Chapter II

NEED FOR ACTION

INTRODUCTION

This chapter describes and quantifies water demand and supply problems for the Navajo Nation, city of Gallup, and Jicarilla Apache Nation. In the view of the Navajo Nation, a poverty rate of greater than 50 percent and a growing population combined with a lack of infrastructure, particularly for water, on a vast, arid reservation with widely dispersed communities and households has created an urgent need for adequate water supplies. The lack of infrastructure and economic development and sustained poverty are closely connected, and they are related to a reliable water supply. The city of Gallup's position is that groundwater is being depleted faster than it is being recharged, and the quality does not meet secondary water quality standards. Severe water shortages are anticipated within the next *decade*. The Jicarilla Apache Nation asserts that it needs a reliable, high-quality water supply in areas outside Dulce to continue diversifying their economy for on-reservation employment and to live in a more dispersed manner as they did traditionally and have stated it desires to do so in the future.

The general study area, east of the Chuska Mountains, is primarily semiarid and desert-like in nature, with low rainfall and low carrying capacity for most forms of wildlife. The vegetative diversity is low, and ground cover in many areas is sparse, offering very little habitat for most forms of wildlife. Land use is primarily open range and sparsely populated, except for those scattered communities along Route 491, and generally undeveloped.

The San Juan River valley in the northern part of the Navajo-Gallup Water Supply Project (proposed project) area is an oasis in what is otherwise a dry and almost barren environment. The river valley supports irrigated agriculture, recreation, fish and wildlife, wetlands, riparian vegetation and habitat, and other systems that are dependent on water.

The projected Navajo Nation's population increase in the proposed project area by the year 2040 from the current 90,000 to 180,462 people will have an impact on the area.

The need for water, which is currently limited in quantity and quality, will continue to increase. Changes in land use patterns may occur as the population expands. The existing communities will likely expand, and new communities may be developed with adequate water supplies. Mineral and energy resource development are expected to grow, and new industries are likely to move in to use the area's human capital and natural resources and to provide services.

NAVAJO NATION AND GALLUP, NEW MEXICO – PROBLEM IDENTIFICATION

Navajo Nation

More than 40 percent of Navajo households rely on water hauling to meet daily water needs. Those households with piped water have limited water quantity and pay among the highest water rates in the region. As challenging as the current circumstances are, limited water supplies in the future will pose an even greater challenge. The Navajo Nation's predicted annual population growth rate is 2.48 percent to the year 2040, which will require six times more municipal water than today.

The limited availability of water is part of the larger pattern of a low economic standard of living throughout the proposed project area. The poverty rate of greater than 50 percent on the Navajo Reservation is one of the worst in the United States, and it persists even while the regional economy is booming. The lack of infrastructure and economic development and sustained poverty are closely connected, and they are related to a reliable water supply.

City of Gallup

As a regional trade center, the city of Gallup supports a municipal population of about 23,000, but also serves as an economic hub for a trade area of about 100,000 people. The city relies solely on a groundwater supply that continues to be progressively mined with little recharge into the source aquifers. Current hydrologic projections by the city predict severe shortages in the groundwater supply within the next decade, which would have severe social and economic impacts on the city and on the neighboring Navajo communities (Gallup Town Hall on Water, May 2003). The city of Gallup has investigated other potential water supplies, water conservation, additional

groundwater supplies, and surface supplies. Water conservation and mining groundwater can help in the short term, but for a long-term sustainable supply, water from the San Juan River is the only viable option.

NAVAJO NATION AND GALLUP, NEW MEXICO – PROBLEM QUANTIFICATION

Population Projections

The proposed project service area includes more than 66,000 people in New Mexico, including the city of Gallup, and more than 11,000 people in Arizona. Population statistics are based on 1990 census data (Rodgers, 1993) and do not take into account that the U.S. Census Bureau believes the actual population of the Navajos in 1990 to have been approximately 13.9 percent greater than the official count. The 2000 census data were not available at the time of this work; the data have since been reviewed, and it would not have measurably changed the results. Additional material on population growth rates and water demand is included in volume II, appendix A. Tables II-1 through II-5 illustrate population growth and the need for additional water supplies in the proposed project area.

Table II-1.—Projected population in the proposed project service area by basin

Decade	New Mexico Upper Colorado Basin	New Mexico Lower Colorado Basin	New Mexico Rio Grande Basin	Arizona Lower Colorado Basin	Project total
2000[1]	43,453	37,828	2,504	15,033	98,818
2010	55,516	46,494	3,199	19,206	124,415
2020	70,926	57,205	4,087	24,538	156,756
2030	90,614	70,454	5,222	31,349	197,639
2040	115,767	86,861	6,672	40,052	249,352

Note: Annual growth for the city of Gallup is 1.82 percent and 2.48 percent for the Navajo Nation.

[1] Data are based on 1990 census data projections for the year 2000.

Water Resource

The water demand in the proposed project service area is based on three distinct components: current population, per capita water use, and projected growth rates, as shown in tables II-2 through II-6 and in volume II, appendix A. The city of Gallup uses 160 gallons per capita per day (gpcd) for current and future demand projections.

Table II-2.—Municipal water demand by basin for the proposed project **(2020)**

Municipal subarea	Basin of use[1]	1990 census pop.	2020 pop.[2]	2020 demand[3] (AFY)[4]	2020 ground-water production and ALP[5] (AFY)	2020 San Juan River diversion[6] (AFY)	2020 San Juan River depletion[7] (AFY)
Central Area, NM	U.C.	1,493	3,113	558	52	506	506
City of Gallup, NM[8]	L.C.	19,154	32,904	5,,898	0	7,500	7,500
Crownpoint, NM	U.C.	5,287	11,025	1,976	541	1,435	1,435
Gallup area, NM	L.C.	7,904	16,482	2,954	382	2,572	2,572
Huerfano, NM	U.C.	1,492	3,111	558	68	489	489
Navajo Agricultural Products Industry, NM[9]	U.C.	N/A	N/A	7,274	500	500	500
Rock Springs, NM	L.C.	3,749	7,818	1,401	113	1,288	1,288
Route 491, NM	U.C.	10,099	21,060	3,775	635	3,139	3,139
San Juan River, NM[10]	U.C.	13,804	28,786	5,159	4,680	479	240
Torreon, NM[11]	U.C./ R.G.	3,797	7,918	1,419	95	1,324	1,324
New Mexico Upper Colorado Basin	U.C.	34,012	75,013	20,719	6,571	7,874	7,634
New Mexico Rio Grande Basin	R.G.	1,960	4,087	773	95	638	638
New Mexico Lower Colorado Basin	L.C.	30,807	57,205	10,253	496	11,360	11,360
Total New Mexico		66,779	132,218	30,972	7,067	19,234	18,994
Total Arizona[12]	L.C.	11,767	24,538	4,398	905	3,493	3,496
Project total		78,546	156,756	35,370	7,972	22,727	22,490

Note: Rounding error may cause subtotals to be off by 1.

[1] U.C. = Upper Colorado Basin, L.C. = Lower Colorado Basin, and R.G. = Rio Grande Basin.

[2] Annual growth for the city of Gallup is 1.82 percent and 2.48 percent for the Navajo Nation.

[3] Per capita water demand is 160 gallons per person per day.

[4] Acre-feet per year.

[5] ALP = Animas-La Plata; estimated sustainable groundwater production.

[6] Diversions = demand - groundwater use.

[7] Depletions are based on zero return flow and use of sustainable groundwater.

[8] The city of Gallup plans to recharge its aquifer and use groundwater for summer seasonal peaking.

[9] Navajo Agricultural Products Industry depletions are 700 AFY, including 400 AFY for the proposed french fry factory.

[10] Approximately 4,680 AFY of diversion and 2,340 AFY of depletion from the San Juan River subarea's demand is met by the ALP Project, and 1,871 acre-feet of depletion is met by the Navajo Gallup Water Supply Project. Assumes 50 percent of the San Juan River municipal diversions return to the river.

[11] Torreon includes use in the Rio Grande Basin. These depletions are counted toward New Mexico Upper Colorado River allocation.

[12] Window Rock subarea includes depletions, which are counted toward the Upper and/or Lower Colorado allocation.

Table II-3.—Municipal water demand by basin for the proposed project **(2040)**

Municipal subarea	Basin of use[1]	1990 census pop.	2040 pop.[2]	2040 demand[3] (AFY)[4]	2040 ground-water production and ALP[5] (AFY)	2040 San Juan River diversion[6] (AFY)	2040 San Juan River depletion[7] (AFY)
Central Area, NM	U.C.	1,493	5,082	911	77	834	834
City of Gallup, NM[8]	L.C.	19,154	47,197	8,459	1,439	7,500	7,500
Crownpoint, NM	U.C.	5,287	17,996	3,225	752	2,473	2,473
Gallup area, NM	L.C.	7,904	26,903	4,822	506	4,316	4,316
Huerfano, NM	U.C.	1,492	5,078	910	46	864	864
Navajo Agricultural Products Industry, NM[9]	U.C.	N/A	N/A	7,274	0	700	700
Rock Springs, NM	L.C.	3,749	12,761	2,287	169	2,118	2,118
Route 491, NM	U.C.	10,099	34,374	6,161	795	5,366	5,366
San Juan River, NM[10]	U.C.	13,804	46,985	8,421	4,680	3,741	1,871
Torreon, NM[11]	U.C./ R.G.	3,797	12,924	2,316	77	2,240	2,240
New Mexico Upper Colorado Basin	U.C.	34,012	115,767	28,023	7,050	15,100	13,229
New Mexico Rio Grande Basin	R.G.	1,960	6,672	1,196	77	1,119	1,119
New Mexico Lower Colorado Basin	L.C.	30,807	86,861	15,568	2,114	13,934	13,934
Total New Mexico		66,779	209,300	44,788	9,241	30,153	28,282
Total Arizona[12]	L.C.	11,767	40,052	7,179	767	6,411	6,411
Project total		78,546	249,352	51,967	10,008	36,564	34,693

Note: Rounding error may cause subtotals to be off by 1.

[1] U.C. = Upper Colorado Basin, L.C. = Lower Colorado Basin, and R.G. = Rio Grande Basin.

[2] Annual growth for the city of Gallup is 1.82 percent and 2.48 percent for the Navajo Nation.

[3] Per capita water demand is 160 gallons per person per day.

[4] Acre-feet per year.

[5] ALP = Animas-La Plata; estimated sustainable groundwater production.

[6] Diversions = demand - groundwater use.

[7] Depletions are based on zero return flow and use of sustainable groundwater.

[8] The city of Gallup plans to recharge its aquifer and use groundwater for summer seasonal peaking.

[9] Navajo Agricultural Products Industry depletions are 700 AFY, including 400 AFY for the proposed french fry factory.

[10] Approximately 4,680 AFY of diversion and 2,340 AFY of depletion from the San Juan River subarea's demand is met by the ALP Project, and 1,871 acre-feet of depletion is met by the Navajo Gallup Water Supply Project. Assumes 50 percent of the San Juan River municipal diversions return to the river.

[11] Torreon includes use in the Rio Grande Basin. These depletions are counted toward New Mexico Upper Colorado River allocation.

[12] Window Rock subarea includes depletions, which are counted toward the Upper and/or Lower Colorado allocation.

Table II-4.—Chapter water demand for the proposed project **(2020)**

Service area	Chapter	1990 population	2020 population	2020 demand (AFY)[1]	2020 ground-water production and ALP[2] (AFY)	2020 San Juan River depletion[3] (AFY)
City of Gallup, NM	City of Gallup	19,154	32,904	5,898	0	7,500
Central Area, NM	Burnham	246	513	92	0	92
	Lake Valley	436	909	163	34	129
	White Rock	201	419	75	See Lake Valley	75
	Whitehorse Lake	610	1,272	228	18	210
	Subtotal	1,493	3,113	558	52	506
Crownpoint, NM	Becenti	193	402	72	See Crownpoint	72
	Coyote Canyon	1,234	2,573	461	47	414
	Crownpoint	2,658	5,543	993	438	555
	Dalton Pass	313	653	117	0	117
	Little Water	638	1,330	238	See Crownpoint	238
	Standing Rock	251	523	94	55	38
	Subtotal	5,287	11,025	1,976	541	1,435
Gallup area, NM	Bread Springs	1,219	2,542	456	60	396
	Chichiltah	1,555	3,243	581	See Bread Springs	581
	Church Rock	1,780	3,712	665	90	575
	Lyanbito	974	2,031	364	77	287
	Mariano Lake	726	1,514	271	107	164
	Pinedale	609	1,270	228	See Mariano Lake	228
	Red Rock	1,041	2,171	389	48	341
	Subtotal	7,904	16,482	2,954	382	2,572
Huerfano, NM	Huerfano	511	1,066	191	45	146
	Nageezi	981	2,046	367	23	343
	Subtotal	1,492	3,111	558	68	489
Rock Springs, NM	Manuelito	631	1,316	236	23	213
	Rock Springs	1,685	3,514	630	58	571
	Tsayatoh	1,433	2,988	536	32	504
	Subtotal	3,749	7,818	1,401	113	1,288

Table II-4.—Chapter water demand for the proposed project **(2020)** (continued)

Service area	Chapter	1990 population	2020 population	2020 demand (AFY)[1]	2020 ground-water production and ALP[2] (AFY)	2020 San Juan River depletion[3] (AFY)
Route 491, NM	Mexican Springs	711	1,483	266	See Tohatchi	266
	Naschitti	1,539	3,209	575	79	496
	Newcomb	651	1,358	243	12	231
	Sanostee	2,081	4,340	778	121	657
	Sheep Springs	660	1,376	247	14	233
	Tohatchi	1,607	3,351	601	222	378
	Twin Lakes	1,967	4,102	735	120	615
	Two Grey Hills	883	1,841	330	66	264
	Subtotal	10,099	21,060	3,775	635	3,139
Torreon, NM	Counselor	1,365	2,846	510	0	510
	Ojo Encino	596	1,243	223	18	205
	Pueblo Pintado	472	984	176	0	176
	Torreon	1,364	2,844	510	77	433
	Subtotal	3,797	7,918	1,419	95	1,324
San Juan River, NM[4]	Beclaibito	388	809	145	0	73
	Cudei	495	1,032	185	0	93
	Hogback	740	1,543	277	0	138
	Nenahnezad	1,253	2,613	468	0	234
	San Juan	540	1,126	202	0	101
	Shiprock	8,100	16,891	3,027	0	1,514
	Upper Fruitland	2,288	4,771	855	0	428
	Subtotal	13,804	28,786	5,159	4,680	240
Navajo Agricultural Products Industry, NM		N/A	N/A	7,247	N/A	500
NM Upper Basin		35,972	75,013	20,719	6,571	7,634
NM Lower Basin		30,807	57,205	10,253	496	11,360
Total New Mexico		66,779	132,218	30,972	7,067	18,994
Window Rock, AZ	Fort Defiance	6,187	12,902	2,312	905	1,408
	Saint Michaels	5,580	11,636	2,086	See Fort Defiance	2,086
Total Arizona		11,767	24,538	4,398	905	3,493
Project total		78,546	156,756	35,370	7,972	22,487

[1] Acre-feet per year.
[2] Animas-La Plata Project.
[3] Depletions assume zero return flows to the San Juan River.
[4] San Juan River depletions do not include Animas-La Plata Project water.

Table II-5.—Chapter water demand for the proposed project **(2040)**

Service area	Chapter	1990 population	2040 population	2040 demand (AFY)[1]	2040 ground-water production and ALP[2] (AFY)	2040 San Juan River depletion[3] (AFY)
City of Gallup, NM	City of Gallup	19,154	47,179	8,459	1,439	7,500
Central Area, NM	Burnham	246	837	150	0	150
	Lake Valley	436	1,484	266	46	220
	White Rock	201	684	123	See Lake Valley	123
	Whitehorse Lake	610	2,076	372	31	341
	Subtotal	1,493	5,082	911	77	834
Crownpoint, NM	Becenti	193	657	118	See Crownpoint	118
	Coyote Canyon	1,234	4,200	753	61	692
	Crownpoint	2,658	9,047	1,622	614	1,008
	Dalton Pass	313	1,065	191	0	191
	Little Water	638	2,172	389	See Crownpoint	389
	Standing Rock	251	854	153	77	76
	Subtotal	5,287	17,996	3,225	752	2,473
Gallup area, NM	Bread Springs	1,219	4,149	744	77	667
	Chichiltah	1,555	5,293	949	See Bread Springs	949
	Church Rock	1,780	6,059	1,086	123	963
	Lyanbito	974	3,315	594	153	441
	Mariano Lake	726	2,471	443	92	351
	Pinedale	609	2,073	372	See Mariano Lake	372
	Red Rock	1,041	3,543	635	61	574
	Subtotal	7,904	26,903	4,822	506	4,316
Huerfano, NM	Huerfano	511	1,739	312	31	281
	Nageezi	981	3,339	598	15	583
	Subtotal	1,492	5,078	910	46	864
Rock Springs, NM	Manuelito	631	2,148	385	46	339
	Rock Springs	1,685	5,735	1,028	77	951
	Tsayatoh	1,433	4,878	874	46	828
	Subtotal	3,749	12,761	2,287	169	2,118

Table II-5.—Chapter water demand for the proposed project **(2040)** (continued)

Service area	Chapter	1990 population	2040 population	2040 demand (AFY)[1]	2040 ground-water production and ALP[2] (AFY)	2040 San Juan River depletion[3] (AFY)
Route 491, NM	Mexican Springs	711	2,420	434	See Tohatchi	434
	Naschitti	1,539	5,238	939	77	862
	Newcomb	651	2,216	397	12	385
	Sanostee	2,081	7,083	1,270	153	1,117
	Sheep Springs	660	2,246	403	15	388
	Tohatchi	1,607	5,470	980	307	673
	Twin Lakes	1,967	6,695	1,200	153	1,047
	Two Grey Hills	883	3,005	539	77	462
	Subtotal	10,099	34,374	6,161	794	5,367
Torreon, NM	Counselor	1,365	4,646	833	0	833
	Ojo Encino	596	2,029	364	15	348
	Pueblo Pintado	472	1,607	288	0	288
	Torreon	1,364	4,643	832	61	771
	Subtotal	3,797	12,924	2,316	77	2,240
San Juan River, NM[4]	Beclaibito	388	1,321	237	0	118
	Cudei	495	1,685	302	0	151
	Hogback	740	2,519	451	0	226
	Nenahnezad	1,253	4,265	764	0	382
	San Juan	540	1,838	329	0	165
	Shiprock	8,100	27,570	4,942	0	2,471
	Upper Fruitland	2,288	7,788	1,396	0	698
	Subtotal	13,804	46,985	8,421	4,680	1,871
Navajo Agricultural Products Industry, NM		N/A	N/A	7,274	N/A	700
NM Upper Basin		35,972	122,439	29,219	7,127	14,348
NM Lower Basin		30,807	86,861	15,568	2,114	13,934
Total New Mexico		66,779	209,300	44,788	9,241	28,282
Window Rock, AZ	Fort Defiance	6,187	21,059	3,774	767	3,007
	Saint Michaels	5,580	18,993	3404	See Fort Defiance	3,404
Total Arizona		11,767	40,052	7,179	767	6,411
Project total		78,546	249,352	51,967	10,008	34,693

[1] Acre-feet per year.
[2] Animas-La Plata Project.
[3] Depletions assume zero return flows to the San Juan River.
[4] San Juan River depletions do not include Animas-La Plata Project water.

Table II-6.—Projected municipal demand (excluding Navajo Agricultural Products Industry) in the proposed project service area by basin
(acre-feet)

Decade	New Mexico Upper Colorado Basin	New Mexico Lower Colorado Basin	New Mexico Rio Grande Basin	Arizona Lower Colorado Basin	Project total
2000	7,789	6,780	448	2,695	17,712
2010	9,951	8,333	573	3,442	22,299
2020	12,672	10,253	773	4,398	28,096
2030	16,241	12,628	936	5,619	35,424
2040	20,749	15,568	1,196	7,179	44,692
2050	26,509	19,214	1,528	9,171	56,422
2060	33,869	23,738	1,951	11,717	71,275

Per capita water use on Navajo Reservation lands varies depending on the accessibility of the water supply. Surveys in 1993 showed that 44 percent of Navajo households in the proposed project area are without direct access to a public water supply system and use very little water (Bureau of Reclamation [Reclamation], 1993). Per capita water use rates for homes without running water are estimated at 10 gpcd (Murray, 1965). It is estimated that families hauling water for domestic purposes spend the equivalent of $22,000 per acre-foot compared with $600 per acre-foot for a typical suburban water user in the region (Northwest Economic Associates, 1993a).

Billing data from the Navajo Tribal Utility Authority (NTUA) indicate that average use on the NTUA system is approximately 100 gpcd; on non-NTUA systems, it ranges from 20 to 100 gpcd. Low usage rates are often limited by system and supply constraints, not demand.

Accordingly, a per capita use rate of 160 gpcd[1] was used for water resource planning at the request of the Navajo Nation.

The Navajo Agricultural Products Industry (NAPI) has plans for future projects, which require water. To support industrial diversification relating to an agricultural-related food processing plan by NAPI, the proposed project would provide 700 acre-feet of treated water per year.

[1] The 160 gpcd amount is customarily used in New Mexico for planning the municipal and industrial water supply.

Water Infrastructure

Existing local water conveyance systems are being upgraded and expanded. The Indian Health Service will design, fund, and oversee construction of most of these improvements. The systems will be turned over to the NTUA for ownership and operation and maintenance. A limited supply of quality groundwater constitutes a restriction in expansion of these systems to meet people's needs. Funding and housing density also limit expansion.

Regional systems such as this project will connect to these local systems to provide a good quality water supply. Improvements and expansions to these local systems will continue as in the past but with an adequate water supply.

City of Gallup

Problems currently encountered by the city of Gallup center on its use of two confined aquifers with water tables between 900 and 3,000 feet deep and two well fields in which static water levels are declining approximately 200 feet every 10 years. The city of Gallup needs to augment its groundwater supply; the level at the city's Ya-ta-hey Well Field has dropped by more than 800 feet since the 1970s, and the city anticipates a 1-million-gallon-per-day deficit by summer 2010.[2]

The city of Gallup is the economic and commercial center of a 15,000-square-mile trade area that includes parts of northwestern New Mexico and northeastern Arizona, including the surrounding Navajo and Zuni Reservations. The economy of the region is based on retail and wholesale trade; Federal, State, and local government agencies; tourism; light manufacturing; agriculture; and energy extraction industries.

The current limited water situation and its future availability are major concerns of area residents. The city of Gallup presently relies on a series of old wells previously owned by the Atchison, Topeka, and Santa Fe Railway. The city is also relying on a more recent field in the Ya-ta-hey area just north of the city of Gallup. The in-city wells, which are located in the Gallup Sandstone Aquifer that is highly dependent on recharge from local precipitation, have shown a substantial decrease in yield. Production has been reduced from 15 active to 9 usable wells, and the lowering yields have been accompanied by deteriorating quality and excessive pumping costs. Because of dependence on local

[2] The city of Gallup identified two short-term alternatives involving expansion of one well field and developing water to the east, but neither alternative is sustainable. Other sources have proven to be inadequate.

recharge for supply, the city of Gallup administration has assumed that the aquifer would have a safe annual sustained yield of only 2,000 acre-feet. Withdrawals in excess of this amount could lead to a "mining"[3] aquifer condition.

Because of the severe limitation of the in-city well system, the city of Gallup began to develop the Ya-ta-hey Well Field as a supplemental supply. The estimated firm yield of this source is about 3,800 acre-feet per year (AFY), but could be less. Even with the full development of the combined well field system, current peaking requirements during heavy use periods severely tax the ability of the two well fields to meet the demands.

It appears that even without extensive industrial development in the area, the city of Gallup's demand for domestic water will exceed present and potential supplies within the next decade. Beyond this point, the city must find alternative sources or possibly be faced with curtailing growth and/or instituting strict water rationing.

The city of Gallup's present water supply problem is that of both quality and quantity. Groundwater is not an alternative that would meet the city's goals to obtain a long-term good-quality supply. Their existing supply does not meet secondary water quality standards. Other groundwater sources in the area are also questionable from a yield and quality standpoint. Desalting or extensive treatment of groundwater would be expensive. The city of Gallup's desire over the years has been to develop a good source of a dependable water supply that would sustain their long-term needs. By Resolution No. 24-51, June 13, 1967, the city of Gallup made a formal request for 15,000 AFY of water from Navajo Reservoir to the New Mexico Interstate Stream Commission. Following reviews and discussions of this request, the city was allocated 7,500 acre-feet in 1968. Secretarial approval was granted to the State of New Mexico for temporary water contracts from Navajo Reservoir. The temporary allocations were for 10,000 AFY through the year 2005. The city of Gallup's 7,500 acre-feet is part of this allocation.

JICARILLA APACHE NATION – PROBLEM IDENTIFICATION

The need for a dependable municipal and industrial water supply for the southwestern part of Jicarilla Apache Nation Reservation lands is tied to their desire for a basic infrastructure that would allow Tribal members to remain on reservation lands with a lifestyle they choose.

Formerly a widely dispersed population with cattle and sheep ranches, the Jicarilla Apache Nation began to focus on timber sales and the oil and gas industries in the

[3] Mining refers to the condition that occurs when more water is being pumped out of the aquifer than is being replenished or recharged.

mid-l950s, with the population gradually moving into Dulce, New Mexico, the center of its government. The Jicarilla Apache Nation is now by far the largest employer for its people; Tribal members seeking alternative employment or post-secondary education must relocate off-reservation where an estimated 21 percent of the total Tribal population resides. The Jicarilla Apache Nation is striving toward a diversified economy that will permit Tribal members to work on the reservation.

Economic development for the Teepee Junction area centers on an existing casino and planned travel service center and accompanying businesses at and near the U.S. Highway 550/State Road 537 junction, where Jicarilla-refined fuel would be sold at retail and possibly wholesale prices and an estimated 400-plus jobs could be created. In addition, the Jicarilla Apache Tribal Utility Authority may ultimately develop a 100-megawatt, gas-fired "merchant" plant that could supply local power needs and also sell wholesale power on the open market. A major barrier to planning for the Teepee Junction area has been the lack of a reliable, high-quality water supply.

JICARILLA APACHE NATION – PROBLEM QUANTIFICATION

The Tribal Office of Integrated Resource Management (IRM) has prepared estimated population growth figures based on 2000 U.S. Census data adjusted for an undercount estimated at 12 percent based on the actual undercount rate determined for the 1990 census and confirmed by housing counts. Historical population growth has varied by decade in the range of 1.1 percent to 1.8 percent per year. For planning purposes and for this planning report and draft environmental impact statement, the population growth rate of 1.7 percent per year is assumed. It is also assumed that if there were adequate housing and employment opportunities on-reservation, the rate of those residing off-reservation would fall to 10 percent at any given time by 2020. The data in table II-7 were provided by IRM.

Table II-7.—Population projections for the Jicarilla Apache Nation

	1990[1]	2000[2]	2010	2020	2030	2040
On-reservation	2,730	3,283	3,836	4,389	4,942	5,495
Off-reservation	425	694	575	440	494	550
Total	3,155	3,977	4,411	4,829	5,436	6,045

[1] Based on 1990 U.S. Census count of 2,438 for Dulce with a 12-percent increase. The U.S. Census estimated a 12-percent undercount for the Jicarilla Apache Reservation in 1990.
[2] Based on August 2000 IRMP Housing Count of 878 occupied housing units in Dulce and an average household size of 3.74 persons from the Jicarilla Income and Housing Survey conducted by the Office of Community Development in August 2000.

Water Demand

Water demands are based on the assumption that the average occupancy per household will fall from 3.74 to 3.00 as a result of fully meeting the housing demand and increasing prosperity of the Jicarilla Apache people. The per capita use is assumed to be 160 gallons per day (this figure was used for planning purposes by Reclamation in the Dulce Water and Wastewater Systems Environmental Assessment [Reclamation, 2001]).

Table II-8 illustrates the Jicarilla Apache Nation's anticipated water needs for the Teepee Junction areas that would be served by the proposed project.

Table II-8.—Projected water needs for the Jicarilla Apache Nation

Water demands (AFY)	2002[1]	2010	2020	2030	2040
Casino/travel center	30	50	70	70	70
Power generation	0	750	750	750	750
Housing	11	48	105	156	231
Other uses[2]	50	50	60	80	110
Total[3]	91	898	985	1,056	1,161

[1] These uses include anticipated groundwater use for facilities planned for 2002, U.S. Highway 44 road construction, and oil and gas water leases. It is assumed that this groundwater demand would shift to surface water provided through the proposed project once water was available.

[2] Other use categories include miscellaneous sales for construction, oil and gas production, drought relief for livestock operators and wildlife, nonmetered losses, and additional small commercial development as significant housing develops.

[3] The Teepee Junction area population is estimated at 585 persons in 2020 and 1,290 persons in 2040. Water demands above the amount that the pipeline could provide beyond 2040 would be met using treated groundwater developed locally.