9.0 THE UNIT COST OF PROJECT WATER

For the water users the single most important variable is the price that they must pay every month for the water service that they desire. To determine the overall aggregate cost of Project water this technical memorandum includes: (1) amortized capital cost (main line and laterals), (2) Colorado River Storage Project Fees, (3) acquiring water rights, (4) NIIP Cost of Services agreement, (5) the City of Gallup municipal system improvements, (6) NTUA and Gallup retail costs, and (7) Project operation and maintenance. The amortized capital costs are presented in Table 9.1 and the annual unit costs are presented in Table 9.3. These costs are described in the following sections.

9.1 Amortized capital costs

The annual amortized cost depends on the total capital cost, the life cycle or repayment period, and the interest rates. For this estimate it is assumed that the Project will deliver 29,067 acre-feet to the Navajo water users and 7,500 acre-feet to the City of Gallup water users. To determine the annualized cost, it has been assumed that the total capital cost is $370 million. The average unit capital cost of the water is approximately $10,100 per acre-foot of Project capacity. The unit capital cost for the Navajo component is approximately $10,700 per acre-foot and the unit capital cost for the Gallup component is approximately $7,700 per acre-foot.

For every one million dollars of capital expenditures, the annual amortized cost over a forty-year period at 4 percent is $50,523, at 6 percent is $66,461, at 7 percent is $75,009 and at 8 percent is $83,860. At 4 percent, a $370 million Project would have a total annualized cost of $18.7 million per year. This figure results in an average unit cost of 511 dollars per acre-foot or $1.58 per thousand gallons. The annual amortized costs at a range of interests rates are shown in Table 9.1.

NTUA has expressed concerns that during the early life the overall demands will be less than the total. Consequently, the Project costs would be distributed over a smaller volume of water. Based on the Project's 2010 demand, the Project will deliver 11,141 acre feet to Navajo water users. At this rate, the unit capital cost of the water would be $15,169 per acre-foot.

Table 9.1
A Range of Amortized Capital Costs for the Navajo Gallup Water Supply Project which delivers 36,700 acre-feet of water for a Project cost of $370 million

Interest Rate (Percent)	Annual Cost ($/Year)	Annual Unit Cost ($/AF/Year)	Annual Unit Cost ($/1000 Gallon/Year)
4%	$17,694,000	$482	$1.48
6%	$24,591,000	$670	$2.06
7%	$27,753,000	$756	$2.34
8%	$31,028,000	$845	$2.60

9.2 Colorado River Storage Project fees

With either alternative the water may come from Navajo Reservoir. Navajo Dam is a feature of the Colorado River Storage Project Act (CRSPA). Consequently, water from the Navajo Reservoir is subject to a CRSPA fee. The current fee for municipal water is approximately 60 dollars per acre-foot.

9.3 Acquiring water rights

To determine the cost of acquiring the water rights for the Project, a range of values can be applied. The most secure option is to secure water rights that are already within the environmental baseline. For this assessment it has been assumed that these water rights would cost approximately $3,000 per acre-foot, or $90 million. A less costly option may be to pursue a new contract with the Secretary of the Interior. However, the long-term availability of this water has not been established. Presumably this contract water would only be subject to the CRSP fee. However, a new contract will require the tacit approval of the Tribes in the basin, and there may be additional costs associated with environmental compliance. Securing a long-term water supply form either NIIP or the Jicarilla Apache Nation would require lease options and possibly forbearance agreements between the parties. These agreements may cost at least as much as securing water from the Secretary, and potentially as much as securing private water rights. Consequently, for the purposes of this cost estimate, a unit cost of $3,000 per acre-foot has been used. Amortized at 7 percent per year over 40 years, the annualized cost of the water rights is $191 per acre-foot or $0.59 per thousand gallons.

9.4 NIIP Cost of Services and Potential Repayment Obligation

With the San Juan River Alternative most of the water supply will be diverted directly from the San Juan River. Only the 3,600 acre-feet of diversion from Cutter Reservoir will require the use of any of the NIIP facilities. However, for the NIIP Alternative the municipal water conveyed through the NIIP facilities will share some of the operation and maintenance responsibility. This responsibility justifies a cost of services agreement. The cost of services principal suggests that the revenue received from a water user should equal the cost of serving that water user. One component of determining this cost is the degree to which a particular user affects base and peak demands. If the municipal water requires the construction of additional NIIP infrastructure that is only used for brief periods of time, then the municipal water use may be expected to contribute a greater share of the operating revenue. If the municipal water requires extra management to ensure an additional degree of reliability, or if the municipal water requires more expensive delivery during the winter months, then the municipal water users may be expected to contribute a greater share of the overall operating revenue.

There is a trade off between conveying water through the NIIP canals during the winter months and minimizing the storage requirement verses not using the canals during the winter months and providing extra reservoir storage. However, with or without the municipal Project, NIIP is winterizing a portion of the Gravity Main Canal to enable limited winter delivery for the proposed french fry factory.

In addition the municipal Project would only use a small segment of the Main Canal and the Burnham Lateral. Consequently, it could be argued that the cost of delivering water to Moncisco Reservoir should be less than the overall NIIP average water delivery expense. Determining which conveyance scenario is the most cost effective, and what the appropriate share of the overall operating expense should be assigned to the municipal water will require a more refined analysis of the alternatives.

From 1991 through 1996 the NIIP operation and maintenance budget ranged from $3.5 to $3.9 million. Based on the total water diversion from Navajo Dam, the unit operating cost of the water ranged from $19.68 to $29.94 per acre-foot. However, the conveyance efficiency of the NIIP canals ranged from a low of 80 percent to a high of 90 percent. Consequently, the average unit cost of the water delivered is between $21.87 and $33.27 per acre-foot.

Based on NAPI's assessment of its operation, maintenance and repair costs, the actual operating cost in 1996 was $6.1 million per year. Based on NAPI's assessment of its needs, the average unit operating cost is $52.13 per acre-foot. For this technical memorandum an average unit NIIP conveyance cost of $50 per acre-foot is assumed.

The municipal water conveyed through the NIIP system may be subject to a repayment obligation to the federal government for the use of the NIIP facilities. The cost of the main canal is $108 million, the cost of the Moncisco Pump station is $54 million, and the cost of the Burnham Lateral is $8 million. Assuming that the Project has an average capacity of approximately 50 cfs, and that the repayment obligation for irrigation water and municipal water is equally shared, the total

repayment obligation for the municipal component may be approximately $7.8 million. These values, which are shown in Table 9.2, have not been included in the total cost estimate.

Assuming a conveyance efficiency of 90 percent, 10 percent of the water diverted from Navajo Reservoir through the NIIP facilities may not reach Moncisco Reservoir. With the NIIP Alternative this loss may be greater than 3,000 acre-feet per year. Some of this loss may return to the San Juan River. However, incidental losses will deplete a portion of the water conveyed. These losses need to be included in the overall cost of the NIIP Alternative

Table 9.2
Potential Capital Repayment Obligation of the Navajo Gallup Water Supply Project for the use of NIIP Facilities

NIIP Facility	Original Cost (Dollars)	Nominal Capacity (CFS)	Design Life (Years)	Percent of Capacity (Percent)	Potential Obligation (Dollars)
Main Canal	$108,000,000	1,200	100	4.17%	$4,500,000
Gallegos Pump	$54,000,000	880	40	5.68%	$3,068,000
1/4 of the Burnham Lateral	$8,000,000	440	100	11.36%	$227,000
Total	$170,000,000				$7,795,000

9.5 The City of Gallup and NTUA municipal system improvements

In addition to the Project components which will convey water from the San Juan River south toward Yah-ta-hey, additional facilities will be needed to distribute the Project water throughout the City. For the cost estimate in presented in this technical memorandum, the Gallup Area Lateral conveys water south to the Gallup Junction and then east toward Church Rock and south toward Red Rock. This lateral has been included with the Project costs. However, the City's internal conveyance system will need programmatic upgrades over the next 40 years to deliver this water to the water users. For this cost estimate it has been assumed that the internal system improvements will cost $40 million. This same unit cost has also been applied to the NTUA system upgrades.

9.6 City of Gallup and NTUA retail costs

In addition to the cost of operating the Project, both NTUA and the City of Gallup will incur additional retail costs for delivering the water to individual water users. These costs include billing, meter reading, and other administrative expenses. To develop an estimate of the retail cost of water, the water rates in the Southwestern Water Rate Survey were reviewed. The City of Page, Arizona delivers slightly more than 3,000 acre-feet of water per year. This volume is approximately the same volume of water delivered by the City of Gallup. The City of Page charges slightly more than $1.00 per thousand gallons ($312 per acre-foot). With its location next to Lake Powell and its intake built into the dam, the City of Page has very few fixed capital or variable costs. Based on its overall water use, the City of Page's nominal water treatment cost should be approximately $380,000 per year. It is reasonable to assume that the balance of their budget, approximately $0.60 per thousand gallons (or $195.per acre-foot), reflects the retail cost of the water.

9.7 Project operation and maintenance

For the San Juan River Alternative with a 36,700 acre-foot diversion, the annual energy cost is approximately $4.3 million per year and the operation and maintenance cost is $5.7 million per year. The average unit cost of this alternative is approximately $272 per acre foot. For the NIIP Alternative with a 36,700 acre-foot diversion, the annual energy cost is approximately $2.9 million per year and the operation and maintenance cost is $4.1 million per year. The unit cost of this alternative is approximately $191 per acre foot. These values are presented in Table 8.18. While the unit cost of the NIIP alternative is less than the San Juan River alternative, the NIIP alternative will require the cost of service agreement with NIIP which may add at least $50 per acre-foot. This value increases the operation and maintenance cost of the NIIP Alternative to $240 per acre-foot. Therefore, the cost advantage of using the NIIP facilities may be eliminated by the cost of utilizing the NIIP canals.

NTUA has expressed concerns that during the early life the overall demands will be less than the total. Consequently, the Project operation and maintenance costs would be distributed over a smaller volume of water. Based on the Project's 2010 demand, the Project will deliver 11,141 acre feet to Navajo water users. At this rate, the unit operation and maintenance cost of the Navajo Nation water would be $424 per acre-foot (or $1.30 per thousand gallons) and the Gallup cost would be $331 per acre-foot (or $1.02 per thousand gallons). Based on the Project's 2020 demand, the Project will deliver 15,430 acre-feet to Navajo water users. At this rate, the unit operation and maintenance cost of the Navajo Nation water would be $368 per acre-foot (or $1.13 per thousand gallons) and the Gallup cost would be $307 per acre-foot (or $0.94 per thousand gallons). Based on the Project's 2030 demand, the Project will deliver 21,391 acre-feet to Navajo water users. At this rate, the unit operation and maintenance cost of the Navajo Nation water would be $282 per acre-foot (or $0.97 per thousand gallons) and the Gallup cost would be $282 per acre-foot (or $0.87 per thousand gallons). And, based on the Project's 2040 demand, the Project will deliver 29,067 acre-feet to Navajo water users. At this rate, the unit operation and maintenance cost of the Navajo

Nation water would be $275 per acre-foot (or $0.85 per thousand gallons) and the Gallup cost would be $261 per acre-foot (or $0.80 per thousand gallons).

9.8 Phasing and conjunctive use

Some of the Project facilities do not need to be fully built until later in the Project's planning horizon. For instance, the construction of the water treatment plant, pumping stations, regulating storage, and groundwater components can readily be phased as the Project's demands justify the capital expenditures. Deferring these facilities will result in a lower present cost of the Project's facilities.

With the San Juan River Alternative 60 percent of the total cost is for the pipeline which does not lend itself to phasing. The water treatment plant which is 25 percent of the total cost, the storage tanks which are 10 percent, and the pump stations which are 5 percent may be phased. With the NIIP Alternative 50 percent of the total cost is for the pipeline and 15 percent is for Moncisco Reservoir. These costs do not lend themselves to phasing. The water treatment plant which is 20 percent of the total cost, the storage tanks which are 10 percent, and the pump stations which are 5 percent may be phased. An analysis of the potential reduction in the present value of the Project with phasing is beyond the scope of this technical memorandum.

9.9 Conclusion of the Unit Cost Analysis

The unit costs of the Project water including several important noncapital costs are presented in Table 9.3. Based on the data presented in Table 9.3 the total unit cost of the Project water is approximately $4.81 per thousand gallons. Included in this estimated rate is the full cost of amortizing the capital investment and the value of the water rights. This estimate also includes the cost of using the NIIP, improving the local systems and the retail expense of the water utilities. The estimated rate is approximately $2 per thousand gallons more than NTUA and the City of Gallup are currently charging for water. For a family of four, using 160 gallons per capita per day, the monthly water bill would be $94 per month.

Table 9.3
Estimated Average Unit Cost of Navajo-Gallup Water Supply Project Water Based on 36,700 acre-feet of Diversion

Cost Component	Estimated 2000 Cost (Dollars/AF)	Estimated Cost (Dollars/1000 gal)
1.Amortized $370 Million Capital Cost (7% and 40 Years)	$756	$2.34
2. CRSP fee	$60	$0.18
3. Amortized Water Rights ($3,000/af, 7% and 40 years)	$191	$0.59
4. NIIP Cost of Services ($50 to $300 per acre-foot)	$50	$0.16
5. City of Gallup improvements	$36	$0.11
6. City of Gallup retail cost	$195	$0.60
7. Project Operation and Maintenance	$272	$0.83
Total Unit Cost	$1,560	$4.81

Note:

During the first decade of operation the Project operation and maintenance expense will be approximately $1.30 per thousand gallons for the Navajo Nation and $1.02 dollars per thousand gallons for the City of Gallup.