434
Prescott Valley	AZ	99	\$34,341	2.53	\$3.36	4.591	10.444	0.928	1.212
Show Low	AZ	126	\$32,356	2.85	\$6.35	4.836	10.385	1.047	1.848
Brighton	CO	137	\$46,779	2.81	\$3.09	4.918	10.753	1.033	1.127
Broomfield	CO	142	\$63,903	2.82	\$2.62	4.955	11.065	1.037	0.965
Brush	CO	282	\$31,333	2.48	\$2.59	5.641	10.352	0.908	0.950
Canon City	CO	347	\$31,736	2.26	\$1.97	5.850	10.365	0.815	0.677
Delta	CO	161	\$27,415	2.27	\$2.65	5.084	10.219	0.820	0.974
Durango	CO	225	\$34,892	2.37	\$1.51	5.416	10.460	0.863	0.414
Englewood	CO	192	\$38,943	2.18	\$1.69	5.257	10.570	0.779	0.523
Estes Park	CO	221	\$43,262	2.27	\$2.73	5.397	10.675	0.820	1.004
Federal Heights	CO	109	\$33,750	2.72	\$2.71	4.690	10.427	1.001	0.996
Fort Morgan	CO	313	\$33,128	2.54	\$1.52	5.746	10.408	0.932	0.417
Golden	CO	198	\$49,115	2.22	\$2.65	5.289	10.802	0.798	0.973
Grand Junction	CO	136	\$33,152	2.15	\$2.34	4.915	10.409	0.765	0.850
Gunnison	CO	167	\$25,768	2.21	\$1.40	5.119	10.157	0.793	0.334
La Junta	CO	289	\$29,002	2.56	\$0.87	5.668	10.275	0.940	-0.137
Lamar	CO	193	\$28,660	2.58	\$1.34	5.264	10.263	0.948	0.293
Louisville	CO	198	\$69,945	2.65	\$2.31	5.287	11.155	0.975	0.836
Montrose	CO	173	\$33,750	2.29	\$2.47	5.152	10.427	0.829	0.906
Northglenn	CO	123	\$48,276	2.78	\$2.52	4.813	10.785	1.022	0.924
Sterling	CO	207	\$27,337	2.33	\$1.10	5.335	10.216	0.846	0.097
Alamagordo	NM	185	\$30,928	2.57	\$1.63	5.220	10.339	0.944	0.488
Aztec	NM	98	\$33,110	2.69	\$2.76	4.583	10.408	0.990	1.014
Belen	NM	275	\$26,754	2.79	\$1.63	5.617	10.194	1.026	0.489
Bernalillo	NM	151	\$30,864	3.06	\$2.37	5.019	10.337	1.118	0.863
Carlsbad	NM	296	\$30,658	2.51	\$1.55	5.690	10.331	0.920	0.441
Clovis	NM	156	\$28,878	2.57	\$2.52	5.050	10.271	0.944	0.924
Deming	NM	195	\$20,081	2.65	\$0.55	5.273	9.908	0.975	-0.597
Farmington	NM	214	\$37,663	2.81	\$2.14	5.366	10.536	1.033	0.762
Gallup	NM	172	\$34,868	2.85	\$2.48	5.147	10.459	1.047	0.909
Hobbs	NM	72	\$28,100	2.87	\$1.43	4.272	10.244	1.054	0.357
Las Cruces	NM	135	\$30,375	2.83	\$1.71	4.904	10.321	1.040	0.537
Los Alamos	NM	197	\$71,536	2.31	\$4.22	5.283	11.178	0.837	1.439
Portales	NM	250	\$24,658	2.51	\$1.40	5.521	10.113	0.920	0.335
Rio Rancho	NM	184	\$47,169	2.70	\$2.42	5.215	10.761	0.993	0.883
Santa Fe	NM	166	\$40,392	2.20	\$3.91	5.112	10.606	0.788	1.364
Socorro	NM	110	\$20,728	2.58	\$3.42	4.700	9.939	0.948	1.230
Tucumcari	NM	123	\$22,560	2.40	\$2.65	4.808	10.024	0.875	0.976
Boulder City	NV	251	\$50,523	2.41	\$1.41	5.525	10.830	0.880	0.346
Elko	NV	700	\$48,608	2.62	\$0.30	6.551	10.792	0.963	-1.207
Fallon	NV	240	\$35,935	2.40	\$0.63	5.481	10.489	0.875	-0.468
Mesquite	NV	152	\$40,392	3.16	\$1.88	5.024	10.606	1.151	0.631
Alpine	UT	134	\$72,880	4.51	\$1.60	4.901	11.197	1.506	0.473
American Fork	UT	186	\$51,955	3.74	\$1.00	5.228	10.858	1.319	0.002

Brigham City	UT	203	\$42,335	3.18	\$0.91	5.315	10.653	1.157	-0.090
Centerville	UT	101	\$64,818	3.83	\$1.76	4.618	11.079	1.343	0.565
Clinton	UT	97	\$53,909	3.91	\$1.22	4.571	10.895	1.364	0.195
Grantsville	UT	167	\$45,614	3.20	\$1.83	5.115	10.728	1.163	0.605
Heber	UT	183	\$45,394	2.96	\$1.08	5.208	10.723	1.085	0.073
Holliday	UT	278	\$66,468	2.91	\$1.22	5.628	11.104	1.068	0.199
Midvale	UT	388	\$40,130	2.56	\$0.57	5.962	10.600	0.940	-0.562
Murray	UT	263	\$45,569	2.66	\$1.05	5.571	10.727	0.978	0.051
North Logan	UT	120	\$49,154	3.90	\$1.94	4.787	10.803	1.361	0.661
North Salt Lake	UT	219	\$47,052	3.14	\$1.23	5.391	10.759	1.144	0.209
Park City	UT	224	\$65,800	2.50	\$1.39	5.413	11.094	0.916	0.331
Pleasant Grove	UT	18	\$52,036	3.83	\$9.14	2.891	10.860	1.343	2.213
Price	UT	131	\$31,687	2.85	\$2.93	4.874	10.364	1.047	1.073
Riverdale	UT	326	\$44,375	2.78	\$0.36	5.788	10.700	1.022	-1.021
Riverton	UT	183	\$63,980	4.14	\$1.19	5.211	11.066	1.421	0.177
South Jordan	UT	216	\$75,433	4.39	\$1.31	5.376	11.231	1.479	0.270
Spanish Fork	UT	156	\$48,705	3.39	\$1.29	5.052	10.794	1.221	0.257
Springville	UT	223	\$46,472	3.28	\$0.96	5.408	10.747	1.188	-0.038
Sunset	UT	176	\$41,726	2.95	\$1.02	5.168	10.639	1.082	0.021
Tremonton	UT	196	\$44,784	3.12	\$1.24	5.276	10.710	1.138	0.214
Washington	UT	201	\$35,341	3.29	\$0.83	5.301	10.473	1.191	-0.182
Cody	WY	74	\$34,450	2.38	\$5.41	4.309	10.447	0.867	1.688
Douglas	WY	247	\$36,944	2.66	\$2.10	5.511	10.517	0.978	0.740
Evanston	WY	234	\$42,019	2.99	\$1.69	5.456	10.646	1.095	0.522
Lander	WY	121	\$32,397	2.48	\$3.06	4.798	10.386	0.908	1.117
Powell	WY	131	\$27,364	2.41	\$4.07	4.877	10.217	0.880	1.405
Rawlins	WY	419	\$36,600	2.60	\$0.34	6.037	10.508	0.956	-1.092
Riverton	WY	190	\$31,531	2.58	\$2.24	5.249	10.359	0.948	0.806
Rock Springs	WY	92	\$42,584	2.66	\$11.24	4.523	10.659	0.978	2.419
Sheridan	WY	177	\$31,420	2.31	\$1.94	5.175	10.355	0.837	0.664
Worland	WY	95	\$31,447	2.63	\$2.53	4.556	10.356	0.967	0.926

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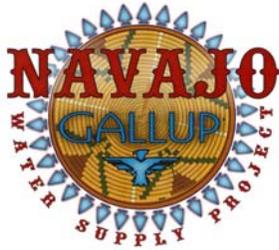
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Dornbusch Associates, telephone interviews.

Utah Department of Environmental Quality, Division of Drinking Water, "1999 Survey of Community Drinking Water Systems," 2000.

Wyoming Water Development Commission, "1998 Water System Survey Report," 1998.

<b>APPENDIX B - SUMMARY OUTPUT FROM REGRESSION</b>					
<b><i>Regression Statistics</i></b>					
Multiple R	0.8028				
R Square	0.6445				
Adjusted R Square	0.6303				
Standard Error	0.2961				
Observations	79				
<b>ANOVA</b>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	11.9214	3.9738	45.3229	0.0000
Residual	75	6.5758	0.0877		
Total	78	18.4972			
<b>Coefficients</b>					
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	
Intercept	2.9126	1.2897	2.2583	0.0268	
Household Income	0.3716	0.1325	2.8051	0.0064	
Household Size	-1.3483	0.2374	-5.6802	0.0000	
Cost of Water	-0.5538	0.0509	-10.8778	0.0000	



## APPENDIX D

*Part III*

Financial and Repayment Analysis

**FINANCIAL AND REPAYMENT ANALYSIS  
NAVAJO – GALLUP WATER SUPPLY PROJECT**

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**October 2, 2007**

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## I. Executive Summary

This report is one of a series of reports concerning economic issues pertaining to the Navajo Gallup Water Supply Project. While another report addresses the *economic* benefits and costs of the Project, this report deals with the Project's *financial* or cash costs. Specifically, the report discusses the capital costs, operation, maintenance and replacement costs, cost of water, and non-Project cash costs that each participant must pay to deliver water to their users. The costs are averaged over the projected water deliveries during the life of the Project to determine a levelized cost, or the constant cost (in 2007\$) per thousand gallons that would repay all Project costs if charged on all Project deliveries. Table EX-1 shows this levelized cost for all participants.

<b>Table EX-1</b>				
<b>NAVAJO-GALLUP WATER SUPPLY PROJECT</b>				
<b>SUMMARY OF LEVELIZED COST / THOUSAND GALLONS</b>				
<b>Federal Financing at 4.875%, NTUA Rates for Energy, 2007\$</b>				
	<b>Navajo</b>	<b>Gallup</b>	<b>Jicarilla</b>	<b>Project Total</b>
<b>Total Levelized Cost</b>	<b>\$7.12</b>	<b>\$9.32</b>	<b>\$9.35</b>	<b>\$7.57</b>

Several federal programs are available to assist in financing rural and small community water projects. The Department of Agriculture and Environmental Protection Agency both have programs that distribute annual appropriations to qualifying projects. Unfortunately, neither program appears to be a good fit for the Navajo Gallup Water Supply Project.

Although the Bureau of Reclamation has no program to distribute annual appropriations to projects it is designated by Congress to assist in planning, constructing and funding water projects that are specifically approved by legislation. We conducted a review of the capital costs of other projects that have either been approved by Congress or are in the planning stages. The Navajo Gallup Water Supply Project capital costs per person served and per acre-foot delivered are both at the lower end of the range represented by these other projects. When the available information on annual operation and maintenance costs are included, Navajo-Gallup Water Supply Project is still within the range of other western U.S. projects, but at the upper end.

Some agency funding programs assess the affordability of community Project costs, and often the programs will provide more assistance if the costs exceed some threshold of affordability. The most common measure of affordability is cost as a percent of median household income, and by that measure the operation, maintenance and water costs for all three Project participants would fall below the EPA threshold, but exceed that threshold once all Project capital costs are added.

## II. Introduction

This report focuses on the *financial* costs of the Navajo Gallup Water Supply Project and how those costs might be paid. The report is a companion to three other reports that address different economic aspects of the Project: (1) “Navajo-Gallup Water Supply Project, Allocation of Capital and OM&R Costs Among Project Participants, San Juan River – PNM Alternative,” (2) “Economic Benefit/Cost Analysis, Navajo-Gallup Water Supply Project,” and (3) “Navajo-Gallup Water Supply Project, Socioeconomic Impacts.”

The financial analysis estimates the cash cost of the Project and determines what the overall cost per thousand gallons would be for Project participants, under different financing scenarios. The financing alternatives considered include various assumptions about the degree to which the Project may be subsidized by the federal government.

## III. Financial Analysis of Project Costs

### A. Financial costs

In this report the term “financial analysis” refers to the compilation of Project cash costs assigned to the Project participants. The financial analysis differs from the economic analysis in the “Economic Benefit/Cost Analysis” report in two important respects. First, the financial analysis focuses on cash flow, excluding non-cash costs such as the opportunity cost of Project water used by the Navajo Nation and Jicarilla Apache Nation, and including cash costs that do not represent a use of economic resources, such as the projected Project-associated tax expenditures. Second, the financial analysis focuses on the projected costs incurred by the Project participants, excluding costs that may be borne by non-participants, such as the loss of downstream power generation capability. Please refer to Chapter B of the “Economic Benefit/Cost Analysis” report [Merchant, 2007b] for a more complete discussion of the differences between the financial and economic analysis frameworks.

### B. Project financial costs

#### 1. Capital costs

The Project’s financial costs include both costs for (1) the main system of pipelines, treatment plants and storage tanks, and (2) the facilities build in and around Gallup to distribute Project water. The total cost for these facilities is expected to be \$865 million (2007\$). In addition, because most of the capital investment will be incurred before Project completion, interest during construction will add an additional \$404 million (2007\$) for which Project participants will also be responsible, assuming full repayment of Project costs. These costs include all construction, right-of-way acquisition, environmental mitigation, cultural resource investigations and taxes [Merchant, 2007a].

The estimated Project construction and interest costs are translated to a constant annual amount by amortizing those costs over the anticipated life of the Project using the current federal discount rate for water projects of 4.875% per year. Then the annual amortized amount is divided by the annual equivalent amount of water deliveries to determine the levelized rate per thousand gallons needed to repay those costs. In this report the term “levelized cost” refers to a constant rate per thousand gallons (in 2007\$), which if applied to all water delivered would repay the capital, interest, OM&R, water and other utility costs over the life of the Project.<sup>1</sup> This rate is calculated by discounting the costs to be paid and all water to be delivered by the same discount rate (4.875% in this report), and dividing the first by the second. Table 1 shows how the levelized rate to repay capital costs is calculated.

<b>Table 1</b>				
<b>NAVAJO-GALLUP WATER SUPPLY PROJECT</b>				
<b>LEVELIZED CAPITAL COST / THOUSAND GALLONS</b>				
<b>50 year Project Life, Federal Financing at 4.875%, 2007\$</b>				
	<b>Navajo</b>	<b>Gallup</b>	<b>Jicarilla</b>	<b>Project Total</b>
<b>Present Value of Capital Costs</b>	\$995,000,000	\$227,000,000	\$47,000,000	\$1,269,000,000
<b>Annual Amortization of Capital Costs</b>	\$53,453,671	\$12,194,958	\$2,524,947	\$68,173,576
<b>Annual Equivalent Water Deliveries (1,000 gal.)</b>	9,889,759	2,443,890	560,120	12,893,770
<b>Levelized Cost/Thousand Gallons</b>	\$5.40	\$4.99	\$4.51	\$5.29

## 2. Operation, Maintenance and Replacement (OM&R) costs

Following its construction, the Project will incur both fixed and variable OM&R costs. The fixed costs include staff salaries, intake dredging, annual maintenance and equipment replacement. Variable costs include energy and chemical costs. The distinction is important because while the fixed costs are assumed constant (in 2007\$) over time, the variable costs will increase in conjunction with increases in water use. We calculate the total present value of the Project’s OM&R costs to be \$365 million (2007\$), using a 4.875% discount rate and energy rates provided by the Navajo Tribal Utility Authority.

Table 2 shows how this OM&R cost is allocated among project participants and calculates the levelized rate needed to pay this cost.

<sup>1</sup> Levelized cost is calculated by dividing the present value of costs by the levelized annual water delivery. The levelized annual water delivery is that constant annual delivery of water that over the 50 year project life has the same present value as the anticipated actual water deliveries (which may change over time and in some cases begin before the 50 year project period).

<b>Table 2</b>				
<b>NAVAJO-GALLUP WATER SUPPLY PROJECT</b>				
<b>LEVELIZED O,M&amp;R COST / THOUSAND GALLONS</b>				
<b>NTUA Rates for Energy, 50 year Project Life, 4.875%, 2007\$</b>				
	<b>Navajo</b>	<b>Gallup</b>	<b>Jicarilla</b>	<b>Project Total</b>
<b>Present Value of O,M&amp;R Costs</b>	\$273,592,000	\$68,018,000	\$23,717,000	\$365,327,000
<b>Annual Amortization of O,M&amp;R Costs</b>	\$14,697,987	\$3,654,082	\$1,274,131	\$19,626,200
<b>Annual Equivalent Water Deliveries (1,000 gal.)</b>	9,889,759	2,443,890	560,120	12,893,770
<b>Levelized Cost/Thousand Gallons</b>	\$1.49	\$1.50	\$2.27	\$1.52

### 3. Cost of water

Both the Navajo Nation and the Jicarilla Apache Nation presently have rights to water they intend to use in the Project. The terms of the Jicarilla Water Rights Settlement Act exempt the Jicarillas from paying any cash cost for water from Navajo Reservoir, the source for Project water. In the absence of a similar settlement the Navajo Nation will pay a levelized cost to the Bureau of Reclamation estimated to be \$4.12 per acre-foot. The City of Gallup will have to pay for obtaining water from a water rights owner. The present value of a tentative purchase arrangement is \$33 million (2007\$). Table 3 shows how this cost translates to the levelized rate needed to cover the projected payments for water.

<b>Table 3</b>				
<b>NAVAJO-GALLUP WATER SUPPLY PROJECT</b>				
<b>LEVELIZED WATER COST / THOUSAND GALLONS</b>				
<b>50 year Project Life, Federal Financing at 4.875%, 2007\$</b>				
	<b>Navajo</b>	<b>Gallup</b>	<b>Jicarilla</b>	<b>Project Total</b>
<b>Present Value of Water Costs</b>	\$3,300,617	\$32,605,398	\$0	\$35,906,016
<b>Annual Amortization of Water Costs</b>	\$177,317	\$1,751,636	\$0	\$1,928,953
<b>Annual Equivalent Water Deliveries (1,000 gal.)</b>	9,889,759	2,443,890	560,120	12,893,770
<b>Levelized Cost/Thousand Gallons</b>	\$0.02	\$0.72	\$0.00	\$0.15

#### 4. Continuing utility costs

The Navajo Nation, the City of Gallup and the Jicarilla Apache Nation will all incur costs separate from the Project to build distribution systems and/or operate their water systems. These costs will presumably be paid by the customers of each utility, and the costs are therefore appropriate to include in future rate calculations. The Navajo costs include the amortized cost of constructing distribution lines to deliver the Project water to various Navajo Chapters. Gallup costs are those costs to operate the City system that will continue even after the Project is constructed. These Gallup costs do not include the cost of operating wells that will be shut down when the Project begins delivering water. The Jicarilla costs included here are those needed to construct and operate a distribution system serving the commercial and residential (not industrial) users of their water allocation. Table 4 summarized these other costs and calculates the levelized rate needed to pay them.

	Navajo	Gallup	Jicarilla	Project Total
<b>Annual Amount of Other Costs - Capital</b>	\$2,041,000		\$269,000	\$2,310,000
<b>Annual Amount of Other Costs - O&amp;M</b>		\$5,183,284	\$150,000	\$5,333,284
<b>Annual Equivalent Water Deliveries (1,000 gal.)</b>	9,889,759	2,443,890	162,926	12,496,575
<b>Levelized Cost/ TG - Capital</b>	\$0.21		\$1.65	\$0.18
<b>Levelized Cost/ TG - O&amp;M</b>		\$2.12	\$0.92	\$0.43

Note: Jicarilla other costs are for commercial and residential users only

#### 5. Summary of levelized rate

Table 5 summarizes the various cost components for each participant and for the Project as a whole, and shows the levelized rate per thousand gallons needed to pay all the financial costs.

<b>Table 5</b>				
<b>NAVAJO-GALLUP WATER SUPPLY PROJECT</b>				
<b>SUMMARY OF LEVELIZED COST / THOUSAND GALLONS</b>				
<b>50 year Project life, Federal Financing at 4.875% and NTUA Rates for Energy, 2007\$</b>				
	<b>Navajo</b>	<b>Gallup</b>	<b>Jicarilla</b>	<b>Project Total</b>
<b>Capital Cost</b>	\$5.40	\$4.99	\$4.51	\$5.29
<b>OM&amp;R Cost</b>	\$1.49	\$1.50	\$2.27	\$1.52
<b>Water Cost</b>	\$0.02	\$0.72	\$0.00	\$0.15
<b>Other Cost - Capital</b>	\$0.21	\$0.00	\$1.65	\$0.18
<b>Other Cost - O&amp;M</b>	\$0.00	\$2.12	\$0.92	\$0.43
<b>Total Cost</b>	<b>\$7.12</b>	<b>\$9.32</b>	<b>\$9.35</b>	<b>\$7.57</b>

#### **IV. Federal and State Programs Available to Assist in Project Financing**

Many water projects in the rural West have been funded through government programs, both federal and state. The eligibility criteria for Indian tribes generally differ from those for non-Indian projects, so the two cases will be discussed separately.

##### **A. Non-Tribal Water Supply Projects**

The United States Department of Agriculture (USDA), Environmental Protection Agency (EPA), and Bureau of Reclamation (BOR) are the primary federal agencies responsible for funding water supply projects in small towns and rural areas. While the BOR builds or supervises construction of water projects at the direction of Congress, USDA and EPA have programs that fund water project construction in communities that meet program criteria.

The USDA's Rural Utility Service (RUS) provides rural communities with loans and grants for water project construction. The RUS distributes funds in direct loans, guaranteed loans, and grants through the Water and Waste Disposal for Rural Communities program. Total program funding declined from the \$2.1 billion in FY 2002 to about \$1.5 billion in FY 2003, 2004 and 2005 [USDA, 2005]. Fiscal year 2007 funds are about \$1.3 billion [USDA, 2007]. These funds are allocated to each state using a formula that takes into account each state's share of national rural population, national rural population with incomes below the poverty level, and national nonmetropolitan unemployment [USDA, 1999]. In FY 2007 New Mexico was allocated \$1,095,000 in funds for guaranteed loans, \$13,440,000 in funds for direct loans and \$4,550,000 in funds for grants [USDA, 2007]. USDA criteria for participation include economic feasibility, population limits, and need. Except in the case of grants awarded to low-income<sup>2</sup> communities, all USDA funds must be repaid [USDA, 1999, Section 1780.10(b)(2)].

The EPA's Drinking Water State Revolving Fund (DWSRF) provides states with capitalization grant funds for loans. These funds are loaned by states to public and non-profit water systems within their respective states. The DWSRF funding for FY 2006 was \$823 million and is

<sup>2</sup> Grant funds cannot be used to pay any costs of a project when the median household income exceeds the non-metropolitan median household income of the State.

expected to be \$827 million in FY 2007 [U.S. EPA, 2007a and 2007b]. New Mexico's share was \$8,229,300 in FY 2006 and is tentatively \$8,268,800 in FY 2007 [U.S. EPA, 2007a and 2007b]. New Mexico adds 20% of the federal contributions as matching funds, so the total available funding is slightly in excess of \$10 million annually. Each state develops its own criteria for participation in the DWSRF program. The criteria for New Mexico are based on public health risk, environmental factors, affordability and capacity development factors [New Mexico Finance Authority, "Fund"]. With the exception of grants awarded based on need, all DWSRF funds must be repaid. Interest rates are applied in three tiers: (1) communities not qualifying as "disadvantaged"<sup>3</sup> pay 3% annual interest; (2) communities with median household income (MHI) less than 90% of State MHI and with an affordability ratio between 1.0% and 1.5% pay 0% interest, and (3) communities with MHI less than 90% of State MHI and an affordability ratio greater than 1.5% receive assistance in planning, design and engineering services, extension of loan repayment period, or forgiveness of principal sufficient to bring their affordability ratio down to 1.5%. New Mexico treats 1.5% as the maximum affordability ratio that a disadvantage community should bear [New Mexico Finance Authority, "Program"].

The BOR does not presently have a program for funding water projects. On the other hand, BOR is often delegated authority by Congress to construct or oversee projects, and the Rural Water Supply Act of 2006 authorizes \$15 million per year for a program for BOR to assist rural communities in planning (but not constructing) water supply projects [U.S. Congress, 2006]. The Act requires the Secretary of the Interior to publish in the Federal Register criteria for determining eligibility of rural communities for assistance under the program [*Ibid.*, section 103(c)], although the Secretary has not yet established any formal eligibility criteria. However, the Act does not amend Section 9 of the 1939 Reclamation Project Act requiring that projects authorized or built pursuant to Federal reclamation laws repay at least their annual operation and maintenance cost [U.S. Congress, 1939]. The Act allows up to 75% federal cost sharing of construction costs. This Act, however, does not establish any separate funding mechanism for water projects [U.S. Congress, 2006, section 106(e)(1)(A)(i)(II)(aa)]. – any recommended projects would still need Congressional authorization and appropriations.

The Non-Tribal assistance criteria for the USDA, EPA, and BOR are summarized in Table 7. The Table shows that the Navajo Gallup Water Supply Pipeline is not a good fit for any of the programs. The USDA's RUS program requires that a project serve only communities of fewer than 10,000 people, while Gallup alone has a population approximately double this size. BOR does not have an ongoing program to fund water projects, so Project participants would have to secure Congressional authorization to obtain BOR sponsorship – they cannot apply directly to the BOR. Most significantly, both the RUS program and the EPA's DWSRF program are inadequate in scale to use as principal funding sources for the Project. The Project's initial capital cost of \$865 million far exceeds the recent program funds that have been made available for water projects in New Mexico.

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<sup>3</sup> "Disadvantaged" is defined as having median household income less than 90% of the State average and having an affordability ratio of at least 1.0%, where the affordability ratio is calculated as the ratio of the cost of water service to the median household income.

Table 7

## Federal Assistance Funding Criteria For Non-Tribal Water Supply Projects

Agency	USDA	EPA	BOR
Population	Population of town cannot exceed 10,000	At least 15% of state fund must be used yearly for projects serving no more than 10,000	Population of community or Indian tribe not more than 50,000
Project Type	Construction, enlargement, extension or improvement of water supplies	Drinking water infrastructure project that bring existing water systems in compliance with the Safe Drinking Water Act or address public health problems	Planning, evaluation and construction oversight of rural water supply projects
Applicant Type	Public entity; not-for-profit organization, or Indian tribe	Community water systems and publicly or privately owned or nonprofit community water systems	State, regional or local authority, including Indian tribes and public districts
Applicant Eligibility	Applicant must have legal authority and responsibility to undertake the project, operate and maintain the proposed facility, and meet the financial terms of the project.	Applicant must be able to repay the loan.	Eligibility criteria yet to be adopted
Cost Sharing Criteria	Project must be economically feasible with regard to repayment, 75% maximum federal cost share.	100% repayment with interest, although States can allow subsidized interest and/or principal forgiveness to disadvantaged communities.	Project must be economically feasible with regard to repayment, 75% maximum federal cost share, based on capability to pay. Locals must pay 100% OM&R.
Growth Considerations	Designed to meet the needs of present or projected population	Project cannot be intended primarily for growth, but may meet needs for reasonable growth over its life.	Project can address future water supply needs
State Requirements		States must prioritize projects on basis of health risk, clean water standards, and need.	
Recent annual funding in N.M	\$12 million	\$10 million (including State contribution)	NA
Service Area	National	National	17 Western States

Sources: General Accounting Office. *Federal Assistance Criteria Related to the Fort Peck Reservation Rural Water Project, June 1998*; U.S. Congress, 2006.

## B. Tribal Water Supply Projects

USDA does not have special criteria for tribal water projects.

EPA and BOR criteria for funding tribal water supply projects differ significantly from criteria for non-tribal water supply projects. Whereas both the EPA and the BOR historically have expected full repayment for non-tribal projects, tribal projects are not expected to repay funds. The primary EPA program for funding tribal water supply projects is the DWSRF Tribal Set Aside. The BOR presently does not have a formal policy regarding funding or cost share. However, as with non-tribal projects, there has been an informal funding policy, which in the case of tribal water projects has been full federal funding. Legislation pending in the current Congress would allow the Secretary of the Interior to consider deferring all tribal construction costs if warranted based on an assessment of tribal capability to repay costs [109 S. 895].

Tribal assistance criteria for the USDA, EPA, and BOR are summarized in the Table 8, below. While both the Navajo Nation and Jicarilla Apache Nation would apparently qualify for both EPA and BOR funding, the EPA funds are inadequate to contribute substantially to the Navajo Gallup Project, and BOR funding is obtained only through specific Congressional authorization, as discussed in the next section.

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**Table 8**

**Federal Assistance Funding Criteria For Tribal Water Supply Projects**

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<b>Agency</b>	<b>USDA</b>	<b>EPA</b>	<b>BOR</b>
Special Tribal Criteria	None	1.5% Tribal set-aside	Repayment of construction costs may be deferred.
Project Type	Construction, enlargement, extension or improvement of water supplies	Drinking water infrastructure project that bring existing water systems in compliance with the Safe Drinking Water Act or address public health problems	Planning, evaluation and construction oversight of rural water supply projects
Applicant Type	Indian tribes are eligible	Indian tribes are eligible	Indian tribes are eligible
Applicant Eligibility	Applicant must have legal authority and responsibility to undertake the project, operate and maintain the proposed facility, and meet the financial terms of the project.	Applicant must be able to repay the loan.	Eligibility criteria yet to be adopted
Cost Sharing Criteria	Project must be economically feasible with regard to repayment, 75% maximum federal cost share.	100% federal funding	Up to 75% federal funding

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**Table 9 - Western Municipal Water Projects Funded by Congressional Authorization**

Project	General		Demographics		Capital Cost (2007\$)				OM&R Cost		Bill or Statute (a)		
	State	Water Delivered (afy)	Pop Served	% Indian	per pers. served	per af	total (million \$)	cost share split fed/non-fed	Interest During Construction	OM&R Cost share fed/non-fed	Preference Power authorized	introduced	enacted
Lewis and Clark Rural Water System (b)	SD, MN, IA	25,763	200,000	0%	\$2,279	\$17,695	\$456	80/20, with the exception of Sioux Falls, Sioux Falls - 50/50 split of incremental cost		0/100			PL106-246
Mid Dakota (c)	SD	4,481	32,000	4%	\$5,321	\$38,005	\$170	\$100 million federal funding of \$147 million project, up to 85% grant	forgiven		yes		PL102-575 Title XIX
Mni Wiconi (d)	SD	14,563	50,000	75%	\$9,286	\$31,881	\$464	non tribal - 80/20 tribal - 100			yes		PL103-434
Rocky Boy North Central Montana Water System (e)	MO	8,000	31,000	10%	\$9,606	\$37,222	\$298	non tribal - 80/20 tribal - 100		all (core) 100/0 non-tribal 0/100 (non-core)	yes		PL106-163 PL107-331
WEB Rural Water Development Project (f)	SD	4,604	14,763	0%	\$12,994	\$41,670	\$192	80/20					PL100-490
Animas La Plata (g)	CO, NM	57,100	70,190	2%	\$8,015	\$9,853	\$563	non-tribal - 0/100 tribal - 100 feds pay 100% of design and env.		all 0/100			PL106-554
Southwest Pipeline Project (h)	ND	3,109	35,000	0%	\$5,697	\$64,129	\$199	75/25				99 HR 1116 106 S 623	
Perkins County (i)	SD	460	2,500	0%	\$12,933	\$70,230	\$32	75/25			yes		PL106-136
Fort Peck Reservation Rural Water System (j)	MO	6,000	28,000	36%	\$8,122	\$37,900	\$227	non-tribal 76/24 tribal - 100		non-tribal 0/100 tribal 100/0	yes.		PL104-300 PL106-382
Fall River Water Users District Rural Water System (k)	SD	118	660	0%	\$8,076	\$45,061	\$5	70/30			yes.		PL105-352
Jicarilla Apache Reservation Rural Water System (l)	NM			100%			\$48 mil. (federal)	specific items allocated to feds and tribe					PL107-331

## Notes:

(c) There is no Indian component in authorization, but Crow Creek reservation is inside service boundaries.

Maximum federal funding for project is a dollar amount ceiling, not a percentage. Maximum grant for federal share is 15%.

(f) WEB Water was unable to provide Population Served. Population Served calculated using number of hook-ups provided by WEB Water and number of persons per household provided by 1990 U.S. Census

(g) Population served has not been formally determined. Population numbers are estimated based on population of prospective service area and USBR informal estimates.

Tribal Population is based on number of Ute Indians.

## Source:

(a) www.thomas.gov

(b) Pam Bonrud, Lewis and Clark Rural Water System

(c) Tribal Population from Department of Commerce, Economic Development Administration, all other information from Kurt Pheifle, Mid Dakota Rural Water District

(d) Mike Curly, Lyman Jones Rural Water System

(e) Tribal Population from Chippewa Creek Tribal Council, all other information from Anne-Marie Robinson, Bear Paw Development

(f) Laurie Swallow, WEB Water

(g) Pat Shumacher, USBR; Rege Leach, USBR

(h) Pinkie Evanscurry, Southwest Pipeline

(i) Dave Ryan, State of South Dakota Department of Environment and Natural Resources

(j) Clint Jacobs, Dry Prairie Rural Water Authority

(k) PL105-352

(l) PL107-331

Capital cost and population served updated from Federal Reserve Bank of Minneapolis, "Fedgazette," Sept., 2005, www.minneapolisfed.org/pub/fedgaz/05-09/table.cfm.

Capital cost indexed to Jan., 2007\$ using Bureau of Reclamation Composite Construction Cost Index

Table 10 - Proposed Western Municipal Water Projects

Title	General		Demographics		Capital Cost (2007\$)				OM&R Cost		Bill or Statute (a)			
	State	Water Delivered (afy)	Pop Served	% Indian	per pers. served	per af	total (million \$)	cost share fed/non-fed	split	Interest During Construction	OM&R Cost share fed/non-fed	Preference Power authorized	introduced	enacted
Lake Powell - St. George Pipeline (a)	UT	100,000	200,000	0%	\$2,694	\$5,389	\$539							
Southern Delivery System (b)	CO	87,000	32,000	0%	\$34,030	\$12,517	\$1,089							
Northern Integrated Supply Project ©	CO	35,700	50,000	0%	\$8,519	\$11,931	\$426							
St. Mary Canal (d)	MT	2,509	14,000	NA	\$9,238	\$51,543	\$129							
Southern Black Hills Water System (e)	SD	3,405	19,000	NA	\$4,538	\$25,320	\$86							
South Central Regional Water System (f)	ND	2,420	13,500	NA	\$5,908	\$32,962	\$80							
Fort Berthold Rural Water Supply System (g)	ND	3,307	9,866	100%	\$13,039	\$38,901	\$129							
Eastern New Mexico Rural Water System (h)	NM	24,000	133,911	0%	\$2,165	\$12,080	\$290	80/20		0/100		108 S. 2513		
Red River Valley Water Supply Project (i)	ND	NA	480,000 to 566,000	NA	\$1,050 to \$4,940	NA	\$590 to \$2,370					106 S. 623	PL106-541	
Navajo Gallup Water Supply Project (j)	NM - AZ	37,600	209,794	80%	\$4,123	\$23,005	\$865							

## Notes:

(h) population served estimated from water deliveries based on 160 gpcd

(d)(e)(f) water use estimated from population based on 160 gpcd

## Source:

(a) "Water Strategist," July/August, 2005

(b) Colorado Springs Utilities, "Southern Delivery System Fact Sheet," May, 2005.

(c) MWH Americas, Inc., "Northern Integrated Supply Project, Phase II Alternative Evaluation," Jan., 2004.

(d) Federal Reserve Bank of Minneapolis, "Fedgazette," Sept., 2005, www.minneapolisfed.org/pub/fedgaz/05-09/table.cfm.

(e) Federal Reserve Bank of Minneapolis, "Fedgazette," Sept., 2005, www.minneapolisfed.org/pub/fedgaz/05-09/table.cfm.

(f) Federal Reserve Bank of Minneapolis, "Fedgazette," Sept., 2005, www.minneapolisfed.org/pub/fedgaz/05-09/table.cfm.

(g) MSE-HKM, Inc., "Discussion of recent Large Scale Municipal, Rural and Industrial (MR&amp;I) Water Projects," Dec. 8, 1999.

(h) 108 S. 2513

(i) Federal Reserve Bank of Minneapolis, "Fedgazette," Sept., 2005, www.minneapolisfed.org/pub/fedgaz/05-09/table.cfm.

(j) James P. Merchant, "Navajo-Gallup Water Supply Project, Allocation of Capital and O,M&amp;R Costs Among Project Participants, San Juan River - PNM Alternative," Sept. 26, 2005.

Growth Considerations	Designed to meet the needs of present or projected population	Project cannot be intended primarily for growth, but may meet needs for reasonable growth over its life.	Project can address future water supply needs
Recent annual national funding	\$16 million	\$13 million	NA
Service Area	National	National	17 Western States

Sources: General Accounting Office. *Federal Assistance Criteria Related to the Fort Peck Reservation Rural Water Project, June 1998*; U.S. Congress, 2006..

### C. Congressional Project Authorization

Projects that do not meet the criteria of established funding programs can seek Congressional authorization. Because the authorization is project-specific there are no formal guidelines on determining whether a project qualifies or the terms of funding once awarded. However, many of the recent Western rural water projects funded by Congress have some similar characteristics. Table 9 shows that the federal share of construction costs for non-Indian projects has typically ranged from 70 to 80 percent, while the federal share of construction costs for Indian projects has normally been 100 percent. While all non-Indian projects have been expected to pay 100 percent of OM&R costs, the Indian projects sometimes pay zero percent and sometimes pay 100 percent.

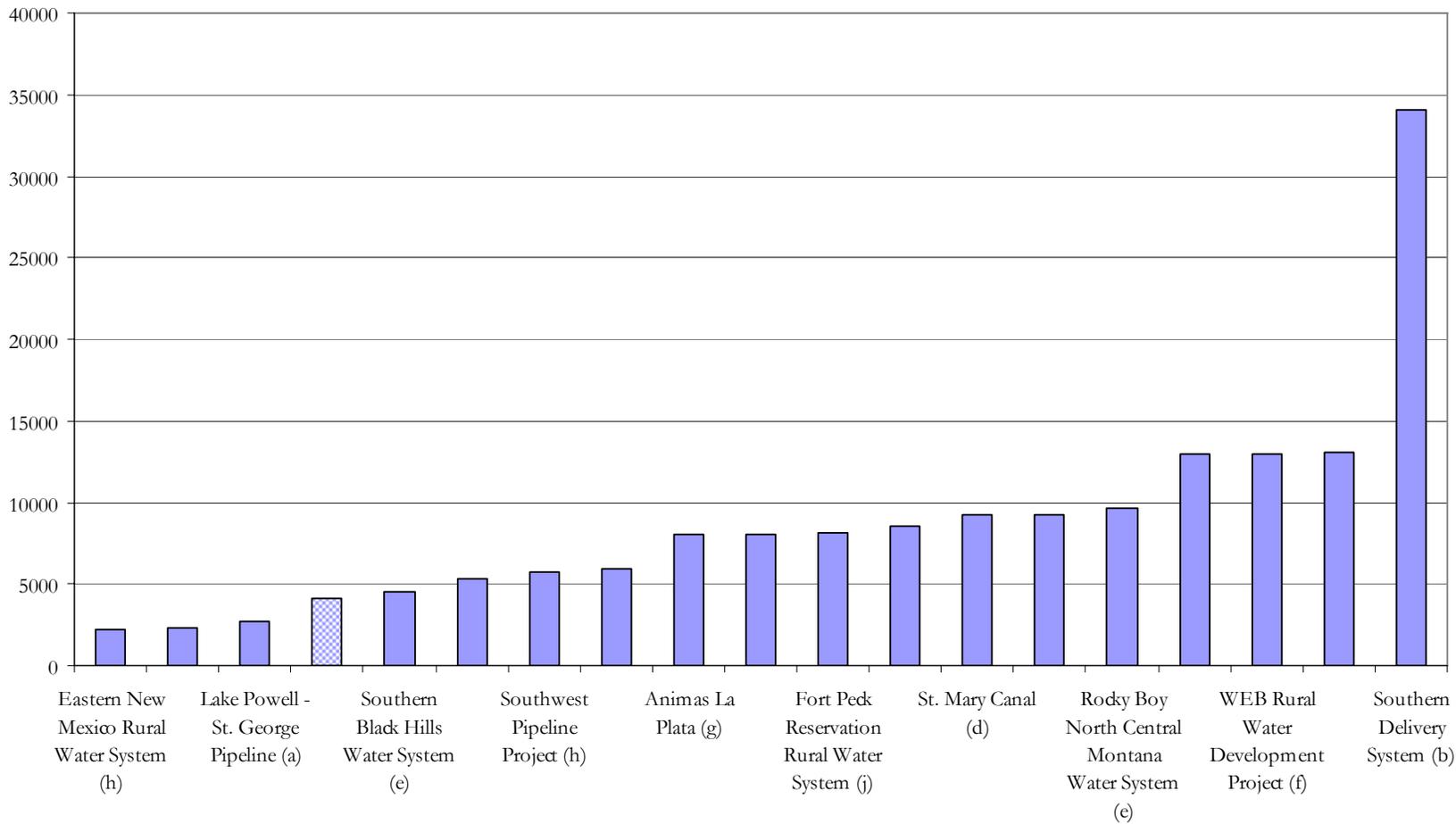
Table 10 shows how the Navajo-Gallup Water Supply Project compares to other water projects being proposed in the West. None of these projects has received Congressional approval for construction, so the terms of any approval are still pending. However, the table does show the relative size of the projects in terms of population served, water supply developed and cost. Figures 1 and 2 compare these proposed projects on a cost per person served and a cost per acre-foot of capacity basis.

Tables 9 and 10, and Figures 1 and 2, compare only the capital costs of various water projects. Operation and maintenance (O&M) costs are not readily available for most of these projects. Table 11 shows the total levelized cost per thousand gallons (\$/TG) for some western projects for which O&M costs were available.

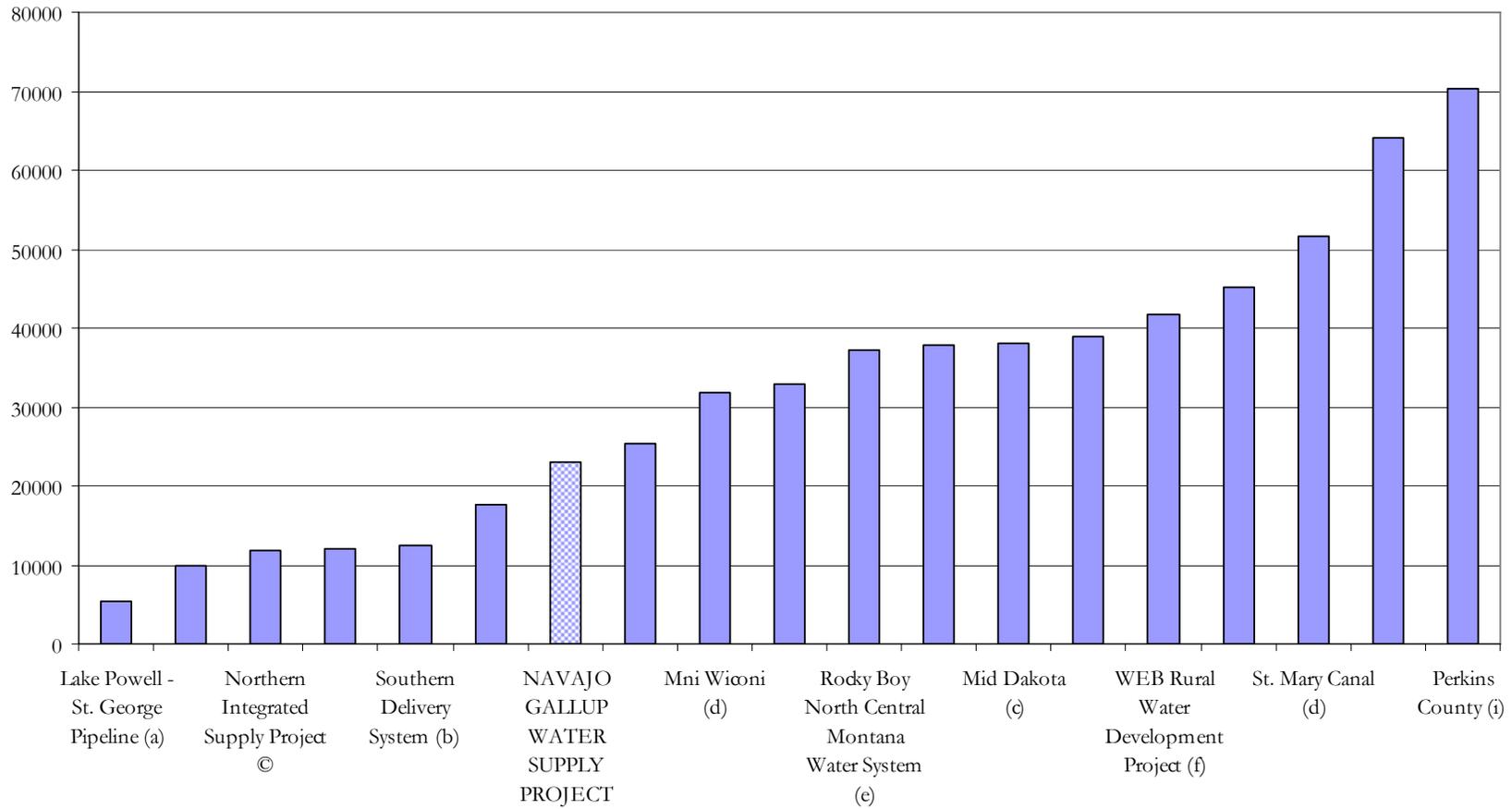
Project	Capacity (afy)	Cost / TG
Albuquerque	97,000	\$1.42
Lewis & Clark	25,760	\$5.50
Navajo-Gallup Water Supply Project	37,550	\$7.57
Rocky Boys/North Central Montana Regional Water System	8,802	\$8.30
Santa Fe	8,730	\$5.71

Sources: Stomp, Carpenter, HKM, Banner, Dornbusch Associates.

**Figure 1**  
**Western United States Water Projects**  
**2007\$ per Person Served**



**Figure 2**  
**Western United States Water Projects**  
**2007\$ per Acre-Foot of Capacity**



## V. Ability to Pay

Some of the funding programs discussed above use “affordability ratios” [NMFA] or “capability to pay” measures [[U.S. Congress, 2007]. These concepts are commonly referred to as the ability of water users to pay for their water service, or in short, the “ability to pay” issue.

*Ability to pay* in a water supply context refers to the affordability of a water system. The Asian Development Bank, for example, explains “ability-to-pay” as “[t]he affordability or the ability of the users to pay for the water services, as expressed by the ratio of the monthly household water consumption expenditure to the monthly household income.” [ADB, p. 362] This ability to pay concept is used by some programs as a threshold which once surpassed triggers additional assistance or as a limit on how much of project’s costs a beneficiary should pay. Although it appears that the available funding programs are either inadequately funded or inappropriate for the Navajo Gallup Water Supply Project, it may be useful to review how the ability to pay is used by these programs and by other agencies. If the Project participants seek Congressional funding, for example, Congress may be interested in knowing the affordability of the Project costs.

The most common measure of ability to pay for water services is utility payments as a percent of median household income. [EPA, 1999(b), p. 93] EPA, for example, uses 2.5% of median household income (MHI) in determining whether water treatment options to comply with clean water standards are affordable and should be required. EPA selected 2.5% of median household income as an affordability threshold based on their analysis of consumer spending on discretionary goods (alcohol and tobacco = 1.5% of MHI), on other utilities (telephone = 1.9% of income, and energy and fuels = 3.3% of MHI), and on the cost of bottled water (about 2.1% of MHI). [EPA, 1998(b), p. 45]

Individual states are free to develop their own criteria for determining an affordability threshold in their drinking water programs. Some states use a ratio of water charges to MHI but set the affordability threshold at a lower level than the EPA’s 2.5%. New York State, for example, sets their threshold at 1.0% to 1.5% depending on the level of income. Pennsylvania uses a sliding threshold of 1.0% to 2.0% of MHI depending on the socioeconomic condition of the community. The State of Washington uses an affordability range of 1.25% to 1.75%. [EPA, 1998(b), Appendix F] New Mexico designates 1.5% of MHI as the maximum amount that any disadvantaged community (MHI less than 90% of statewide average) should pay. [NM Finance Authority, “Program”]

The USDA Rural Utilities Service uses a different approach in determining the extent to which a project can qualify for federal funds under the Water and Waste Water Loan and Grant Program. Projects can qualify for 75% federal funding when the median household income is below the higher of the poverty line or 80% of the state nonmetropolitan median income, or 45% federal funding if the MHI is above 80% but below 100% of the statewide nonmetropolitan household income. [USDA, 1999]

The Rural Water Supply Act of 2006 directs the Secretary of Interior to determine the Federal share of construction costs based on an analysis of per capita income, median household income, poverty rate, ability to raise revenues, the strength of the balance sheet and the existing cost of water, all relative to regional averages. [U.S. Congress, 2006, Section 106(f)(2)] However, the Act

does not specify any threshold for these measures.

The Asian Development Bank and the World Bank use a rule of thumb that water costs should not exceed 5% of household income. [See Churchill, p. 102; ADB, p. 58; IRC, p. 17 (3% to 5%)]. For example, in the China Rural Water Supply Project costs of 3.6% to 3.7% of household income are characterized as appearing to be “affordable.” [World Bank, pp. 5-6] Similarly, in a Chilean water supply project subsidies are provided to limit the maximum household payments for water and sewer to 5% of monthly household income. [Kessides, p. 28]

The variety of MHI thresholds used to determine affordability, as well as the application of alternative approaches in defining affordability, highlight the fact that affordability is not an objective economic concept. Rather, affordability is a social or equity concept based on the premise that safe drinking water is a right that all citizens should enjoy, and that no one should have to pay more than some limited percentage of their income to obtain that water supply. This threshold percentage cannot be objectively determined but is based on a subjective judgment of fairness and equity. [See EPA, pp. 7 and 11; CBO, Appendix C; Churchill, p. 102; Bieder, p. 8]

Given this lack of an objective basis for determining affordability it may be useful to show the average percentage of MHI that the Project participants would pay for water. Table 12 shows the Project costs, by component, as a percent of MHI. These percentages are calculated by dividing the average monthly household costs for each component (from Table 6), by the MHI shown in Table 13.

<b>Table 12</b>			
<b>NAVAJO-GALLUP WATER SUPPLY PROJECT</b>			
<b>TOTAL ANNUAL COST (FULL REPAYMENT) / MEDIAN HOUSEHOLD INCOME</b>			
<b>50 year Project life, Federal Financing at 4.875% and NTUA Rates for Energy, 2007\$</b>			
	<b>Navajo</b>	<b>Gallup</b>	<b>Jicarilla</b>
<b>Project Capital Cost</b>	4.5%	1.6%	2.7%
<b>Project OM&amp;R Cost</b>	1.2%	0.5%	1.4%
<b>Project Water Cost</b>	0.0%	0.2%	0.0%
<b>Other Facility Capital Cost</b>	0.2%	0.0%	1.0%
<b>Other Facility O&amp;M Cost</b>	0.0%	0.7%	0.6%
<b>Total Cost</b>	<b>6.0%</b>	<b>3.0%</b>	<b>5.6%</b>

Table 13 NAVAJO-GALLUP WATER SUPPLY PROJECT MEDIAN HOUSEHOLD INCOME			
	NAVAJO NATION	CITY OF GALLUP	JICARILLA APACHE NATION
1999 MEDIAN HOUSEHOLD INCOME (1999\$)	\$20,005	\$34,868	\$26,750
2007 MEDIAN HOUSEHOLD INCOME (2007\$)	\$25,597	\$44,261	\$32,498

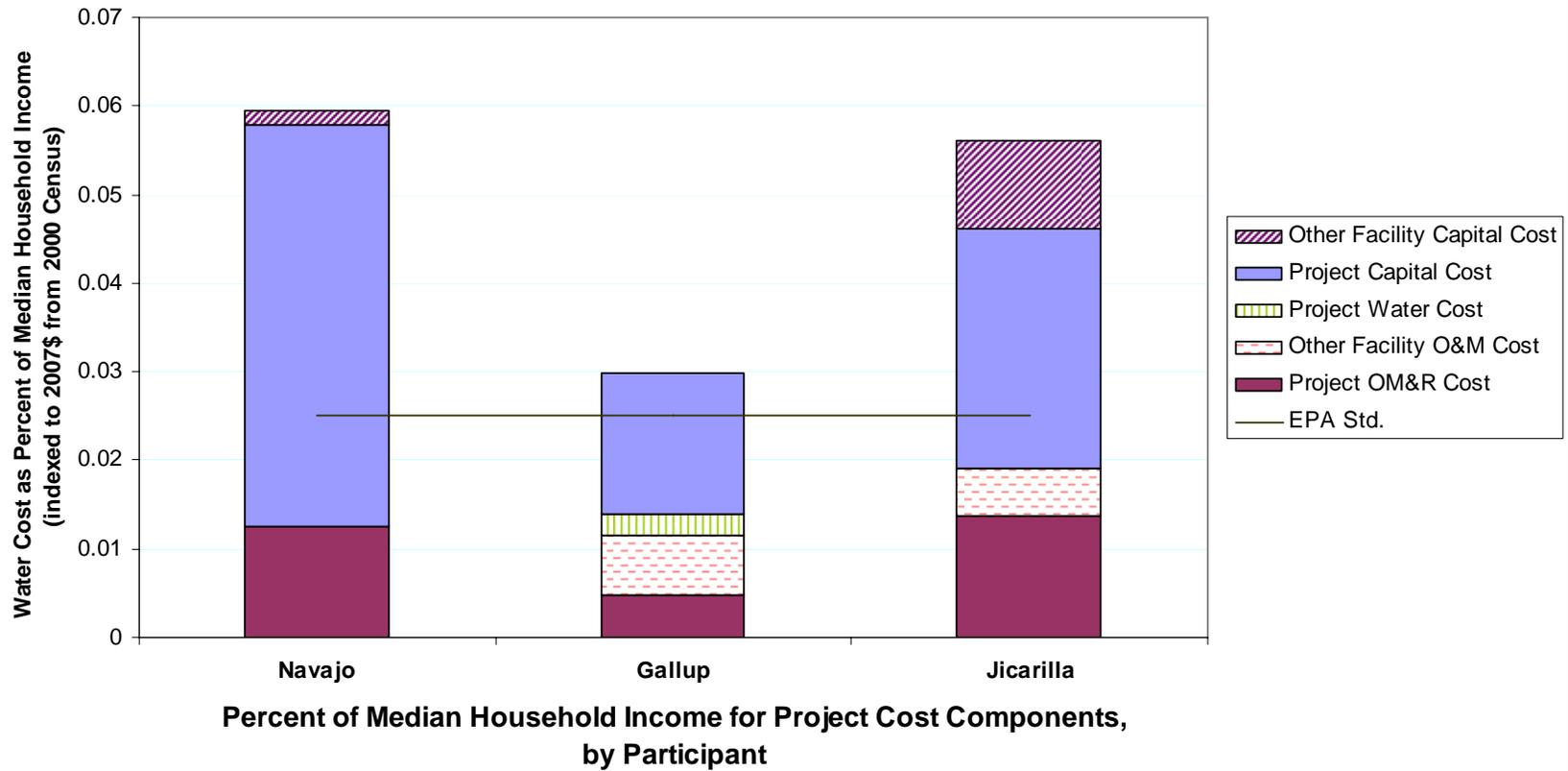
Source: 1999 MHI from U.S. Census Bureau, "2000 Census of Population and Housing;" indexed to 2005\$ with U.S. Bureau of Labor Statistics, "Consumer Price Index;" annual growth rates from U.S. Census Bureau, "1990 Census of Housing" and "2000 Census of Population and Housing;" Dornbusch Associates.

The affordability percentages for different Project cost components are shown in Figure 3. Figure 3 also compares these cost percentages to the EPA benchmark 2.5% of MHI. This benchmark is based on the EPA judgment of the affordable portion of household income used to pay for a water supply. Figure 3 shows that the O&M and water costs for all three Project participants are within the EPA threshold of 2.5%, but once full capital cost repayment is added the percentage income needed exceeds the EPA threshold for all three participants.

***Other measures of Ability to Pay.*** Although water cost as a percent of median household income is a common way for programs to measure ability to pay, it is not the only way. Recent federal legislation, for example, requires the Secretary of the Interior to devise a measure of "capability to pay" by including factors such as per capita income, poverty rate, ability to raise tax revenues, strength of the community balance sheet and existing cost of water, in addition to median household income. While many of these additional measures should be highly correlated to median household income some may not be, and the resulting analysis could provide a more nuanced assessment of affordability, particularly in borderline cases.

***Income Disparity.*** Regardless of how water costs compare to median household income in a community, by definition costs are a greater percentage of household income for one-half of the households and a lesser percentage of household income for the other one-half. This means that even if community-wide water costs are below some threshold of affordability, there may be many individual households within that community for which water costs exceed that threshold. This disparity can be addressed within a community by implementing a progressive rate structure such that a certain basic water supply is available at a relatively low rate and additional amounts of water are available at progressively higher rates. The *average* rate for water can remain the same, but low water users not only pay for less water but also a lower rate for that water, and higher water users not only pay for more water but also a higher rate. This type of price structure encourages water conservation while also addressing the income disparity issue.

**Figure 3**  
**Navajo-Gallup Water Supply Project**  
**Water Costs as a Percent of Median Household Income**  
**NTUA Power Rates**



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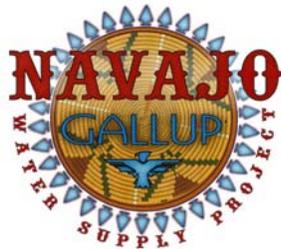
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## APPENDIX D

### *Part IV*

Social Impacts from the Navajo-Gallup  
Water Supply Project

**SOCIAL IMPACTS FROM THE  
NAVAJO – GALLUP WATER SUPPLY PROJECT**

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**October 2, 2007**

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## **A. EXECUTIVE SUMMARY**

This report discusses the social impacts associated with the Navajo-Gallup Water Supply Project. The report addresses impacts on three groups of people, the Navajo Nation, the City of Gallup and the Jicarilla Apache Nation. The types of social impacts addressed include (1) Community cohesion, (2) Accessibility to water, (3) Public health, (4) Employment impacts, (5) Demand for local services, and (6) Environmental Justice issues.

The Project should have strong positive effects on the Accessibility to water and Public health categories, and positive effects on Employment and Environmental Justice categories. If Project jobs are filled predominantly by new arrivals to the area there may be a minor negative impact on the Demand for local services. Project employment may increase construction sector employment by somewhat more (166%) than the standard deviation in that sector, but total Project-related employment (including secondary employment) will not represent an unusual fluctuation in the area's year-to-year total employment. We did not identify any significant impact on Community Cohesion.

## **B. COMMUNITY COHESION**

For purposes of this report "Community Cohesion" refers to interactions among people and groups within a community<sup>1</sup> and may be affected to the extent that a project interferes with those interactions or introduces stress into the social patterns within a community. A project could interfere with community interactions by physically displacing people, by creating physical or aesthetic barriers that disrupt established patterns, or by creating a divisive debate about the advisability of the project.

The Navajo-Gallup Water Supply Project will consist primarily of buried pipelines, community storage tanks and two water treatment plants. While the pipeline route will

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<sup>1</sup> US Department of Transportation, 1996.

transit some privately held property, most of that route is in rural areas and no residences will be displaced. Undergrounding the pipeline should preclude any barrier effect from that project aspect. The storage tanks and treatment plants are tentatively sited outside any community and should also not create barriers to community interaction.

The Project has enjoyed very strong local support among all its constituents. The Northwest New Mexico Council of Governments in conjunction with the U.S. Bureau of Reclamation held public scoping meetings early in the Project design stage at which numerous people spoke about the Project's desirability. The meetings were held in St. Michaels, AZ, and Crownpoint, Farmington, Shiprock and Gallup, New Mexico<sup>2</sup>. Of the 36 speakers, 19 people specifically expressed support for the Project, 3 expressed qualified support, and 3 others supported the concept of an increased water supply but did not express an opinion on the Project. Of the 36 speakers only 2 did not support the Project in some way.

All three local government bodies also have expressed their support for the Project. The Resources Committee of the Navajo Nation Council adopted a resolution supporting the PNM alignment of the Project, and the Navajo President and Vice-President have repeatedly written letters expressing the Navajo Nation's support for the Project.<sup>3</sup> The City of Gallup ... The Legislative Council of the Jicarilla Apache Nation has cited their significant development plans for the southeast portion of their Reservation and has formally endorsed the planning effort to participate in the Navajo-Gallup Water Supply Project.<sup>4</sup>

Finally, the Upper Colorado River Commission, representing the Upper Basin states of Colorado, New Mexico, Utah and Wyoming, also adopted a resolution supporting the Navajo-Gallup Water Supply Project.<sup>5</sup>

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<sup>2</sup> Northwest New Mexico Council of Governments, 2000.

<sup>3</sup> Navajo Nation Council, Resources Committee.

<sup>4</sup> Jicarilla Apache Nation, 2001.

<sup>5</sup> Upper Colorado River Commission.

### C. ACCESSIBILITY TO WATER

Accessibility to a clean, reliable water supply is considered so important that the United Nations Millennium Project cites water infrastructure as one of the key requirements to help people break out of the “poverty trap.”<sup>6</sup> Providing a water supply is also cited as the basis for Congressional legislation in the United States. For example, the first Congressional finding in the 1996 Amendments to the Clean Water Act states that “safe drinking water is essential to the protection of public health.”<sup>7</sup>

Some 40% of the Navajo people living in the Project service area presently have no access to piped water, and consequently haul water from sometimes distant sources.<sup>8</sup> Some of the water they do consume is from non-potable sources intended for stock watering and not compliant with EPA water quality standards.<sup>9</sup> The Project is planned to deliver a reliable supply of treated water to many of the Navajo homes that are presently without a piped water supply. Although Project plans assume that 10% of the Navajo homes presently without a piped water supply will not be served by the Project, the remainder will be.

In addition, many of the Navajo communities in the Project service area that presently do have a piped water supply rely on wells with a limited water supply. The Project will allow these communities to provide an adequate water supply to their future population and commercial needs.

The City of Gallup currently relies on groundwater pumping to supply water to its residents. The water level in Gallup wells has been falling by 7 to 29 feet per year over an extended period, and at some point the production capacity of the current well system is expected to diminish. Absent the Project, therefore, Gallup would be faced with some combination of the following scenarios: (1) development of alternative water supply

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<sup>6</sup> UN Millennium Project, 2005, p. 39.

<sup>7</sup> PL 104-182, 1996, Section 3.

<sup>8</sup> Navajo Nation Department of Water Resources, p. ES-3.

<sup>9</sup> Ecosystem Management, Inc., 2004.

projects, (2) diminishing per capita water supply, and/or (3) curtailment of population growth. Gallup has not been able to identify any other water supply project that is as cost-effective as the Navajo Gallup Water Supply Project. Without new water it is estimated that the available water per capita would fall to less than one-half of existing water use by the year 2033. Thus without the Project, Gallup would have to make major changes in water use patterns, with consequential negative implications for the city's economic well-being. Accordingly, one Project impact is to prevent the overall economic losses to the City that would occur if future water shortages caused residents and businesses to locate elsewhere.

The Jicarilla Apache Nation has established a policy of developing the southwest portion of its Reservation. In order to attract the housing and commercial enterprises to that area they must develop a reliable, sustainable water supply. The Nation has no adequate local water sources capable of providing such a water supply, so they have investigated various alternatives for importing water from non-local sources. Of the alternatives investigated the Navajo Gallup Water Supply Project offers the best combination of reliability and cost-effectiveness. The effect, then, of the Project would be to facilitate the Jicarilla Nation's plans to diversify their Reservation, both residentially and economically.

#### **D. PUBLIC HEALTH**

A primary rationale for the public policy of providing clean and reliable water to all people in the United States is the resulting health benefit. As noted in the "Accessibility to Water" section, above, the 1996 Amendments to the Clean Water Act explicitly link public health to safe drinking water.<sup>10</sup> In addition, Congress has found specifically for Indians that a "major national goal of the United States is to provide the quantity and quality of health services which will permit the health status of Indians to be raised to the highest possible level . . .,"<sup>11</sup> and that "the provision of safe water supply systems and sanitary sewage and solid waste disposal systems is primarily a health consideration and

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<sup>10</sup> PL 104-182, Section 3.

<sup>11</sup> 25 USC 1601

function,” and that “it is in the interest of the United States, and it is the policy of the United States, that all Indian communities and Indian homes, new and existing, be provided with safe and adequate water supply systems... as soon as possible.”<sup>12</sup>

There is a clear connection between sanitation facilities (water & sewerage) and Indian health. The Indian Health Service considers the availability of essential sanitation facilities to be “critical to breaking the chain of waterborne communicable disease episodes... In addition, many other communicable diseases, including hepatitis A, shigella, and impetigo are associated with the limited hand washing and bathing practices often found in households lacking adequate water supplies. This is particularly true for families that haul water.”<sup>13</sup> The Indian Health Service reports that American Indian families living in homes with satisfactory environmental conditions required about one-fourth the medical services as those with unsatisfactory environmental conditions.<sup>14</sup>

The Navajo Gallup Water Supply Project will provide a safe water supply to many households who would otherwise not have it, particularly on the Navajo Reservation. As mentioned in the previous section, approximately 40% of Navajo households presently must haul water, sometimes from non-potable water sources. The Project is designed to deliver a safe, reliable water supply to most of these households, and this water supply should have a direct beneficial effect on the health of the people receiving it.

## **E. EMPLOYMENT IMPACTS**

Project-induced change in employment opportunities could represent either a positive or negative social impact. To the extent that a project provides opportunities for employment in an area with high unemployment rates, the project can relieve social stress due to the lack of jobs. On the other hand, a project that attracts a large number of employees from outside the local area could create social tension. The degree to which

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<sup>12</sup> 25 USC 1632

<sup>13</sup> Indian Health Service, 2004

<sup>14</sup> Ibid.

Project employment could attract a substantial influx of workers, stressing both community infrastructure and community cohesion, is addressed in the next section.

The Navajo-Gallup Water Supply Project will create jobs for both the construction and operation phases. The construction phase is expected to last some 16 years, and construction will occur in San Juan and McKinley counties in two main corridors: the western branch from the PNM diversion on the San Juan River to Gallup, with east and west branches; and the eastern branch from the Cutter diversion on the NAPI canal south to Torreon. The construction employment is estimated to average about 600 workers and peak at about 650 workers during the 3<sup>rd</sup> through 15<sup>th</sup> years of construction. The operational phase will employ about 28 full-time equivalent workers on a long term basis. The jobs for these workers will be located primarily at the water treatment plants and pumping plants, with crews monitoring and repairing the pipelines and electric transmission lines.

The San Juan – McKinley county area has experienced long-term unemployment problems, particularly among the Navajo and Jicarilla people. In recent years the overall unemployment rate in the area has exceeded the national rate by approximately 10% to 70%, while the unemployment rate among Navajo and Jicarilla people has been six to ten times the national rate. Table 1 shows the most recently available unemployment rates for the area.

**Table 1**

**Unemployment Rates in United States and Vicinity of Navajo Gallup Water Supply Project**

<b>Year</b>	<b>United States</b>	<b>San Juan County, NM</b>	<b>McKinley County, NM</b>	<b>Navajo Reservation</b>	<b>Jicarilla Apache Reservation</b>
1999	4.2%	7.5%	7.1%	34%	40%
2000	4.0%	5.8%	6.6%		
2001	4.7%	6.2%	6.2%	52%	33%
2002	5.8%	6.9%	6.2%		
2003	6.0%	7.6%	7.4%		
2004	5.5%	6.1%	7.6%		
2005	5.1%	5.5%	6.8%		
2006	4.6%	4.3%	5.6%		

Sources: National and county unemployment rates from U.S. Bureau of Labor Statistics, "Local Area Unemployment Statistics;" Reservation unemployment rates from U.S. Bureau of Indian Affairs, "American Indian Population and Labor Force Report," 1999 and 2001.

To the extent that the construction and operation jobs can be filled by currently unemployed local people, the Project should represent an important benefit to the local area's socioeconomic condition. The Water Resources Council's Principles and Guidelines conclude that in an area of substantial and persistent unemployment a local hire rule can increase the percent of jobs going to otherwise unemployed people from 30% to 43% in the case of skilled workers, and from 47% to 58% in the case of unskilled workers.<sup>15</sup> In either event the Project should result in a significant number of jobs for otherwise unemployed people.

#### **F. DEMAND FOR LOCAL SERVICES**

Although many Project workers may be hired from the local population base, some other workers may be attracted from outside the area. If the number of immigrants is sufficiently large, it may have negative effects on both community infrastructure and on community social fabric.

During the construction phase the Project will support two types of additional employment in the region. First, the Project will require several hundred construction workers to build the water treatment plants, pipeline, storage tanks, pumping plants and electrical transmission lines. Second, the income earned by Project construction workers will stimulate local spending on goods and services, adding more jobs primarily to the retail and service sectors. Table 2 shows an estimate of the jobs added in the construction sector and in all sectors (including construction) during each year of construction. The numbers of new construction and new total jobs were estimated using an IMPLAN input-output model that links a change in employment to an initial change in spending (in this case, Project construction spending).<sup>16</sup> Table 2 also shows an estimate of the baseline construction and overall employment that would exist in the absence of the Project.

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<sup>15</sup> U.S. Water Resources Council, p. 94.

<sup>16</sup> IMPLAN

Future overall employment was estimated by extending the 1999-2003 trend in overall employment into the future. Construction employment has been declining over the 1999-2003 period. For purposes of this analysis we assumed that the decline will halt and in the absence of the Project, future construction employment would stabilize at the 2003 level.

**Table 2**  
**Baseline and Project-Related Additional Employment**  
**McKinley and San Juan Counties, New Mexico**

<b>Year</b>	<b>Baseline Construction Employment</b>	<b>Additional Project-Related Construction Employment</b>	<b>Baseline Total Employment</b>	<b>Additional Project-Related Total Employment</b>
1999	5,124		62,261	
2000	4,554		62,097	
2001	4,477		64,377	
2002	4,142		65,441	
2003	4,187		66,000	
2004	4,187		67,282	
2005	4,187		68,364	
2006	4,187		69,446	
2007	4,187		70,528	
2008	4,187		71,611	
2009	4,187		72,693	
2010	4,187		73,775	
2011	4,187	181	74,857	346
2012	4,187	357	75,939	682
2013	4,187	653	77,022	1247
2014	4,187	653	78,104	1247
2015	4,187	653	79,186	1247
2016	4,187	653	80,268	1247
2017	4,187	653	81,350	1247
2018	4,187	653	82,433	1247
2019	4,187	653	83,515	1247
2020	4,187	653	84,597	1247
2021	4,187	653	85,679	1247
2022	4,187	653	86,761	1247
2023	4,187	653	87,844	1247
2024	4,187	653	88,926	1247
2025	4,187	653	90,008	1247
2026	4,187	380	91,090	725

Source: U.S. Bureau of Labor Statistics, "State and County Employment and Wages from the Quarterly Census of Employment and Wages;" IMPLAN; Dornbusch Associates.

Table 2 shows the future estimated baseline (without Project) employment and the Project-related increase in employment for the construction sector and for total employment. The significance of these increases is a remaining question. As the actual employment data for 1999-2003 in Table 2 show, employment can vary considerably from year to year. Using the data for 1999-2003 we calculate standard deviations for both construction and total employment. This measure indicates the expected variability in employment from year to year. So long as the annual employment numbers are “normally” distributed, we would expect the annual numbers to be within one standard deviation of the mean about two-thirds of the time. Table 3 shows the annual Project-related employment as a percent of one standard deviation.

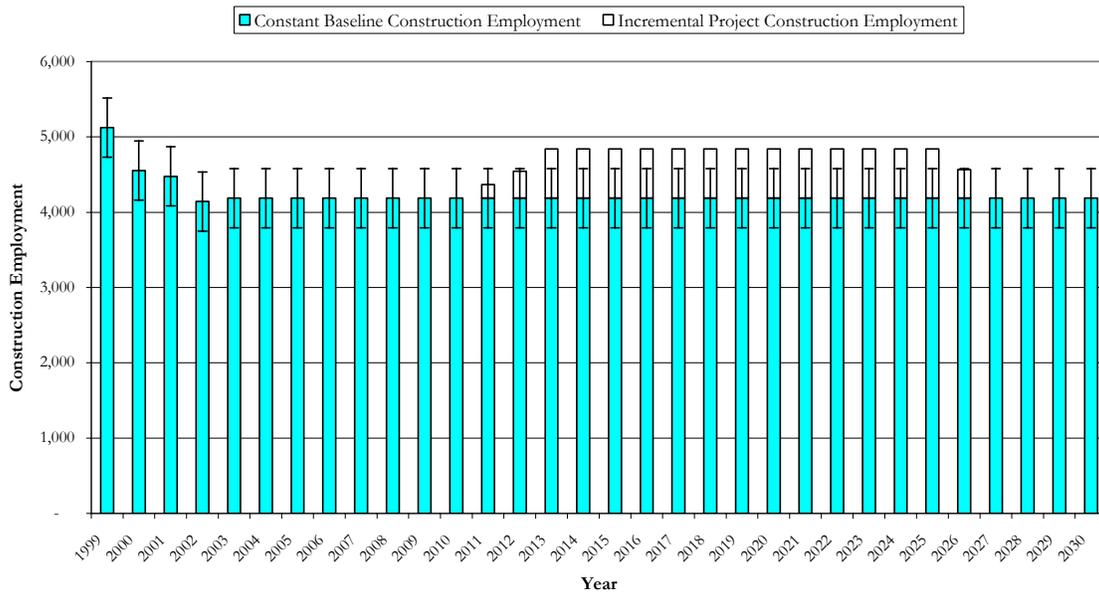
**Table 3**  
**Project-Related Construction and Total Employment as a Percent of One Standard Deviation, McKinley and San Juan Counties, New Mexico**

<b>Year</b>	<b>Project-Related Construction Employment / Standard Deviation</b>	<b>Project-Related Total Employment / Standard Deviation</b>
2011	46%	19%
2012	91%	38%
2013	166%	70%
2014	166%	70%
2015	166%	70%
2016	166%	70%
2017	166%	70%
2018	166%	70%
2019	166%	70%
2020	166%	70%
2021	166%	70%
2022	166%	70%
2023	166%	70%
2024	166%	70%
2025	166%	70%
2026	97%	40%

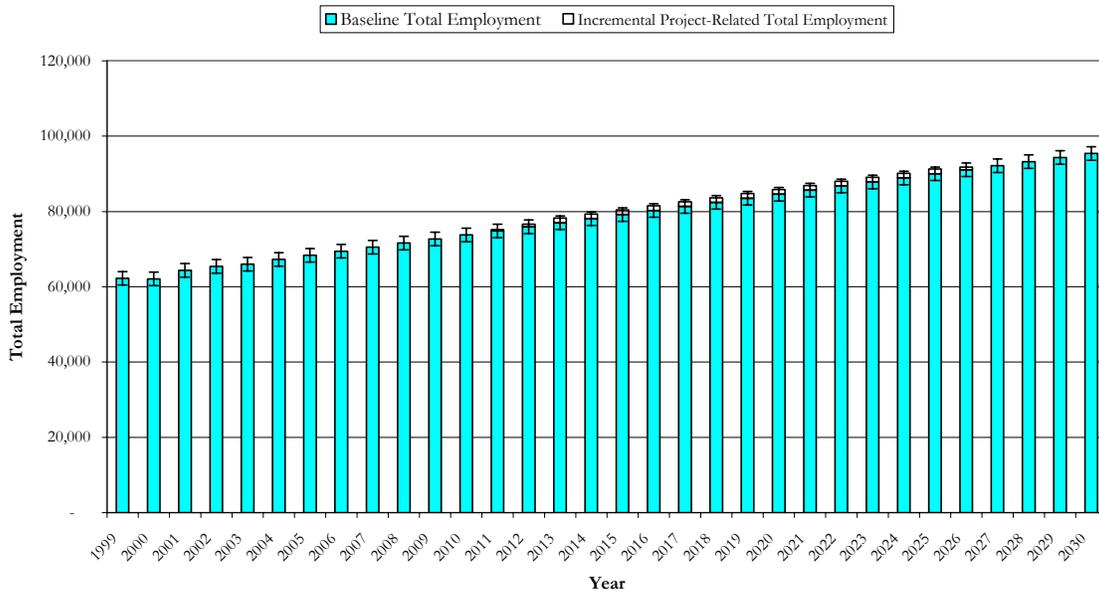
Table 3 shows that the Project-related total employment change is estimated to be within one standard deviation of the baseline employment. On the other hand, the Project-related construction employment is estimated to exceed one standard deviation from the

baseline employment. If the distribution of annual construction employment follows a normal distribution, an increase the magnitude of Project-related construction employment would only be expected to occur in about one year in ten. However, the Project-related construction employment does not reach this peak level until the third year of construction; the biggest year-to-year change in Project-related construction employment is well within the one standard deviation benchmark. Figures 1 and 2 show graphically how the Project-related construction and total employment, respectively, compare to expected baseline employment during the construction phase. The error bars around the baseline employment numbers represent plus and minus one standard deviation from the mean number.

**Figure 1**  
**Project Construction Employment Impact**  
**Navajo-Gallup Water Supply Project**  
**San Juan and McKinley Counties, NM**



**Figure 2**  
**Project-Related Total Employment Impact**  
**Navajo-Gallup Water Supply Project**  
**San Juan and McKinley Counties, NM**



The changes shown in Table 3 represent a worst case possibility. To the extent that the construction industry and other sectors hire local people who were otherwise unemployed these jobs will be filled by people who will not add substantially to the demand for local services and infrastructure. For example, these local people may already have housing and their children may already attend local schools. As discussed in the previous section, the U.S. Water Resources Council suggests that in an area with persistent and substantial unemployment some 30% to 58% of the construction workforce will come from the pool of unemployed workers. The number depends partially on whether the jobs are skilled or unskilled and on the presence of a local hire rule.<sup>17</sup>

The Project operation will require operators and maintenance personnel. Based on the IMPLAN model we estimate that about 83 workers will be needed, of which about one-third will be directly working on the Project, one-third working for businesses that supply goods and services to the Project, and the remaining one-third working for businesses that provide goods and services to Project employees and employees of the businesses

<sup>17</sup> U.S. Water Resources Council, p. 94.

supplying the Project. Sixty-six employees represents about one-tenth of one percent of total area employment. This level of employment should not have more than a minor impact on the area's infrastructure and services.

## G. ENVIRONMENTAL JUSTICE

The Environmental Justice issue is essentially one of discrimination against specific subpopulations. Executive Order 12898 directs that federal programs, policies and activities not have a disproportionately high and adverse human health and environmental effect on minority and low-income populations.<sup>18</sup>

Substantial populations in the Project area clearly qualify as minority and low-income. The 2000 Census of Population reports that 74.7% of the 74,798 people in McKinley County and 36.9% of the 113,801 people in San Juan County are American Indians.<sup>19</sup> The 2000 Census also shows that both the Navajo people (\$21,830) and Jicarilla Apache people (\$26,667) in New Mexico earn median incomes far below the New Mexico state average (\$34,133).<sup>20</sup>

No major adverse impacts from the Project have been identified, and there is no indication that any adverse impacts would have a disproportionate effect on the minority and low-income populations.

Conversely, the beneficial effects from providing water to those who would otherwise have to haul water will accrue *primarily* to the minority and low-income populations. This access to water benefit and the related health improvements are discussed in earlier sections of this report. These important positive Project impacts will assist rather than harm the minority and low-income populations.

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<sup>18</sup> Presidential Executive Order 12898.

<sup>19</sup> US Census Bureau, Quick Facts McKinley County and US Census Bureau, Quick Facts San Juan County.

<sup>20</sup> US Census Bureau, Characteristics of American Indians.

In addition to the positive water accessibility and related health benefits to the minority and low-income populations, the Project will have an additional beneficial impact by increasing the attractiveness of the area for economic development. The Project will provide a water infrastructure essential for many businesses. The water provided by the Project will assist the City of Gallup in retaining existing businesses and attracting new ones, and will assist the Navajo Chapters and the Jicarilla Apache Nation in attracting businesses that would not otherwise be interested in investing in the area.

Finally, the Project may indirectly help reduce the outmigration of Navajo people. The improved economic climate facilitated by the Project will provide more employment opportunities for the minority and low-income populations. This increased employment opportunity, together with an improved water infrastructure, will make the area more attractive for young adults who might otherwise consider moving outside the area.

According to Census Bureau data the population of the Navajo Nation grew by 32.4% between 1990 and 2000, from 225,298 to 298,197 people [U.S. Census Bureau, 1995; U.S. Census Bureau, 2002]. In contrast, the number of Navajo people residing on the Navajo Reservation or Trust Lands increased only 21.6% [U.S. Census Bureau, “American Factfinder;” U.S. Census Bureau, “American Indian Reservations and Trust Lands”]. This disparity indicates that the number of Navajo people residing off-Reservation increased by 53.2%, or over 40,000 people.

The Navajo tribal statistician noted this trend of Navajo outmigration in the 1996 “Chapter Images” profile of Navajo communities [Navajo Division of Community Development, 1997, p. vii]. The statistician attributed the trend to “development stagnation” on the Reservation [*Ibid.*]. Another factor contributing to the outmigration, however, may be the low standard of living due to primitive water supply conditions. About 40% of Navajo families have no piped water supply and must haul water from a central source to their dwellings. As noted in the section discussing health benefits, above, water hauling is not only expensive and inconvenient but also contributes to health problems for families who haul water.

Section E, above, discussed the likelihood that the Navajo Gallup Water Supply Project would stimulate the regional economy. This increased economic activity should provide additional long-term employment opportunities for all people in the Project service area, including those on the Navajo Reservation. In addition, the provision of a piped water supply will raise the standard of living in the Project area, providing clean, reliable water at a price much less than the cost of water hauling. The increased opportunity for increased economic well-being, in addition to the convenience afforded by a reliable source of clean piped water, should substantially reduce the outmigration of Navajo people.

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