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WATER USE IN THE AREA OF THE SAN JUAN BASIN REGIONAL URANIUM STUDY, NEW MEXICO, COLORADO, ARIZONA, AND UTAH

By

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PREFACE

This is one of a series of reports prepared as part of the San Juan Basin Regional Uranium Study, which is under the leadership of the Bureau of Indian Affairs (BIA). The reports were used as source of material in the preparation of the Regional Study, which is available for public examination at BIA offices in Albuquerque, New Mexico, and Washington, D.C.

The reports listed below are a part of the series that was prepared by the U.S. Geological Survey. These reports have been open filed by the Survey and can be examined by the public at the Survey offices in Denver, Colorado; Albuquerque, New Mexico; and Reston, Virginia.

Water Use in the area of the San Juan Basin Regional Uranium Study, New Mexico, Colorado, Arizona, and Utah--Open File Report 79-1500

Surface-water Environment in the area of the San Juan Basin Regional Uranium Study, New Mexico, Colorado, Arizona, and Utah------------------------Open File Report 79-1499

Regional Geohydrology of the San Juan Hydrologic Basin of New Mexico, Colorado, Arizona, and Utah--Open File Report 79-1498

Reconnaissance Study of Selected Environmental Impacts on Water Resources due to the Exploration, Mining, and Milling of Uraniferous Ores in the Grants Mineral Belt, Northwest New Mexico--Open File Report 79-1497

Effects of Uranium Development on Erosion and Associated Sedimentation in Southern San Juan Basin, New Mexico----------------------------Open File Report 79-1496

Depths of Channels in the area of the San Juan Basin Regional Uranium Study, New Mexico, Colorado, Arizona, and Utah----------------------------------Open File Report 79-1526

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WATER USE IN THE AREA OF THE SAN JUAN BASIN REGIONAL URANIUM STUDY, NEW MEXICO, COLORADO, ARIZONA, AND UTAH

By Mark W. Busby

ABSTRACT

The largest use of water in the study area is about 300 million gallons per day (mgd) for irrigation of about 200,000 acres. The next largest is for thermoelectric generating plants, which used an estimated average of 22.4 mgd in 1975. Nearly all of this water is from surface-water sources. Industrial use, including coal mining, is about 8 mgd; all from ground-water sources. About 21.4 mgd is pumped from uranium mines for mine dewatering. About 8 mgd of this water is used for ore processing in uranium mills.

Twelve municipal water-supply systems and 66 community-type water systems are in the study area. Most of the systems obtain their water from wells, springs, or infiltration galleries adjacent to streams. Nine of the systems obtain all or part of their water supplies directly from streams. Many rural residents haul water from these systems. These public water systems used an estimated average of 21 mgd in 1975; about three-fourths of this water came from streams.

Rural domestic use of water from wells and springs averaged about 3 mgd in 1975. Another 4 mgd was used for livestock. Most of the stock water was obtained from small stock ponds.

Use of water in the basin is legally constrained by various interstate compacts and the Mexican Water Treaty of 1944. Surface waters of the region are fully appropriated. Ground-water development is subject to the approval of the New Mexico State Engineer.

WATER USE IN THE AREA OF THE SAN JUAN BASIN REGIONAL URANIUM STUDY

Water-use data are not available for the entire study region. The New Mexico District Office of the U.S. Geological Survey, Water Resources Division, has estimated water use during 1975 for the San Juan River drainage in New Mexico. These estimates were used as a basis to compute total water use within study area.

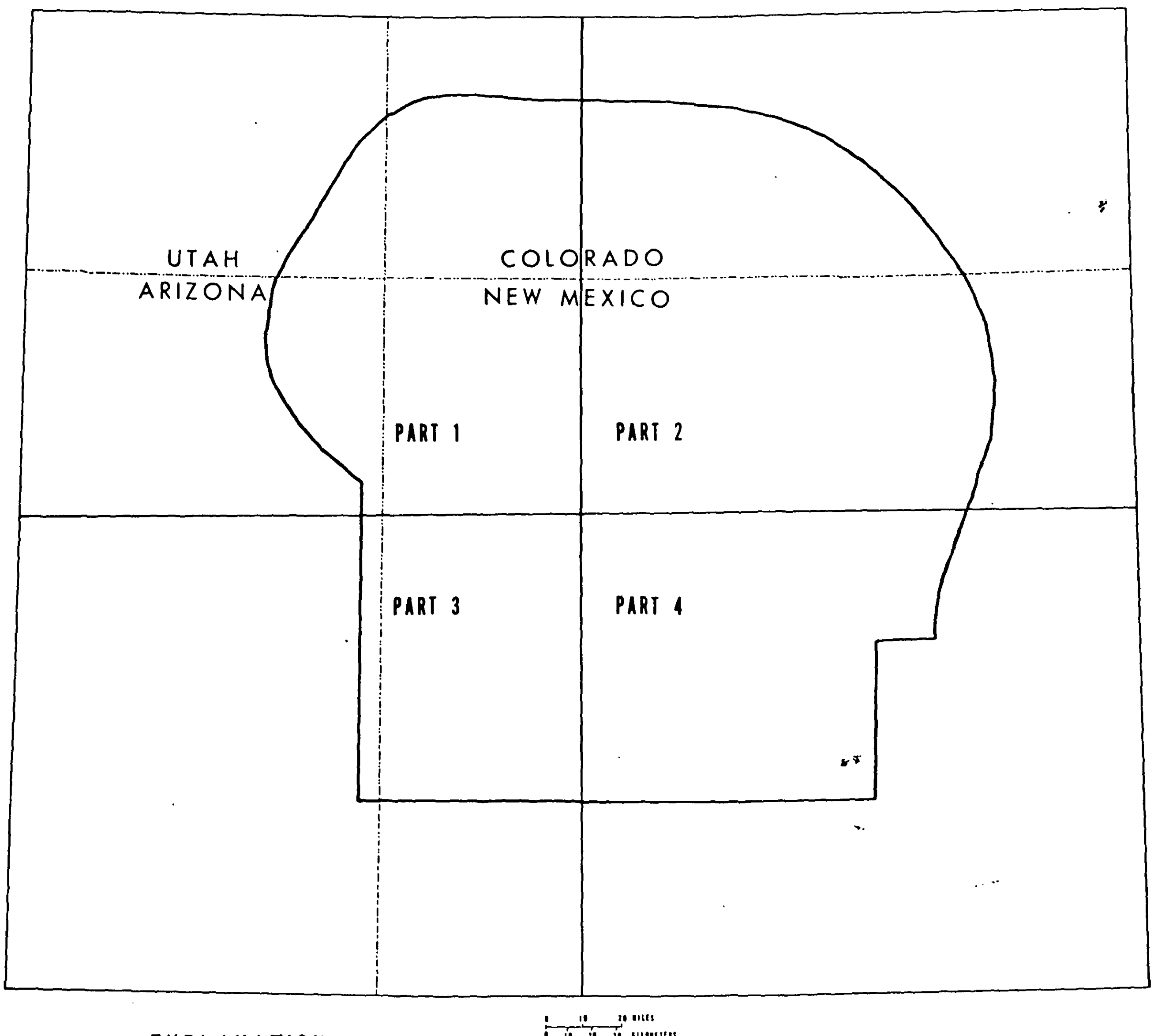
The largest use of water in the study area, about 300 mgd, is for irrigation of about 200,000 acres, mostly along the Animas, La Plata, and San Juan Rivers. Only a small part of the water is from ground-water sources. The largest single irrigation project in the study area is the Navajo Indian Irrigation Project located south and southwest of Farmington, New Mexico. Authorizing legislation provided for an annual diversion of 508,000 acre-feet for this project, which is still in the developmental stage. Recent information, however, indicates that when fully implemented, this project will use an average of 294 mgd from Navajo Reservoir on the San Juan River to irrigate 110,630 acres. The first 10,000 acres were put under irrigation in 1976, and an additional 10,000 acres will be added each year through 1986.

The next largest use of water in the San Juan River drainage is by thermoelectric generating plants. These plants used an estimated average of 22.4 mgd in 1975, all from the San Juan River. Other self-supplied industries in the basin, including coal mining, used an average of about 8 mgd, all from ground-water sources.

Outside the San Juan River drainage, but within the study area, some individual underground uranium mines pump as much as 3,000 gal/min (4.3 mgd) for mine dewatering purposes. Some of this water is used for ore processing in the uranium mills. The rest is pumped into nearby washes and maintains perennial flow for several miles in some streams in the Puerco River and Rio San Jose basins before it seeps into the streambed. In 1978, about 21.4 mgd was pumped from the mines; about 8 mgd of this was used to process ore. As a result of pumping for mine dewatering, water levels in nearby wells tapping the Westwater Canyon Sandstone Member of the Morrison Formation have declined.

Twelve municipal water-supply systems and 66 community-type water systems are in the study region (table 1 and figs. 1-5). Many rural residents haul water from these public-supply systems. Nine of the public water-supply systems take all or part of their water directly from streams. Bayfield, Blanco, Durango, Pagosa Springs, and San Ysidro use infiltration galleries. All other systems obtain their water from wells or springs. These public water-supply systems used an estimated average of 21 mgd in 1975, about three-quarters of which was from surface water.

Much of the rural population obtain water from wells and springs. Slightly more than 3 mgd was used in 1975 for rural domestic purposes. Nearly all this water came from ground-water sources. Another 4 mgd was used for livestock, 1 mgd of which was ground water, and the remainder surface water from small stock ponds.



EXPLANATION

- △ 3795 Partial record surface-water gaging station
- ▲ 3722 Daily record surface-water gaging station
- 3555 Daily record surface-water gaging station, with chemical quality data
- 3505 Daily record surface-water gaging station, withchemical quality and radiochemical data
- 2870 Daily record surface-water gaging station, with sediment data
- ○ A Ground-water well, with radiochemical data
- ● Community with public water-supply system

These various symbols may be combined in different ways. Number is the gaging station identification number, letter refers to well number table.

Map Letter	Well Number
A	354145108135501
B	354332108165501
C	354345108175001
D	354514108190601
E	355415107252801
F	365425107314401
G	355558107293301
H	355534107275701
I	355702107340501
J	355723107312201
K	353534108355201
L	354342108184001
M	355302107130501
N	360313107473401
O	361008107543901
P	360941107581601
Q	360857107531001
R	360823107544001
S	360849107561801
T	360822107561601
U	361446108090801
V	361446108083701
W	350232107263701
X	350240107291201
Y	350344107391901
Z	350349107413401

Figure 1. - Index to location of stream-gaging stations, ground-water wells, and public water-supply systems. This figure and the four that follow are common to three reports supporting the San Juan Basin Regional Uranium Study and contain more information than needed by any one of the reports.

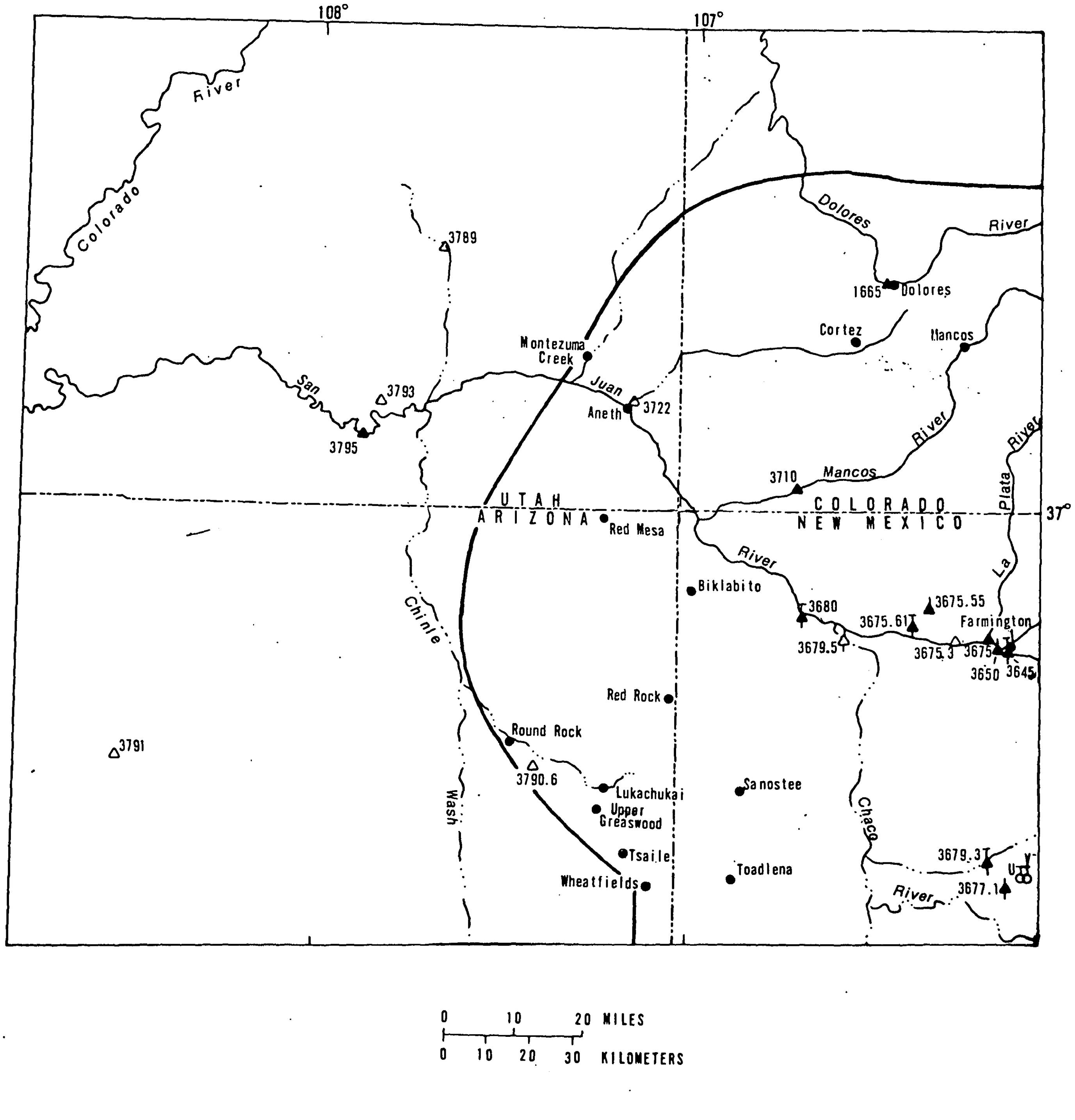


FIGURE 2 -Location of stream-gaging stations, ground-water wells, and public water-supply systems, Part 1

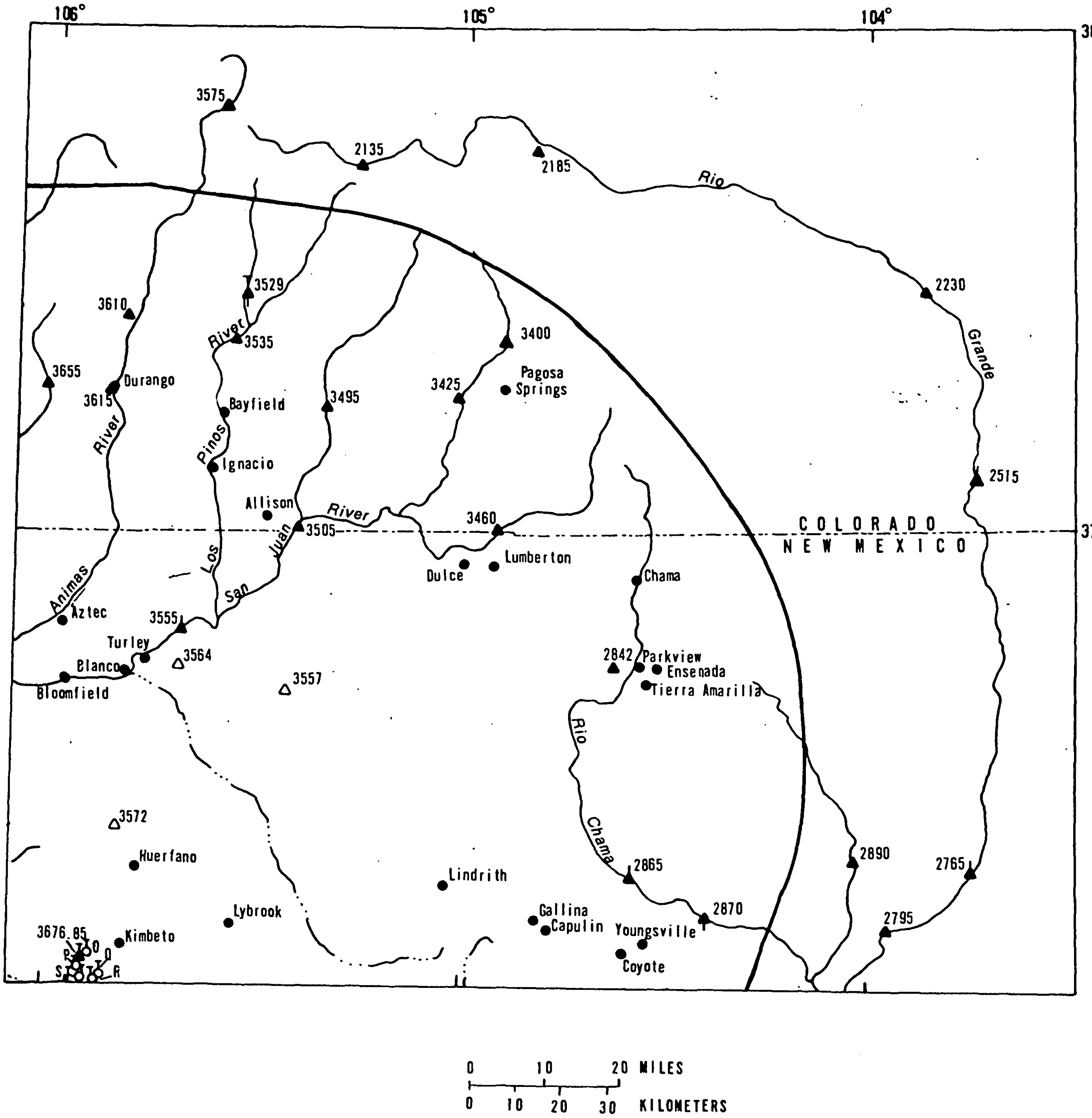


FIGURE 3 -Location of stream-gaging stations, ground-water wells, and public water-supply systems, Part 2

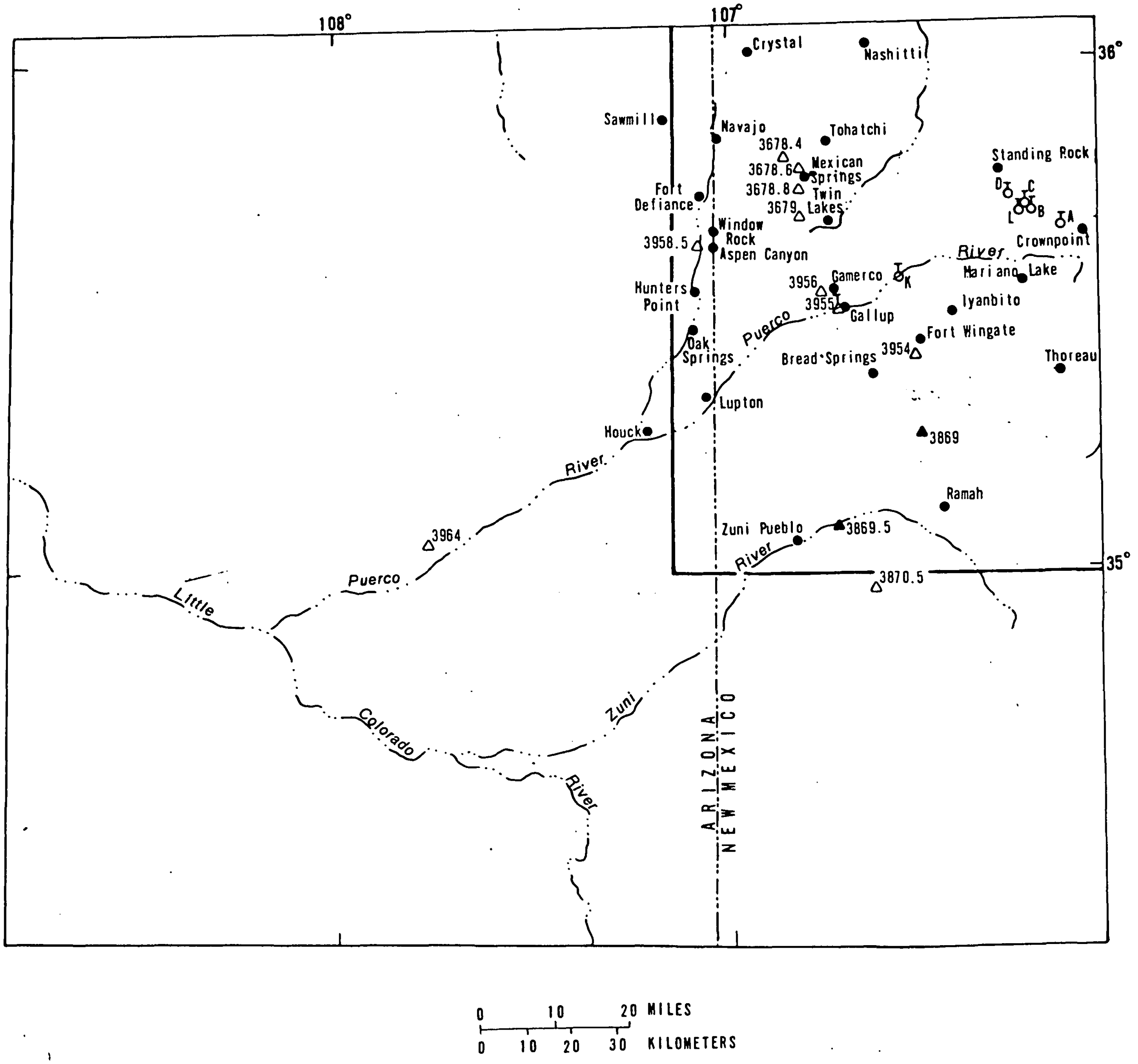


FIGURE 4 -Location of stream-gaging stations, ground-water wells, and public water-supply systems, Part 3

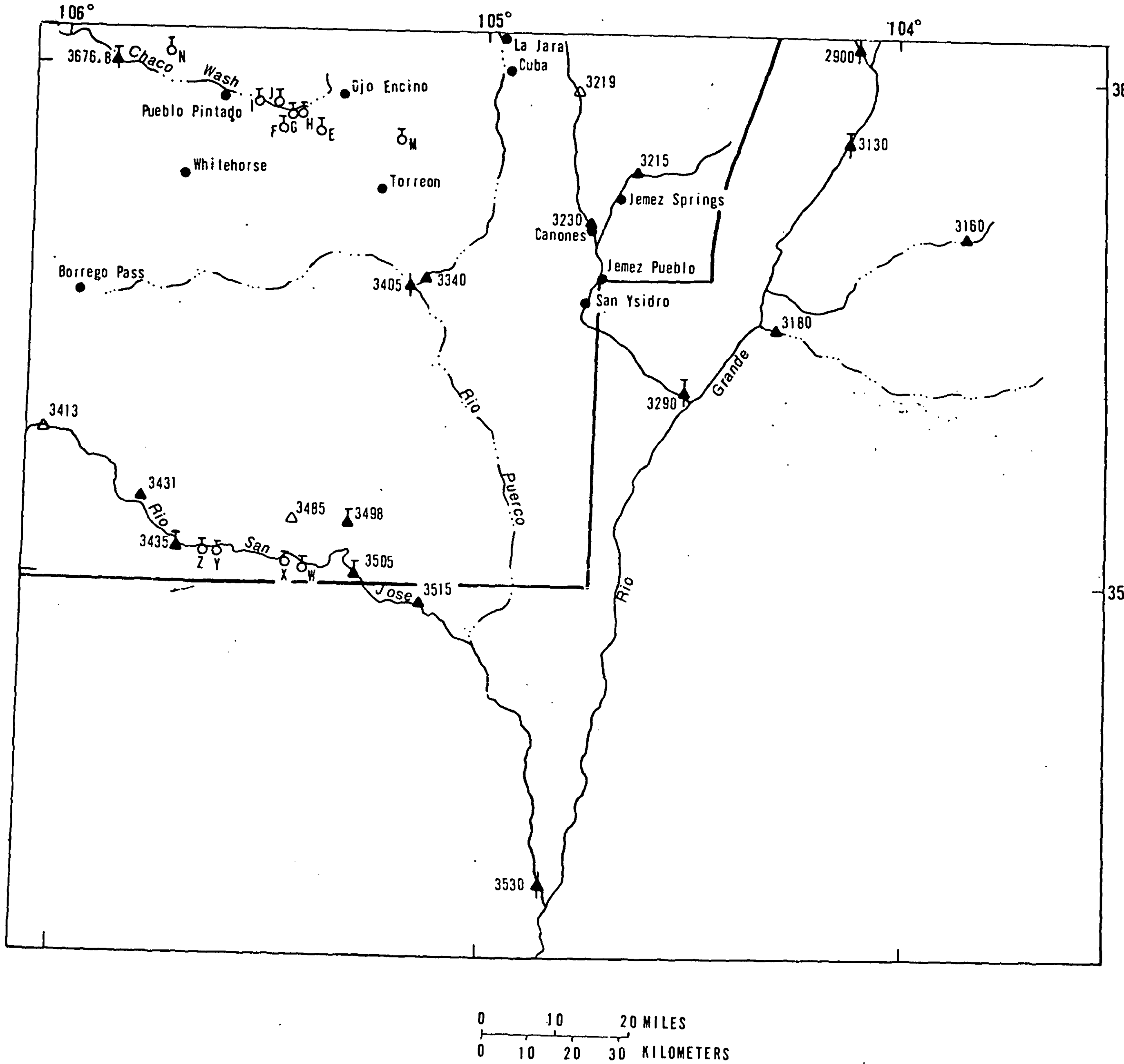


FIGURE 5 -Location of stream-gaging stations, ground-water wells, and public water-supply systems, Part 4

Table 1. Public water-supply systems in the area of the San Juan Basin Regional Uranium Study
(Data from New Mexico Interstate Stream Commission and New Mexico State Engineer Office, 1974, 1975a, b, c, and other unpublished sources)

Name of Town or Community	Source	Aquifer[1]	Average use (gal/d)	Dissolved solids concentrations (mg/L)
Allison	1 well	--	10,000	1,075
Aneth	--	--	est.10,000	--
Aspen Canyon	--	--	est.4,000	--
Aztec	Animas River	--	1,500,000	550
Bayfield	Los Pinos River (infiltration gallery)	Qal	26,000	--
Biklabito	well	--	6,000	--
Blanco	San Juan River (infiltration gallery)	Qal	--	--
Bloomfield	[2]San Juan River	--	190,000	17
Borrego Pass	1 well	Jm	7,000	--
Bread Springs	2 wells	Kcc	6,000	403
Canonas	1 well	--	4,000	46
Capulin	1 well	--	--	--

Table 1. Public water-supply systems in the area of the San Juan Basin Regional Uranium Study (Continued)

Name of Town or Community	Source	Aquifer[1]	Average use (gal/d)	Dissolved-solids concentrations (mg/L)
Chama	3 wells	--	20,000	627
Cortez	Dolores River	--	2,100,000	--
Coyote	1 well	--	--	--
Coyote Canyon	1 well	--	12,000	--
Crownpoint	4 wells	Jm	20,000	530
Crystal	Spring	--	17,000	--
Cuba	1 well and	Tsj	--	--
	springs	Qal	30,000	700
Dolores	3 wells and	--	--	--
	Dolores River	--	--	--
Dulce	1 well and	--	150,000	218
Durango	Animas River (infiltration gallery)	Qal	4,000,000	--
Ensenado	1 well	--	8,000	247
Farmington[3]	Animas River	--	8,000,000	342

Table 1. Public water-supply systems in the area of the San Juan Basin Regional Uranium Study (continued)

Name of Town or Community	Source	Aquifer[1]	Average use (gal/d)	Dissolved-solids concentrations (mg/L)
Fort Defiance	--	--	est. 13,000	--
Fort Wingate	1 well and spring	--	115,000	795
Gallina	1 well	--	--	--
Gallup	9 wells	Kg	1,700,000	1,017
Gamerco	1 well	Kg	25,000	663
Houk	(No information available)			
Hunters Point	--	--	est. 17,000	--
Huerfano	1 well	Tn	14,000	883
Holly Villages	--	--	est. 5,000	--
Ignacio	Los Pinos Creek	--	--	--
Iyanbito	1 well	Psa	1,000	--
Jemez Pueblo	1 well	--	--	--
Jemez Springs	Springs	--	20,000	95
Kimbeto	1 well	Qal	3,000	--
La Jara	Springs	--	--	--

Table 1. Public water-supply systems in the area of the San Juan Basin Regional Uranium Study (continued)

Name of Town or Community	Source	Aquifer[1]	Average use (gal/d)	Dissolved-solids concentrations (mg/L)
Lindrith	1 well	--	2,000	632
Likachukai	--	--	est. 50,000	--
Lumberton	1 well	--	--	--
Lupton	--	--	est. 8,000	--
Lybrook	1 well	Tn, Toa	--	--
Mancos	West Mancos River	--	--	--
Mariano Lake	2 wells	Jm, Jsr	12,000	273
Mexican Springs	1 well	Kpl, Kcc	10,000	405
Montezuma Creek	--	--	est. 16,000	--
Nashitti	1 well	Kmf	9,000	580
Navajó	--	--	est. 75,000	--
Nenahnezad	San Juan River	--	19,000	--
Oak Springs	--	--	est. 4,000	--
Ojo Encino	Spring	Toa	3,000	719

Table 1. Public water-supply systems in the area of the San Juan Basin Regional Uranium Study (Continued)

Name of Town or Community	Source	Aquifer[1]	Average use (gal/d)	Dissolved-solids concentrations (mg/L)
Pagosa Springs	San Juan River (infiltration gallery)	Qal	260,000	--
Parkview	1 well	--	--	--
Pueblo Pintado	1 well	Kch	7,000	1,545
Ramah	3 wells	Qal, Jm	20,000	408
Red Mesa	--	--	est. 6,000	--
Red Rock	(No information available)			
Round Rock	--	--	est. 13,000	--
Sanostee	1 well	--	22,000	205
San Ysidro	Jemez River (infiltration gallery)	--	--	--
Sawmill	--	--	est. 50,000	--
Standing Rock	1 well	--	9,000	1,393
Thoreau	2 wells	Psa,TRc	17,000	550
Tierra Amarilla	2 wells	Jm,Kpl	10,000	393
Toadlena	Spring	Jm	43,000	195

Table 1. Public water-supply systems in the area of San Juan Basin Regional Uranium Study (Continued)

Name of Town or Community	Source	Aquifer[1]	Average use (gal/d)	Dissolved-solids concentrations (mg/L)
Tohatchi	3 wells	--	32,000	1,643
Torreon	1 well	Toa	9,000	795
Tsaile	(No information available)			
Turley	1 well	Qal	--	--
Twin Lakes	1 well	Kg,Jm	12,000	668
Upper Greaswood	(No information available)			
Wheatfields	(No information available)			
Whitehorse	1 well	Kmf	7,000	830
Youngsville	1 well	--	4,000	1,048
Zuni Pueblo	3 wells	--	--	1,200

[1] Qal, alluvium; Tsj, San Jose Formation; Tn, Nacimiento Formation; TKoa, Ojo Alamo Sandstone; Kch, Cliff House Sandstone; Kmf, Menefee Formation; Kpl, Point Lookout Sandstone; Kcc, Crevasse Canyon Formation; Kg, Gallup Sandstone; Jm, Morrison Formation; Jsr, Entrada Sandstone; ħc, Chinle Formation; Psa, San Andres Limestone

[2] Estimated

[3] Supplies water to Fruitland, Kirtland, and Shiprock

Water use in the upper Colorado River in New Mexico in 1970 and projected water use for 1980 and 2000 are given in table 2. Data for this table are from the U.S. Bureau of Reclamation (1976), using population projections from the Bureau of Business Research, University of New Mexico.

Certain legal constraints govern both surface- and ground-water use within the study region. Uses of surface waters are governed by the Colorado River Basin Compact of 1922, the Mexican Water Treaty of 1944, the Upper Colorado River Basin Compact of 1948, the La Plata River Compact of 1922, and the Rio Grande Compact of 1938. Use of ground waters in New Mexico are governed by the Declaration of San Juan Underground Water Basin of July 29, 1976; the Declaration of the Bluewater Underground Water Basin in Valencia County, New Mexico, of May 21, 1956, and its extension of May 14, 1976; and the Order Declaring the Rio Grande Under-ground Water Basin of November 29, 1956, and its extensions of September 7, 1973, and May 14, 1976.

Surface waters of the study region are fully appropriated and are now committed to existing uses and authorized projects or are committed tentatively to projects under investigation. Future surface-water developments must be accomplished by acquisition and transfer of existing rights or by modification of tentative commitments. Except for the Puerco River basin, all future ground-water development in New Mexico is subject to approval of the Office of the State Engineer, State of New Mexico, under the rules and regulations of the declaration of a ground-water basin. Wells in Colorado is subject to approval of the Office of the State Engineer, State of Colorado.

Table 2. Withdrawals and consumptive water use, upper Colorado River basin, New Mexico

In thousands of acre-feet (million gallons per day)
(Modified from U.S. Bureau of Reclamation, 1976)

Use	1970 Withdrawal	1970 Consumption	1980 Withdrawal	1980 Consumption	2000 Withdrawal	2000 Consumption
Urban (Municipal)	8.8 (7.9)	3.9 (3.5)	9.1 (8.1)	4.6 (4.1)	17.7 (15.8)	10.5 (9.4)
Rural domestic	3.1 (2.8)	1.4 (1.2)	2.4 (2.1)	1.6 (1.4)	3.0 (2.7)	2.1 (1.9)
Irrigation	209.8 (187)	80.4 (71.8)	335.8 (300)	179.3 (160)	545.1 (487)	330 (295)
Manufacturing	.4 (.4)	.2 (.2)	.4 (.4)	.2 (.2)	.6 (.5)	.3 (.3)
Minerals	6.1 (5.4)	2.3 (2.0)	53.2 (47.5)	45.6 (40.7)	87.1 (77.8)	78.2 (69.8)
Livestock	.8 (.7)	.8 (.7)	.8 (.7)	.8 (.7)	1.0 (.9)	1.0 (.9)
Stock-pond evaporation	3.4 (3.1)	3.5 (3.1)	4.2 (3.8)	4.2 (3.8)	4.9 (4.4)	4.9 (4.4)
Power	24.7 (22.0)	16.4 (14.6)	49.8 (44.5)	49.0 (43.7)	71.9 (64.2)	71.9 (64.2)
Fish and wildlife	2.8 (2.5)	1.0 (.9)	21.3 (19.0)	6.6 (5.9)	33.0 (29.5)	18.3 (16.3)
Reservoir evaporation	24.2 (21.6)	24.2 (21.6)	31.1 (27.8)	31.1 (27.8)	32.7 (29.2)	32.7 (29.2)
Total	284.2 (253.4)	134.1 (119.6)	508.1 (453.9)	323 (288.3)	797 (712)	549.9 (491.4)

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