

M E M O R A N D U M

October 28, 1992

TO: File

FROM: Patricia Turney, Staff Engineer

SUBJECT: Upper Colorado River System - Consumptive Uses and Losses Report (New Mexico), 1986-90

Pursuant to the provisions of Title VI of Public Law 90-537, the Secretary of the Interior is directed to prepare reports on the annual consumptive uses and losses of water from the Colorado River System after each successive five year period, beginning with the five year period starting October 1, 1970. This office is requested to furnish data on consumptive uses in New Mexico in the Upper Basin of the Colorado River for the period 1986-90.

The Interstate Stream Commission staff compiled consumptive use data for the New Mexico portion of the Upper Colorado River Basin (New Mexico Upper Basin) for the years 1986-90. Table 1 shows estimates of water consumption by category for 1980-90.

RESERVOIR EVAPORATION

Evaporation on all reservoirs except Beeline Reservoir, Lake Morgan, Jackson, Berland, Big Gap, Holmburg, and Toadacheene are reported under the reservoir evaporation category. The named reservoirs are variously used for municipal water supply, power generation, fish and wildlife, and recreation. Evaporation is reported accordingly.

Navajo Reservoir evaporation was computed for each year using the average of daily reservoir gage heights, corresponding surface areas, and actual pan evaporation and precipitation data recorded

at Navajo Dam. Pan evaporation data from **Characteristics of the Water Supply in New Mexico**, New Mexico State Engineer Technical Report 31 was used for months when data was not available at Navajo Dam.

Evaporation on all other reservoirs reported under this category was computed based on a long-term average content for each month and long-term net lake evaporation rates for individual areas. The same data were used in the 1981-85 consumptive uses and losses report.

AGRICULTURE

Agriculture accounts for 50 - 57% of the consumptive water uses in the New Mexico portion of the New Mexico Upper Basin during each of the years 1986-90. Irrigated acreage determinations were made using the following references:

- 1 Navajo Indian Irrigation Project (NIIP) operation and maintenance status reports for 1986 through 1990;
- 2 **Sources of Irrigation Water and Irrigated and Dry Cropland Acreages in New Mexico, by County¹** for 1985 through 1989 for acreage other than NIIP and Hammond;
- 3 the Bureau of Reclamation's annual series, **Summary Statistics, Vol. 1, Water, Land, and Related Data** for 1985 through 1990 for Hammond Project acreage,
- 4 **Water Use by Category in New Mexico Counties and River Basins, and Irrigated Acreage in 1990**, New Mexico State

¹ Published by the Agricultural Experiment Station, New Mexico State University (NMSU).

Engineer Office Technical Report 47 (TR47) for 1990 acreage other than NIIP and Hammond, and;

- 5 The New Mexico State Engineer Office hydrographic survey of the La Plata River basin (circa 1982).

Because reference #2 reports acreage by county and not by drainage basin, the percentages of irrigated acreage for those portions of Rio Arriba and McKinley counties in the Upper Colorado River Basin were obtained from TR47 for the year 1990. These percentages were multiplied by the total county irrigated acreage listed in reference #2 to determine that portion of irrigated acreage in the Upper Colorado River Basin for the years 1986-89. No irrigated agriculture occurs in the portion of Sandoval County lying within the New Mexico Upper Basin. All irrigated acreage of San Juan County lies within the New Mexico Upper Basin.

Irrigated acreage for San Juan County was broken down into the categories of NIIP, Hammond Project, La Plata, and Other. For 1990, the amount of acreage in Other was obtained by subtracting NIIP, Hammond, and La Plata acreage from the "County Total" in TR47, "Tables 3 & 4 summarized".

The same procedure was used for each of the years 1986-89, but for these years, total county irrigated acreage was obtained from reference #2. Except for NIIP, irrigated acreage thus obtained was multiplied by appropriate consumptive irrigation requirement factors (CIRs) obtained from **Consumptive Irrigation Requirements of**

Selected Irrigated Areas in New Mexico² to obtain irrigation consumptive use. The CIRs used were calculated using the Blaney-Criddle formula and they are as follows:

Hammond Project	1.767 acre-feet/acre
Rio Arriba County	1.0 acre-feet/acre
McKinley County	1.823 acre-feet/acre
San Juan County Other	1.823 acre-feet/acre

Depletions for NIIP were determined using the annual diversions from Navajo Reservoir for the project as reported in the annual NIIP operation and maintenance reports and Bureau of Reclamation data relating to the build-up of groundwater in the project area.

Irrigation depletions were adjusted for shortage conditions where necessary. For purposes of this analysis only, the required supply for full service irrigation was estimated on the basis of 1 cfs diversion per 70 acres.

The total acreage irrigated in the La Plata drainage was 4,089 acres, which would require 58 cfs flow from April through September for a full supply based on the required 1 cfs per 70 acres. Investigation of flow records for the La Plata River at Colorado-New Mexico Stateline show that monthly average flows less than the amount required for a full supply occurred in all years of this reporting period. (When monthly mean flow was greater than the required flow for full supply, the required flow was used to

² Published by the Agriculture Experiment Station, New Mexico State University as Bulletin 531

compute a more realistic water supply for the period.) An average supply factor was computed and used to determine depletion for each year.

The same procedure was used to compute supply factors for the remainder of San Juan County (other than NIIP and Hammond) based on the mean flow of the Animas River at Cedar Hill; and for the New Mexico Upper Basin portion of Rio Arriba County, based on the mean flow of the Navajo River Below Oso Diversion Dam. Neither of these areas experienced shortages in the 1986-90 period.

The procedure was also used to compute supply factors for the New Mexico Upper Basin portion of McKinley County, based on the mean flow of the Rio Nutria Near Ramah. The McKinley County portion of the New Mexico Upper Basin experienced shortages throughout 1986-90.

Depletions for incidental losses during delivery to farms was estimated to be 10% of the CIR depletion after supply factors were applied. Incidental losses were computed for all irrigated acreage except NIIP.

Stockpond evaporation data used in the 1981-85 consumptive uses and losses report were used again in computations for this report. An estimated 3,680 acre-feet per year was used for each year from 1986-90.

Livestock uses were calculated from annual head counts for each county as published in **New Mexico Agricultural Statistics**, an annual series prepared by the United States Department of Agriculture. Percentages of each type of livestock in the New

Mexico Upper Basin portions of Rio Arriba, McKinley, and Sandoval counties were obtained for the 1981-85 consumptive uses and losses report from **Water Use in New Mexico in 1985**, New Mexico State Engineer Technical Report 46 (TR46). These same percentages were used in computations for this report. Per capita livestock water depletions, also from TR46, were used to obtain total livestock depletions for 1986-90 in the New Mexico Upper Basin.³

MUNICIPAL/INDUSTRIAL

This category includes water used for the extraction of mineral resources, generation of thermal electric power, municipally supplied domestic and industrial uses, self-supplied industrial uses, and rural domestic uses. (Municipally supplied domestic and industrial uses are not separable.)

Mineral resource extraction, thermal electric power generation, and self-supplied industrial uses of water in the New Mexico Upper Basin are supplied from surface and groundwater sources. In petroleum extraction, secondary recovery techniques use water by subsurface injection and are not considered to consume water. Self-supplied water use for mineral and power resources were reported by the Water Rights Division of the State Engineer Office for the 1986-90 period. Evaporation from Lake Morgan is included in the industrial category.

Municipal and domestic water suppliers also report annual water withdrawals to the Water Rights Division. When annual

³ Per capita livestock depletions used: Beef Cattle 10 GPCD, Chickens 0.1 GPCD, Hogs 2 GPCD, Horses 10 GPCD, Milk Cows 50 GPCD, Sheep 2 GPCD

reports were not available, per capita water demands listed in TR46 and population data were used to estimate water withdrawals. When such water use estimates were necessary, the per capita demand for rural domestic uses was assumed to be 60 gpcd. All domestic and municipal uses were assumed to have a 45% depletion factor. Both assumed values were used in similar computations for the 1981-85 consumptive uses and losses report. Evaporation from Beeline Reservoir is included in the municipal category.

FISH & WILDLIFE, RECREATION

Reservoir evaporation data for this category was developed for the 1981-85 consumptive uses and losses report and those values were included in this 1986-90 report. Evaporation from Jackson, Berland, Big Gap, Holmberg, and Toadacheene Reservoirs is included in this fish & wildlife, recreation category. About 80% of the depletion attributed to this category is for fish and wildlife purposes including reservoir evaporation and irrigated acreage at Jackson Wildlife Refuge for wildlife feeding. Also included in the fish & wildlife, recreation category are depletions at national and state parks in San Juan and Rio Arriba counties and self-supplied golf courses and miscellaneous businesses in San Juan County.

EXPORTS

The only export of water in the New Mexico Upper Basin in the 1986-90 period occurred from the San Juan-Chama Project diversions. These diversions are considered to be fully depleted and are reported by the USGS in annual water supply papers for New Mexico

as the discharge of Azotea Tunnel at Outlet, near Chama, New Mexico.

POPULATION

Population estimates for 1986-90 were based on **Population Projections for the Hydrobasins of New Mexico: 1990-2040**, a report by the Bureau of Business and Economic Research (BBER), University of New Mexico, August, 1989, and U.S. Census Bureau data for 1980 and 1990. Table 2 summarizes population estimates for 1980 through 1990. By U.S. Census Bureau definition, there are no urban populations (2500 or more persons) in McKinley, Sandoval or Rio Arriba counties in the New Mexico Upper Basin.

Population projections reported for Rio Arriba County in the New Mexico Upper Basin for the 1981-85 consumptive uses and losses report were based on the rate of increase for the entire county which includes the highly populated Rio Grande Basin. It is believed that the estimates used for that period were inflated by the rate of population increase in the Rio Grande Basin.

Rio Arriba County population for the New Mexico Upper Basin has been reduced for the 1986-90 report to more accurately reflect the demographics of the region. The data used were verified in a phone conversation with Ms. Susan Turner, U.S. Public Health Service, Dulce Health Center. Ms. Turner reported 2,978 people "enrolled" for purposes of Indian health care and estimated that the total Jicarilla Reservation population was between 3,000 and 3,200. These numbers are also verified by the BBER report and 1980 U.S. Census Bureau data.

 SUMMARY OF ESTIMATED WATER USE BY NEW MEXICO AND TYPES OF USE

 UNITS: 1000 ACRE-FEET

TABLE 1

YEAR	AGRICULTURE										MUNICIPAL/INDUSTRIAL				EXPORT				ESTIMATED WATER USE TOTAL
	RESERVOIR EVAP.	IRRIGATION	LIVESTOCK	STOCKPOND EVAP. & LIVESTOCK TOTAL	AGRICULT TOTAL	MINERAL RESOURCES	THERMAL ELECTRIC POWER	MUNICIPAL, INDUSTRIAL & DOMESTIC	MUNICIPAL, INDUSTRIAL TOTAL	FISH & WILDLIFE RECREATION	EXPORT OUTSIDE SYSTEM	EXPORT WITHIN SYSTEM	EXPORT WITHIN SYSTEM	EXPORT WITHIN SYSTEM					
1981	39.3	175.7	4.4	180.1	4.2	28.1	9.5	41.8	0.9	53.9	0.0	320.2							
1982	37.6	179.4	4.5	183.9	3.9	34.2	9.1	47.2	0.9	131.0	0.0	404.5							
1983	34.3	185.2	4.5	189.7	5.4	33.2	8.5	47.1	0.9	130.3	0.0	407.7							
1984	40.1	186.7	4.5	191.2	4.2	37.7	8.2	50.1	0.9	113.6	0.0	400.1							
1985	33.2	198.6	4.5	203.1	5.0	34.0	7.8	47.5	0.9	91.8	0.0	382.1							
1986	27.2	199.7	4.5	203.2	1.8	37.3	8.3	47.4	0.8	89.2	0.0	369.5							
1987	31.4	166.8	4.5	171.3	1.5	41.2	10.1	52.8	0.8	83.1	0.0	340.9							
1988	33.7	161.3	4.5	165.8	1.5	40.7	9.0	51.3	0.8	63.6	0.0	316.7							
1989	51.5	213.3	4.5	217.8	1.4	47.5	11.0	59.9	0.8	50.1	0.0	301.6							
1990	33.7	194.2	4.5	198.7	1.0	41.7	9.8	52.7	0.8	76.2	0.0	363.0							

RESERVOIR EVAPORATION *
 =====

RESERVOIR	MAXIMUM AREA (ACRES)	EVAP					NET EVAP (feet)	
		1985	1986	1987	1988	1989		
NAVAJO	NA	31944	25959	30204	32512	50305	32479	----
BASS	5	20	20	20	20	20	20	4.00
CHUSKA	40	113	113	113	113	113	113	2.83
FERRIS	1	4	4	4	4	4	4	4.00
MULHOLLAND	4	16	16	16	16	16	16	4.00
WHISKEY	60	190	190	190	190	190	190	3.17
CROWLEY	6	5	5	5	5	5	5	0.83
DULCE	80	93	93	93	93	93	93	1.16
LA JARA	50	58	58	58	58	58	58	1.16
LOWER MUNDO	60	50	50	50	50	50	50	0.83
LUNA	20	17	17	17	17	17	17	0.85
BLACK	20	65	85	65	65	65	65	3.25
BOLACK	36	110	110	110	110	110	110	3.06
BUTLER	10	43	43	43	43	43	43	4.30
CAPTAIN TOMS	20	60	60	60	60	60	60	3.00
DEADMAN	20	40	40	40	40	40	40	2.00
EL PASO	6	23	23	23	23	23	23	3.83
JUANS (VICENTE)	40	80	80	80	80	80	80	2.00
LITTLE WHITE CONE	20	60	60	60	60	60	60	3.00
LONG	50	113	113	113	113	113	113	2.26
LOST	20	63	63	63	63	63	63	3.15
SOUTHERN NASCHITTI	3	5	5	5	5	5	5	1.67
TOTAL EXCLUDING NAVAJO		1228	1228	1228	1228	1228	1228	
TOTAL ALL RESERVOIRS		33172	27187	31432	33740	51533	33707	

* 1981-85 data used for all reservoirs except Navajo.

AGRICULTURE: IRRIGATION
 IRRIGATION

MEAN FLOW LA PLATA RIVER AT COLORADO-NEW MEXICO STATE LINE (CFS)

	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	AVERAGE	SUPPLY FACTOR	IRRIGATED ACRES (1)	AVG FLOW REQUIRED @ 1 CFS/70 AC
1985 *	58.00	58.00	58.00	21.30	7.33	17.50	37	0.63	4089	58
1986 *	58.00	58.00	58.00	29.20	16.30	27.90	41	0.71	4089	58
1987 *	58.00	58.00	58.00	29.50	13.60	9.62	38	0.65	4089	58
1988	44.50	62.30	52.30	14.10	12.30	15.30	33	0.57	4089	58
1989	52.00	40.70	18.00	6.25	9.17	3.68	22	0.37	4089	58
1990	12.10	49.80	35.10	12.80	3.73	9.18	20	0.35	4089	58

* Where historic mean flow was greater than 58 cfs, 58 cfs was used to reflect a more realistic water supply for the April through September period.

MEAN FLOW ANIMAS RIVER AT CEDAR HILL, NM (CFS)

	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	AVERAGE	SUPPLY FACTOR	IRRIGATED ACRES (from TR46)	AVG FLOW REQUIRED @ 1 CFS/70 AC
1985	2192	3472	4737	1669	631	796	2250	11.54	13650	195
1986	1503	3164	3750	1947	807	1087	2043	10.48	13650	195
1987	2014	3247	3971	1559	820	482	2016	10.34	13650	195
1988	733	1486	2094	746	633	678	1062	5.44	13650	195
1989	1393	1595	1239	597	547	281	942	4.83	13650	195
1990	407	1535	2258	834	472	495	1000	5.13	13650	195

MEAN FLOW RIO NUTRIA NEAR RAMAH, NM (CFS)

	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	AVERAGE	SUPPLY FACTOR	IRRIGATED ACRES (from TR46)	AVG FLOW REQUIRED @ 1 CFS/70 AC
1985 #	19	13	1	0	0	0	6	0.29	1325	19
1986	1	0	0	0	1	0	0	0.02	1325	19
1987 #	19	6	0	0	5	1	5	0.28	1325	19
1988	12	1	0	0	1	0	2	0.13	1325	19
1989	0	0	0	3	0	1	1	0.04	1325	19
1990	1	0	0	0	1	0	0	0.01	1325	19

Where historic mean flow was greater than 19 cfs, 19 cfs was used to reflect a more realistic water supply for the April through September period.

(1) from hydrographic survey of La Plata River Basin, circa 1982.

MEAN FLOW NAVAJO RIVER BELOW OSO DIVERSION DAM (CFS)

YEAR	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	AVERAGE	SUPPLY FACTOR	IRRIGATED ACRES (from TR46)	AVG FLOW REQUIRED @ 1 CFS/70 AC
1985	77	266	720	219	102	88	245	78.08	220	3
1986	117	197	262	194	71	115	159	49.82	224	3
1987	100	215	117	96	63	43	106	32.47	228	3
1988	81	88	57	56	56	56	66	19.81	232	3
1989	58	90	57	57	50	37	58	17.26	236	3
1990	39	89	70	56	54	56	61	17.67	240	3

MCKINLEY COUNTY	UPPER CO IRRIGATED ACRES	CIR	CIR DEPLETION	SUPPLY FACTOR	INCIDENTAL LOSSES	TOTAL IRRIGATION DEPLETION
1985	1325	1.823	2415	0.29	71	776
1986	1325	1.823	2415	0.02	6	66
1987	1325	1.823	2415	0.28	66	731
1988	1325	1.823	2415	0.13	31	340
1989	1325	1.823	2415	0.04	10	111
1990	1325	1.823	2415	0.01	4	39

RIO ARRIBA COUNTY	UPPER CO IRRIGATED ACRES	CIR	CIR DEPLETION	SUPPLY FACTOR	INCIDENTAL LOSSES	TOTAL IRRIGATION DEPLETION
1985	220	1.0	220	1.00	22	242
1986	224	1.0	224	1.00	22	246
1987	228	1.0	228	1.00	23	251
1988	232	1.0	232	1.00	23	255
1989	236	1.0	236	1.00	24	259
1990	240	1.0	240	1.00	24	264

SANDCVAL COUNTY	UPPER CO IRRIGATED ACRES	CIR	CIR DEPLETION	INCIDENTAL LOSSES	SUPPLY FACTOR	TOTAL IRRIGATION DEPLETION
1985	0		0	0		0
1986	0		0	0		0
1987	0		0	0		0
1988	0		0	0		0
1989	0		0	0		0
1990	0		0	0		0

ANNUAL RATE OF INCREASE 0.02

SAN JUAN COUNTY NIF	IRRIGATED ACRES	TOTAL DIVERSION	WASTE	TOTAL IRRIGATION DIVERSION	SUPPLY FACTOR	TOTAL IRRIGATION DEPLETION #
1985	43615	131815	3515	128300		105068
1986	43508	154790	7184	147606		120792
1987	46421	130528	5358	125170		102493
1988	49047	117838	4978	112860		92406
1989	50210	170656	3117	167539		135831
1990	50151	142988	2827	140161		114825

NIF depletion based on B.O.R. Table: Ground Water Storage

SAN JUAN COUNTY HAMMOND	IRRIGATED ACRES	CIR	CIR DEPLETION	INCIDENTAL LOSSES	SUPPLY FACTOR	TOTAL IRRIGATION DEPLETION
1985	2972	1.823	5418	542		5960
1986	3554	1.823	6479	648		7127
1987	3492	1.823	6366	637		7003
1988	3714	1.823	6771	677		7448
1989	3725	1.823	6791	679		7470
1990	3602	1.823	6566	657		7223

SAN JUAN COUNTY LA PLATA	IRRIGATED ACRES	CIR	CIR DEPLETION	SUPPLY FACTOR	INCIDENTAL LOSSES	TOTAL IRRIGATION DEPLETION
1985	4089	1.82	7454	0.63	468	5150
1986	4089	1.82	7454	0.71	526	5788
1987	4089	1.82	7454	0.65	482	5304
1988	4089	1.82	7454	0.57	427	4698
1989	4089	1.82	7454	0.37	276	3037
1990	4089	1.82	7454	0.35	261	2871

SAN JUAN COUNTY OTHER	IRRIGATED ACRES	CIR	CIR DEPLETION	INCIDENTAL LOSSES	SUPPLY FACTOR	TOTAL
						IRRIGATION DEPLETION
1985	35153	1.823	64084	6408	1.00	70492
1986	32259	1.823	58808	5881	1.00	64689
1987	25448	1.823	46392	4639	1.00	51031
1988	27980	1.823	51008	5101	1.00	56108
1989	33196	1.823	60516	6052	1.00	66568
1990	34376	1.823	62667	6267	1.00	68934
ALL COUNTIES	IRRIGATED ACRES					TOTAL IRRIGATION DEPLETION
1985	87374					187688
1986	84959					198708
1987	81003					166812
1988	86387					161255
1989	92781					213276
1990	93783					194156

LIVESTOCK (New Mexico Agricultural Stats. 1986) \$

1986	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
MCKINLEY						
BEEF CATTLE \$	25950	0.265	6877	68767	77	
HOGS/PIGS \$	450	0.250	113	225	0	
SHEEP/LAMBS \$	85000	0.406	34510	69020	77	
HORSES \$			200	2000	2	
CHICKENS \$	700	1	700	70	0	
MILK COWS \$	50	1	50	2500	3	160

1986	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
RIO ARRIBA						
BEEF CATTLE \$	33950	0.305	10355	103548	116	
HOGS/PIGS \$	300	1.000	300	600	1	
SHEEP/LAMBS \$	8500	0.390	3315	6630	7	
HORSES \$			300	3000	3	
CHICKENS \$	37000	0.222	8214	8214	1	
MILK COWS \$	50	1	50	2500	3	131

1986	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
SANDOVAL						
BEEF CATTLE \$	16400	0.064	1050	10496	12	
HOGS/PIGS \$	300	0.064	19	38	0	
SHEEP/LAMBS \$	5000	0.064	320	640	1	
HORSES \$			200	2000	2	
CHICKENS \$	1000	0.064	64	6	0	
MILK COWS \$	1600	0.064	102	5120	6	20

1986	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
SAN JUAN						
BEEF CATTLE \$	29100	1	29100	291000	326	
HOGS/PIGS \$	200	1	200	400	0	
SHEEP/LAMBS \$	50000	1	50000	100000	112	
HORSES \$			1800	18000	20	
CHICKENS \$	2300	1	2300	230	0	
MILK COWS \$	900	1	900	45000	50	509
TOTAL 1986 DEPLETION						821

LIVESTOCK (New Mexico Agricultural Stats. 1987) \$

1987

	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
MCKINLEY						
BEEF CATTLE	25950	0.265	6877	68767	77	
HOGS/PIGS	450	0.250	113	225	0	
SHEEP/LAMBS	80000	0.406	32480	64960	73	
HORSES			200	2000	2	
CHICKENS	500	1	500	50	0	
MILK COWS	50	1	50	2500	3	155

1987

	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
RIO ARRIBA						
BEEF CATTLE	32900	0.305	10035	100345	112	
HOGS/PIGS	300	1.000	300	600	1	
SHEEP/LAMBS	8500	0.390	3315	6630	7	
HORSES			300	3000	3	
CHICKENS	2300	0.222	511	51	0	
MILK COWS	100	1	100	5000	6	130

1987

	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
SANDOVAL						
BEEF CATTLE	10100	0.064	646	6464	7	
HOGS/PIGS	300	0.064	19	38	0	
SHEEP/LAMBS	5000	0.064	320	640	1	
HORSES			200	2000	2	
CHICKENS	700	0.064	45	4	0	
MILK COWS	1600	0.064	102	5120	6	16

1987

	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
SAN JUAN						
BEEF CATTLE	30100	1	30100	301000	337	
HOGS/PIGS	200	1	200	400	0	
SHEEP/LAMBS	53000	1	53000	106000	119	
HORSES			1800	18000	20	
CHICKENS	1800	1	1800	180	0	
MILK COWS	900	1	900	45000	50	527
TOTAL 1987 DEPLETION						828

LIVESTOCK (New Mexico Agricultural Statistics, 1988) \$

1988	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
MCKINLEY						
BEEF CATTLE \$	24950	0.265	6612	66117	74	
HOGS/PIGS	450	0.250	113	225	0	
SHEEP/LAMBS \$	92100	0.406	37393	74785	84	
HORSES			200	2000	2	
CHICKENS	500	1	500	50	0	
MILK COWS \$	50	1	50	2500	3	163

1988	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
RIO ARRIBA						
BEEF CATTLE \$	31900	0.305	9730	97295	109	
HOGS/PIGS	300	1.000	300	600	1	
SHEEP/LAMBS \$	7000	0.390	2730	5460	6	
HORSES			300	3000	3	
CHICKENS	2300	0.222	511	51	0	
MILK COWS \$	100	1	100	5000	6	125

1988	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
SANDOVAL						
BEEF CATTLE \$	15400	0.064	986	9856	11	
HOGS/PIGS	300	0.064	19	38	0	
SHEEP/LAMBS \$	4000	0.064	256	512	1	
HORSES			200	2000	2	
CHICKENS	700	0.064	45	4	0	
MILK COWS \$	1600	0.064	102	5120	6	20

1988	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
SAN JUAN						
BEEF CATTLE \$	29200	1	29200	292000	327	
HOGS/PIGS	200	1	200	400	0	
SHEEP/LAMBS \$	66000	1	66000	132000	148	
HORSES			1800	18000	20	
CHICKENS	1800	1	1800	180	0	
MILK COWS \$	800	1	800	40000	45	54.1
TOTAL 1988 DEPLETION						84.8

LIVESTOCK (New Mexico Agricultural Stats. 1989) 5

1989	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
MCKINLEY						
BEEF CATTLE \$	24950	0.265	6612	66117	74	
HOGS/PIGS	450	0.250	113	225	0	
SHEEP/LAMBS \$	94000	0.406	38164	76328	85	
HORSES			200	2000	2	
CHICKENS	500	1	500	50	0	
MILK COWS \$	50	1	50	2500	3	165

1989	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
RIO ARRIBA						
BEEF CATTLE \$	31900	0.305	9730	97295	109	
HOGS/PIGS	300	1.000	300	600	1	
SHEEP/LAMBS \$	8000	0.390	3120	6240	7	
HORSES			300	3000	3	
CHICKENS	2300	0.222	511	511	0	
MILK COWS \$	100	1	100	5000	6	126

1989	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
SANDOVAL						
BEEF CATTLE \$	15300	0.064	979	9792	11	
HOGS/PIGS	300	0.064	19	38	0	
SHEEP/LAMBS \$	4500	0.064	288	576	1	
HORSES			200	2000	2	
CHICKENS	700	0.064	45	4	0	
MILK COWS \$	1700	0.064	109	5440	6	20

1989	TOTAL COUNTY POPULATION	FACTOR	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
SAN JUAN						
BEEF CATTLE \$	29100	1	29100	291000	326	
HOGS/PIGS	200	1	200	400	0	
SHEEP/LAMBS \$	69000	1	69000	138000	155	
HORSES			1800	18000	20	
CHICKENS	1800	1	1800	180	0	
MILK COWS \$	900	1	900	45000	50	552
TOTAL 1989 DEPLETION						862

LIVESTOCK (New Mexico Agricultural Stats, 1990) \$

1990	TOTAL COUNTY POPULATION	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
MCKINLEY					
BEEF CATTLE \$	24950	6612	66117	74	
HOGS/PIGS	450	113	225	0	
SHEEP/LAMBS \$	88000	35728	71456	80	
HORSES		200	2000	2	
CHICKENS	500	500	50	0	
MILK COWS \$	50	50	2500	3	159

1990	TOTAL COUNTY POPULATION	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
RIO ARRIBA					
BEEF CATTLE \$	31900	9730	97295	109	
HOGS/PIGS	300	300	600	1	
SHEEP/LAMBS \$	8000	3120	6240	7	
HORSES		300	3000	3	
CHICKENS	2300	511	511	0	
MILK COWS \$	100	100	5000	6	126

1990	TOTAL COUNTY POPULATION	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
SANDOVAL					
BEEF CATTLE \$	16500	1056	10560	12	
HOGS/PIGS	300	19	38	0	
SHEEP/LAMBS \$	4500	288	576	1	
HORSES		200	2000	2	
CHICKENS	700	45	4	0	
MILK COWS \$	1500	96	4800	5	20

1990	TOTAL COUNTY POPULATION	FACTORED POPULATION	CONSUMPTIVE USE (GAL/DAY)	CONSUMPTIVE USE (AC-FT/YR)	TOTAL DEPLETION (AC-FT)
SAN JUAN					
BEEF CATTLE \$	29500	29500	295000	330	
HOGS/PIGS	200	200	400	0	
SHEEP/LAMBS \$	64000	64000	128000	143	
HORSES		1800	18000	20	
CHICKENS	1800	1800	180	0	
MILK COWS \$	500	500	25000	28	523
TOTAL 1990 LIVESTOCK DEPLETION					828

STOCKPOND EVAPORATION
=====

=====

UNITS: ACRE- FEET	STOCKPOND DEPLETION
1985	3680
1986	3680
1987	3680
1988	3680
1989	3680
1990	3680

INDUSTRIAL/MUNICIPAL/DOMESTIC

THERMAL ELECTRIC POWER

	1985	1986	1987	1988	1989	1990
2838 1 Four Corners - (BHP Utah)	17790	20624.7	26524.7	26201.5	27071.8	24671.2
3258 1 San Juan - (PNM)	16200	16697.2	14648.3	14539.5	20417.3	17019.7
SUBTOTAL	33990	37321.9	41173	40741	47489.1	41690.9

MINERALS

2838 1 El Paso Natural Gas	1970	1745.3	1475.1	1472.9	1398.7	1018.1
San Juan Basin Water haulers	80	24.9	25.6	53.1		
Sunbelt Mining	0	0.6	9.5	9.3	0	0
San Juan - (PNM)	3420					
SUBTOTAL	5470	1770.8	1510.2	1535.3	1398.7	1018.1

INDUSTRIAL

2 Bloomfield Refining	30	354.4	345.8	374.7	364.1	360.1
Conoco, Inc.	20	62.8	443.7	417.7	454	464.3
San Juan Concrete	20	4.5	4.9	38.3	10.3	
Sunterra Gas Processing	40	35.1	29.1	27		4.1
Meridan Oil	20	21.1	7.8	29.7		
Morrison-Knudsen	110	127				
SUBTOTAL	220	604.9	831.3	887.4	828.4	828.5

MUNICIPAL/INDUSTRIAL URBAN

3 Aztec.	560	557.4	529.6	492.9	505.0	621.0
Bloomfield	290	479.0	517.5	487.7	537.7	555.4
4 Farmington	4120	4486.5	6023.9	4938.6	6904.6	5670.0
Beeline Reservoir Evap.	488	488	488	488	488	488
SUBTOTAL	5458	6010.94	7559.03	6407.21	8435.315	7334.48

1 After 1985 all uses under permit 2838 are designated as thermal electric power due to the ultimate disposition of the mined coal directly to Four Corners and San Juan Power plants. Separation of the individual uses as to mining or power, under either permit 2838 or 3258, is no longer feasible.

2 In 1987 both Conoco, Inc. and the City of Farmington increased their respective uses. Both increases were sustained through 1990.

3 Includes deliveries to West Hammond, North Heights, and Lee Acres Water User Associations.

4 Includes deliveries to Ntwa in Shiprock, and Lower Valley and Upper La Plata Water User Associations.

INDUSTRIAL/MUNICIPAL/DOMESTIC
 =====
 1985 1986 1987 1988 1989 1990
 =====
 DOMESTIC RURAL
 @RATE/YEAR
 =====

	1985	1986	1987	1988	1989	1990	@RATE/YEAR
Dulce	130	134	138	143	147	151.7	0.03
West Hammond							
North Heights							
Lee Acres							
Morningstar				38.5	48.1	48.1	
Lower Valley							
North Star							
Other self-supplied homes		20.8	23.3	27.2	28.5	28.1	
McKinley County							
Rio Arriba County		333.37	338.52	343.76	349.07	354.47	0.02
Sandoval County		15.39	15.66	15.93	16.20	16.48	0.02
San Juan County		58.72	54.16	49.95	46.06	42.48	-0.08
Other	1520	864.56	799.22	738.82	682.98	631.36	-0.08
		248	331	370	435	507	
SUBTOTAL	1650	1675	1701	1727	1753	1780	
TOTAL	93911	95078	105835	102856	120045	105513	

Based on Table 2.1 of Water Use by Categories in New Mexico Counties and River Basins, and Irrigated Acreage in 1990, Brian C. Wilton (TR 47).
 Rate based on BBER Population Projections for the Hydrobasins of New Mexico: 1990-2040, August 1989, page 32, and U.S. Census Bureau.

FISH & WILDLIFE, RECREATION 1986-90
 =====

	CONSUMPTIVE USE (AC-FT)	
RIO ARRIBA		
Carson National Forest	0.1	0
SAN JUAN		
Aztec Ruins	0.6	0
Chaco Culture NHP	0.5	0
Elks Club	9.0	0
Gas Co. of NM	0.4	0
Hidden Valley Country Club	50.5	0
Misc. Businesses	22.5	0
Navajo Lake State Park (Pine)	3.7	0
Navajo Lake State Park (San Juan)	0.8	0
Navajo Lake State Park (Sims)	0.3	0
San Juan Country Club	68.1	0
Jackson Lake Evap.	157.0	#
Jackson Lake Irrigation (215 ac.)	391.3	\$
Bertrand	11	#
Big Gap	43	#
Holmberg	7	#
Toadachene	16	#

TOTAL 781.7

S CIR = 1.82
 Data from TR47 or Water Use and Reports database per Brian Wilson
 # Data used in 1981-85 consumptive uses and losses report.

POPULATION - UPPER COLORADO RIVER BASIN, NEW MEXICO

YEAR	MCKINLEY		RIO ARRIBA		SANDOVAL		SAN JUAN		TOTAL	UCRB-NM TOTAL POPULATION
	RURAL	URBAN	RURAL	URBAN	RURAL	URBAN	RURAL	URBAN		
1980	9266	32581	2886	55929	456	35676	48852	35676	91433	94041
1981	9470	33607	2935	33607	458	33607	50391	33607	83998	96861
1982	9674	34633	2984	34633	460	34633	51930	34633	86563	99681
1983	9878	35659	3035	35659	462	35659	53469	35659	89128	102503
1984	10082	36685	3086	36685	464	36685	55008	36685	91693	105325
1985	10395	36447	3138	36447	466	36447	54650	36447	91097	105096
1986	10553	39706	3191	39706	427	39706	50182	39706	89888	104059
1987	10714	43257	3191	43257	391	43257	46079	43257	89336	103685
1988	10877	47125	3300	47125	358	47125	42312	47125	89436	103971
1989	11043	51338	3355	51338	328	51338	38852	51338	90191	104917
1990	11211	55929	3412	55929	300	55929	35676	55929	91605	106528

1985-90
RATE OF
CHANGE
PER YEAR

0.02 0.02 # -0.08 0.09 -0.08 0.001

* Sandoval County rural population in the New Mexico Upper Basin was assumed to have declined at the same rate as the San Juan County rural population decline: 8% per year from 1985 through 1990.
Rate of change per year for Rio Arriba Rural is for 1980-90 period.