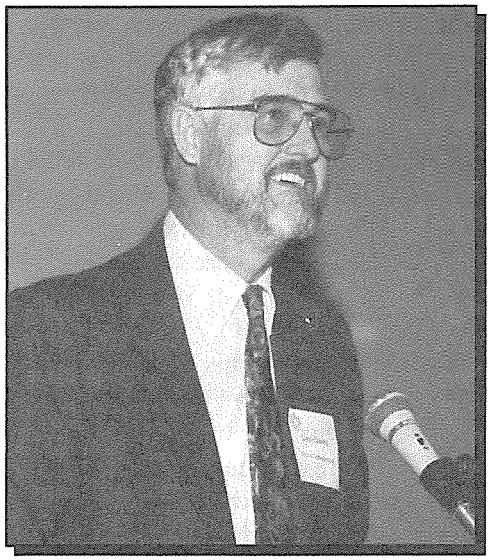
Gary Daves manages the water rights program for the City of Albuquerque which includes water-rights purchases and administration and management of the City's San Juan-Chama Water Project. He grew up in rural New Mexico and graduated with a B.S. in Chemistry from Arizona State University. Following graduation, Gary taught chemistry and English in Ethiopia while serving with the U.S. Peace Corps. While serving with the International Voluntary Services in Vietnam, he was taken prisoner-of-war during the 1968 Tet offensive. Following his release in 1973, he obtained a law degree from UNM. Gary has been an attorney with the Federal Highway Administration and for the Albuquerque City Council. During 1991-1992, Gary was a Valencia County Commissioner.



HISTORY OF WATER DEVELOPMENT IN THE MIDDLE VALLEY

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I start with eloquent words by Frank Tenorio of San Felipe Pueblo on September 9, 1994, at the Albuquerque Water Conservation Town Hall sponsored by City of Albuquerque Mayor Martin Chavez. In speaking of the Rio Grande he said, "It sustains our soul, cleanses our spirit." He talked of being taught to visit the River to "promote its journey downstream." He talked of his father taking him to the River so that its qualities could be imbued in his son, "placid yet full of energy."

NATIVE-AMERICAN HISTORY OF THE RIO GRANDE

How much water did the Rio Grande provide for crop irrigation by the Pueblos who settled along its banks and tributaries? Extrapolating historic flows to this pre-historic use, in the average year, almost 1,000,000 acre-feet (a-f) of water reached what was to become the Colorado/New Mexico border. About 900,000 a-f of water entered in tributaries of what was to become New Mexico north of and within the Middle Rio Grande Valley. This certainly amounted to a "Rio Grande" and a place of substance to the people who were here before the Europeans.

The following discussion was obtained from the encyclopedic report, *Irrigation and Water Supply of the Pueblos of New Mexico in the Rio Grande Basin*, transmitted to the Commissioner of Indian Affairs in 1938 by Hydrographic Engineer, Paul V. Hodges.

Dr. Edgar L. Hewitt in *Ancient Life in the American Southwest*, (1930) wrote: "The Pueblos of New Mexico and Arizona are the surviving remnants of the once considerable population that was in ancient time distributed over the valleys of the Southwest, a region as extensive as France or

Germany . . . The towns that now rest upon the bank of the Great River . . . are all of modern origin. To find their antecedents we must go into the side valleys east and west of the main stream; especially into the mesas and foothills . . . This repeats the condition to be seen along the great water ways of the Old World, such as the Tigris, Euphrates and Nile . . . The large valleys were comfortably populated . . . There were no cities . . ." (Hodges, pp. 21-23) "What are known as the Pueblos of New Mexico consists of 18 tribes living in 24 towns or villages, inhabited by Indians who occupy the Rio Grande Valley in this State, who tilled the soil, irrigated the lands from the streams, and used the same ditches they use today at the time when Coronado's Expedition reached them in 1541-2, and there is no history to show how long prior to that date." (Report of H.F. Robinson, August 3, 1913) (Hodges, p. 1)

From *Report of the Chief Engineer*, Middle Rio Grande Conservancy District (MRGCD), August 1928, we can read that Antonio de Espajo, writing of the Rio Grande as seen by him in 1582 says, "They (the Indians) have fields of maise, beans, gourds and piciete (tobacco) in large quantities which they cultivate like the Mexicans." (Hodges, p. 8) And from *Commerce of the Prairies* by Josiah Gregg (1844), is found: "When these regions were first discovered it appears that the inhabitants lived in comfortable houses and cultivated the soil, as they have continued to do up to the present time. Indeed, they are now considered the best horticulturists in the country, furnishing most of the fruits and a large portion of the vegetable supplies that are to be found in the markets. They were until very lately the only people in New Mexico who cultivated the grape." (Hodges, pp. 5-6)

Pueblo Irrigation

From the Follett Report of 1896, the ancient ditches listed are 52 in number, have a total capacity of 618 second-feet and irrigated 20,730 acres in 1896. The year was, however, a year of deficient water supply, having about 60 percent of a normal year. This would indicate that possibly about 34,500 acres were irrigated normally from these ancient ditches. Narrowing that down to the Middle Valley, "The Hedke Report (1924) shows irrigation development in the Rio Grande from Cochiti to San Marcial, based on reports of Follett, Yeo and the 1918 NM Drainage Survey. In this report Mr. Hedke shows Indian development which started before the year 1600 to consist of 22 ditches with capacity of 537 second-feet covering 25,555 acres between Cochiti and San Marcial." (Hodges, p. 17)

"There are ditches in the Rio Grande valley still used by the Indians, with bottoms eight to ten feet above the ground surface, which had been built up to this height by countless years of cleaning out the silt deposited by the waters and placing it on the banks." (Hodges, p. 18)

The Middle Valley Pueblos, below Cochiti Reservoir, are Cochiti, Santo Domingo, Santa Ana, San Felipe, Sandia, and Isleta. Present day Indian irrigation in the Middle Valley is over 8,000 acres, with about 13,000 acres developed for irrigation and up to a total of 20,000 acres irrigable with further development.

THE SPANISH/MEXICAN ERAS

Into this land along this grand River with no cities came the Spaniards. At first, like Coronado in 1592, they came as explorers for great treasures. The first settlement at Chamita, the confluence of the Chama and Rio Grande, in 1598 was abandoned a few years later in 1609 when Ciudad Real de la Santa Fe de San Francisco de Assisi, Santa Fe, was founded. Exploration and colonization was carried on from Santa Fe for about 75 years until the Pueblo Revolt of 1680 and the 12-year retirement of the Spaniards to El Paso del Norte. In 1692 the revolt was quashed and the Spanish returned under Don Diego de Vargas to Santa Fe and the Rio Grande Valley.

Development occurred south down the Valley from Santa Fe through land grants; for example, Bernalillo in 1700 and the Villa de San Felipe de Alburquerque in 1706. "The Socorro area was developed many years later. There were Indian pueblos in this locality in pre-Spanish time and the Spaniards established several missions at these pueblos, but after the rebellion of 1680 these few small settlements were exposed to continual attack by the hostile Apaches who murdered or drove off the settlers, and it was not until the building of the railway down the Rio Grande valley some 200

years later that the real development of this country took place." (Hodges, p. 10)

With Spanish and then Mexican colonization of the Valley, acequias were created to serve the farmers' needs. At the time of the water rights filing of the Middle Rio Grande Conservancy in 1928, discussed below, there were 68 ditches of which 13 were Indian and 55 non-Indian.

TOTAL EXPLOITATION OF RIO GRANDE FLOWS

Let's jump through the Mexican Independence of 1821, the U.S. taking of portions of Mexico, resulting in the Treaty of Guadalupe-Hidalgo of 1848 and subsequent Gadsden Purchase in which the territory of New Mexico became territory of the United States.

Before any sizable Anglo population settled in the Middle Valley, irrigated agriculture peaked at about 125,000 acres sometime between 1850 and 1880. In the 1880s, extensive irrigation development began in the San Luis Valley of Colorado, above which the headwaters of the Rio Grande lie. This development has led to depletion in Colorado in the average year of about two-thirds of the supply that would otherwise reach the New Mexico border. This source passing through the San Luis Valley, presently provides on average about one-third of the water passing through the Middle Valley, about 300,000 a-f per year. The balance comes from the Chama, Sangre de Cristo watersheds, Jemez, and others. Before its development, Colorado provided on average about 55 percent, 975,000 a-f per year, of the total flow within the Middle Valley.

Apparently, the first to feel the effects of the new Colorado depletion were the El Paso, Juarez and Mesilla Valley areas. Mexican protests that upstream diversions were taking its citizens' long-established and prior rights to water from the Rio Grande led in 1896 to an indefinite embargo on further Colorado and New Mexico irrigation development on the Rio Grande through prohibition on the use of public land as right-of-way for irrigation purposes. This effectively stopped Colorado efforts to construct dams to store spring runoff water for use later in the season. In 1906 the U.S. and Mexico by treaty agreed that the U.S. deliver 60,000 a-f per year to Mexico at Juarez. In 1905 Congress authorized Elephant Butte Reservoir in Sierra County, completed in 1916, in anticipation of the need to meet Mexican delivery requirements and to provide water to irrigators in both New Mexico (the Elephant Butte Irrigation District) and Texas (the El Paso Irrigation District).

CREATION OF THE MIDDLE RIO GRANDE CONSERVANCY DISTRICT

During this same time, as a result of both decreased flows due to increased depletions and centuries of Middle Valley irrigation through dozens of ditches, both Indian and non-Indian, there were drastic decreases in the irrigated land and productivity of land still irrigated. From a peak of 125,000 acres during the years 1850-1880, about 50,000 acres were irrigated in 1892 and by 1925, it fell to about 40,000 acres. Due to sediment deposition, the River had aggraded raising it above the surrounding land, and today the River remains above downtown Albuquerque. This, with the multiplicity of ditches, led to water logging of the land swamps, alkali, and salt grass areas. In 1920, the average depth to water was 2.5 feet.

After many fits and starts, the MRGCD came into being through enabling legislation in 1923 and State Engineer Office permit applications to change the points of diversion from 68 ditches, 13 Indian and 55 non-Indian, to four—Cochiti, Angostura, Isleta and San Acacia under Permit No. 620 dated August 15, 1928 and to develop El Vado Reservoir on the Rio Chama for carryover storage of about 191,000 a-f of unappropriated water under filing 1690, dated May 27, 1930. The MRGCD consists essentially of the Valley areas of Sandoval, Bernalillo, Valencia, and Socorro counties, from Cochiti Dam to Bosque del Apache (Figure 1). The federal government contributed about $1.5 million to a total $10.3 million project costs for the Indian portion of 8,847 acres of lands with prior and paramount water rights plus an additional 13,000 acres that could be brought into irrigation.

The Middle Valley of 1925 (Figure 2), with an Albuquerque of about 26,000 people and with its 68 ditches was likely much like the acequia life that continues in northern New Mexico today in custom, culture and ambience. The MRGCD, which headed

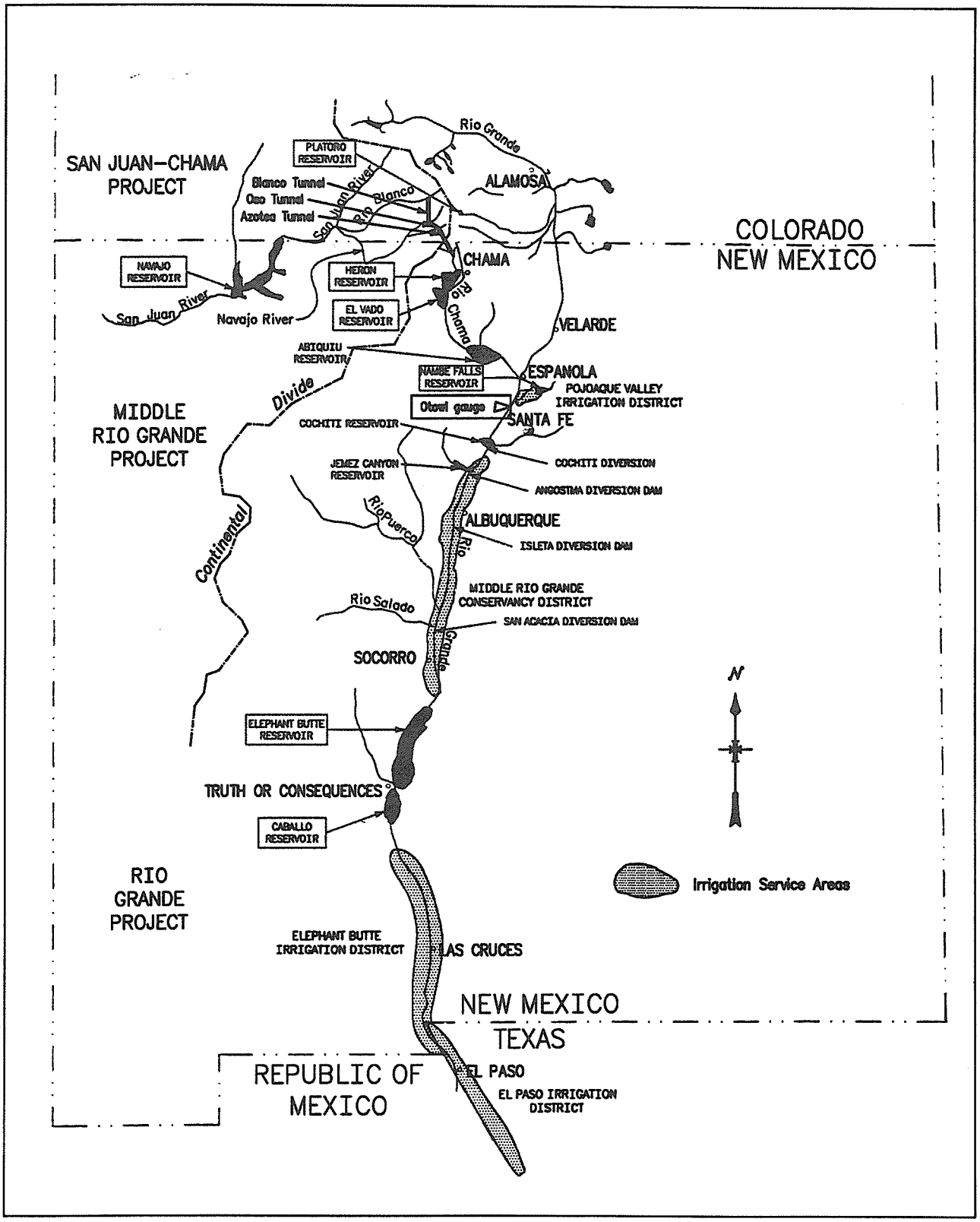

Figure 1. Area map of the Rio Grande Valley.

off the decline in irrigated land due to the failing ditches and non-existent drainage system of that era along with subsequent population growth, replaced that life with what exists today.

The mission of the MRGCD was to (1) re-establish the river channel through jetty jacks to straighten and narrow the channel and build riverside levees, (2) construct a system of riverside and internal drains to drain the seeped lands, and (3) develop a comprehensive system of diversion dams, canals and laterals plus construct El Vado Reservoir on the Rio Chama. The goal was to bring a total of about 120,000 acres into cultivation with the reclaimed land and water plus the water that El Vado would provide.

MRGCD accomplished its goals and all went well for a generation, except during the floods of 1941-1942. The District works were completed by 1935 with El Vado finished shortly thereafter, in 1936-1938. The drains dried up much of the swampy land and the salt was leached out of the thousands of acres of salt grass/alkali flats that were created, bringing much land back into cultivation and allowing the cultivation of new acreage. The District never reached the goal of 120,000 cultivated acres—peaking at perhaps 80,000 in the 1950s—with the momentum of urbanization gradually overcoming the increases that would otherwise have occurred. As a new aesthetic for the Valley, channelizing the River and creating the riverside levees caused a new dense cottonwood forest on many acres of land within the levees that had been part of the meandering expanse of floodway (figures 3 and 4).

Figure 2. Airplane view of downtown Albuquerque, May 26, 1930. Photo courtesy of Middle Rio Grande Conservancy District.

Figure 3. View looking south from now Tingley Beach Drive, Barelas Bridge in background, March 23, 1931. Photo courtesy of Middle Rio Grande Conservancy District.

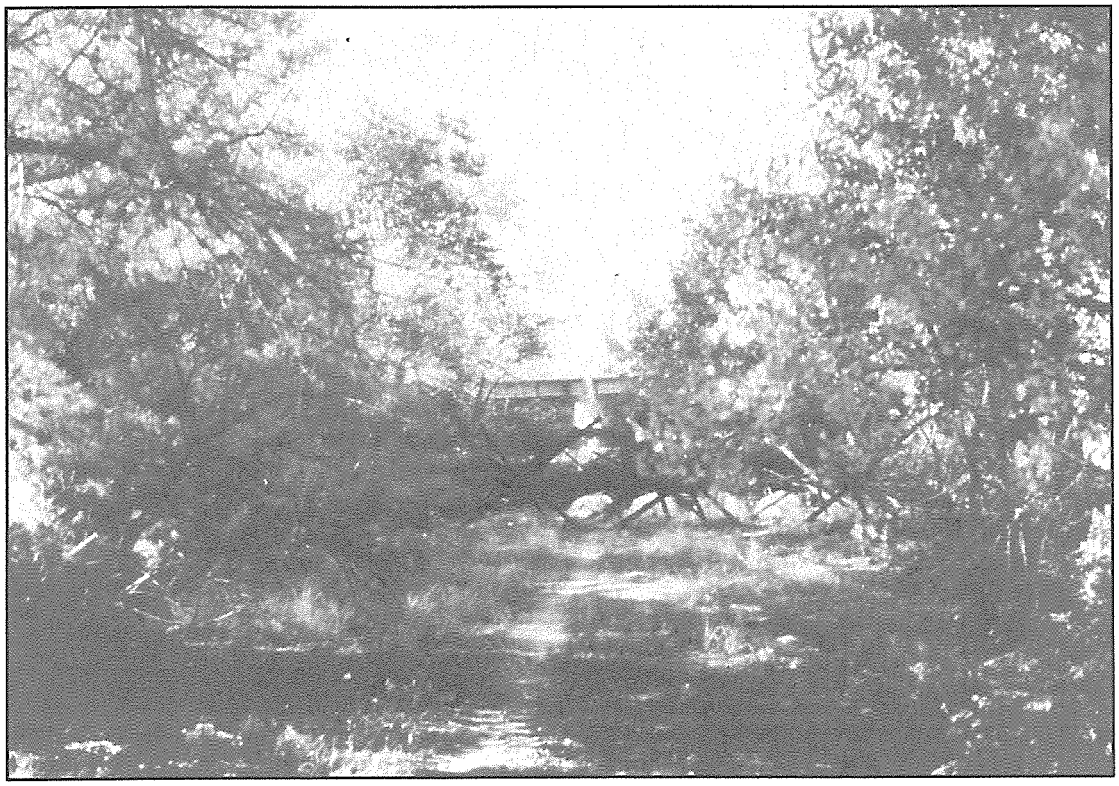

Figure 4. Barelas Bridge in fall 1994. Photo by Gary Daves.

CITY OF ALBUQUERQUE

Albuquerque was established with the coming of the railroad. The City's water system originated with a private water company that served its citizens before the 1885 City incorporation date. Angus Grant acquired a franchise for the "Albuquerque Water Works" in 1882 and was granted a franchise by the City upon its incorporation. The 1890 Albuquerque population was a little over 5,000 people. The system was acquired by the City in 1917, under the leadership of Clyde Tingley. In 1929, the City had 6,489 water service connections, in 1936, 7,441 water meters. In 1950, the City had about 97,000 people and in 1955, about 150,000. Per capita water consumption increased from 74 gal/day in 1930 to about 150 gal/day in 1955. The first well for the City water works was apparently drilled in 1875 near old Albuquerque High School and was called the "wonder of the town." From then to the present, the City has obtained water from wells tapping the groundwater basin. As demands have increased and wells have passed their useful life, new wells have been drilled, and water consumption has grown at a pace significantly faster than the population.

RIO GRANDE COMPACT

After the turn of the century, there remained conflicts among the states of Colorado, New Mexico and Texas on sharing the waters of the Rio Grande. Negotiations among the three states began in the early 1920s to create an interstate compact apportioning the Rio Grande. A 1929 "status quo" compact was agreed to, pending investigations (the Rio Grande Joint Investigation completed in 1937) needed for a permanent compact. The final compact was agreed to by the three states in 1938 and approved by Congress in 1939. The Rio Grande Compact commenced in 1940.

The Rio Grande Compact is a critical parameter to water flow governance and water management. It mandates deliveries by Colorado as a percentage of gaged flows down the Rio Grande into New Mexico, about 20 percent in dry years, about one-third in a typical year to over 50 percent in wet years. A corresponding requirement lies with New Mexico to deliver a certain flow, as a percentage of the flow at Otowi gage, located upstream of Cochiti Reservoir, to Elephant Butte Reservoir. This amounts to a low of 57 percent at low flows, peaking at 86.5 percent for very high flows, not yet close to having occurred (see figures 5 and 6 for

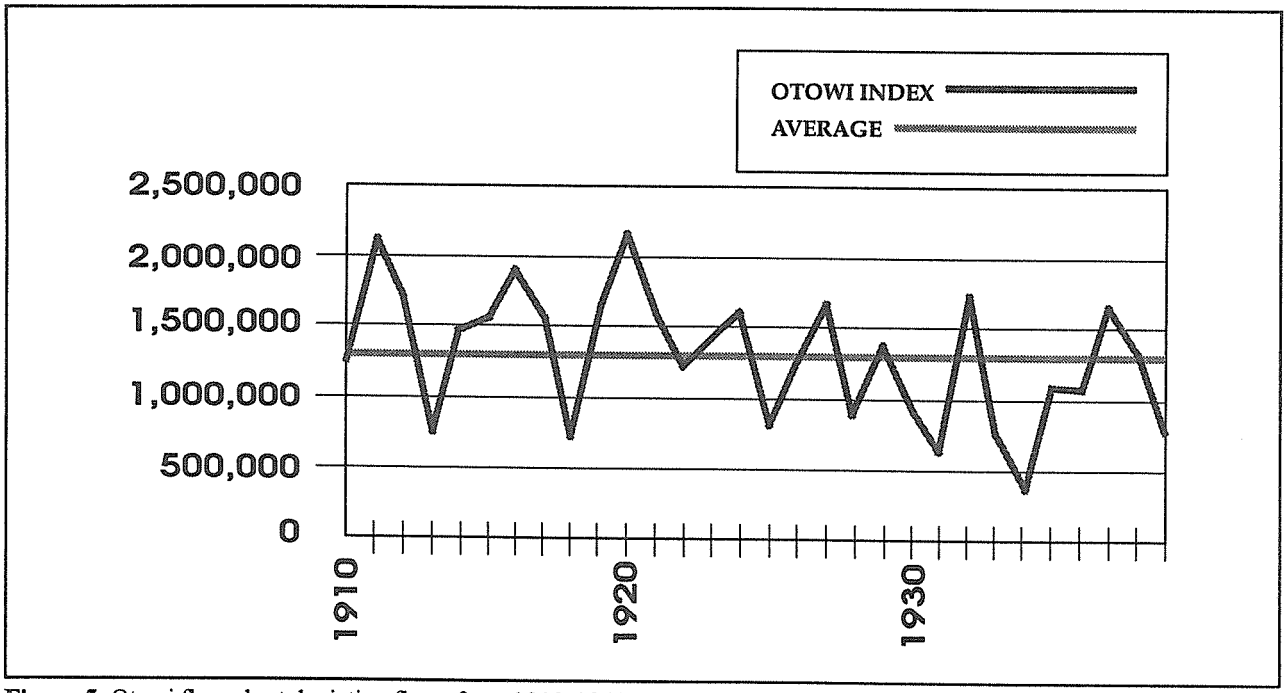

Figure 5. Otowi flow chart depicting flows from 1910-1940.

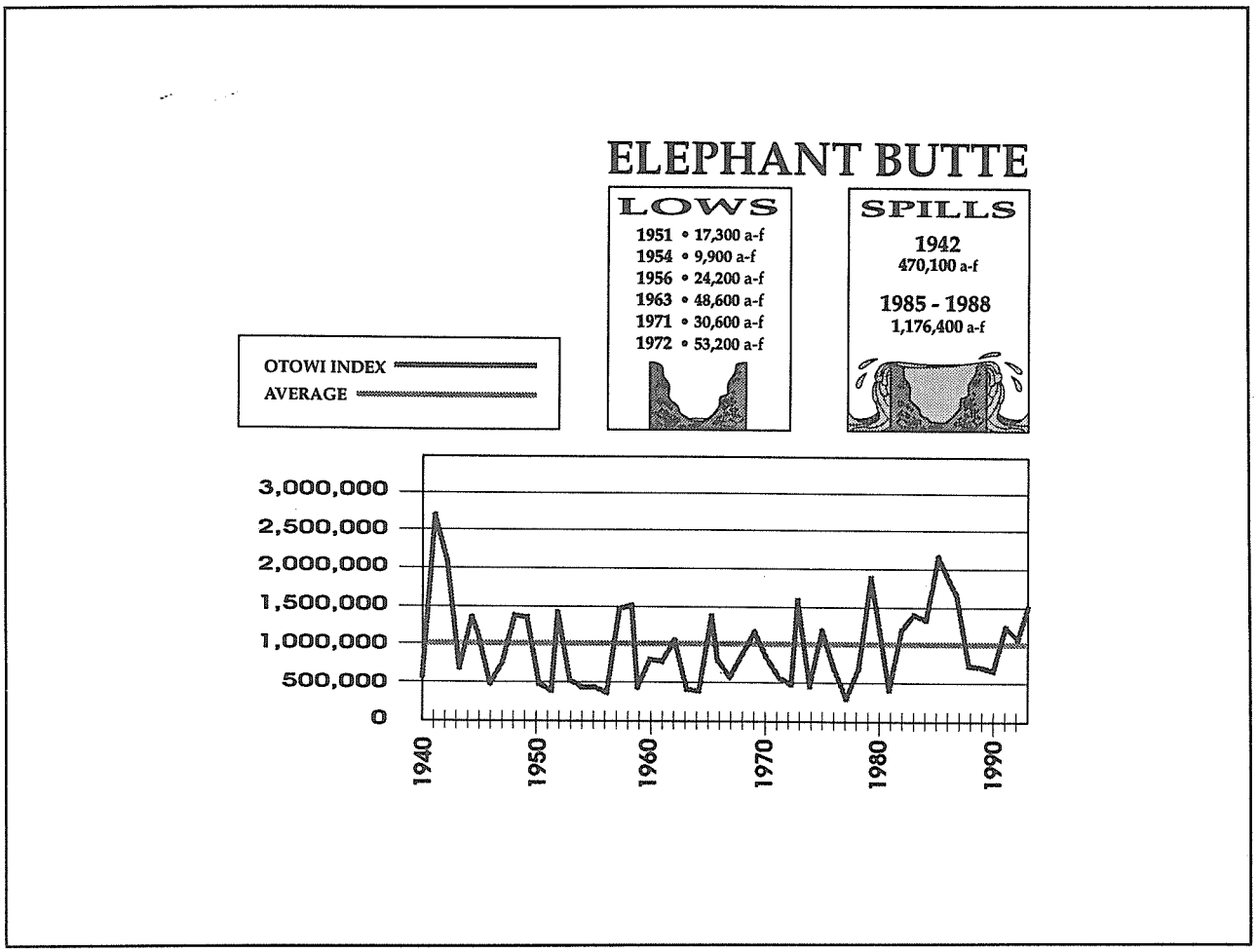

Figure 6. Otowi flow chart depicting flows from 1940-1993.

Otowi flows from 1910 to 1993). Thus Colorado cannot divert all flows, nor can New Mexico. Translating these to numbers, in a typical year Colorado delivers about 370,000 a-f (using 1968 to 1992 numbers) to New Mexico, and, with a bit of equivocation, New Mexico delivers in a typical year about 700,000 a-f to Elephant Butte Reservoir.

The Compact anticipated under and over-delivery of water (debits and credits); Colorado's and New Mexico's cumulative debit was not to exceed 100,000 and 200,000 a-f respectively. The Compact also provides that accumulated debits or credits of both Colorado and New Mexico would go to zero in any year Elephant Butte spilled (i.e., water released in excess of irrigation demand), and that neither state has delivery requirements to Elephant Butte in the year of a spill following the spill. The Compact also strictly limits the use of post-1929 reservoirs, that is, El Vado. The MRGCD may not use water out of El Vado when Elephant Butte has less than 400,000 a-f of water nor if New Mexico is in debit except amounts stored that might be in excess of the debit; and Texas may demand release of water stored in El Vado to extent of a New Mexico debit so as to bring Elephant Butte up to 600,000 by March 1. In addition, if New Mexico is in debit but there is sufficient water in Elephant Butte such that a call is not made, water stored in El Vado must be held, notwithstanding an irrigation need in the Middle Valley, except for delivery to Pueblo land with prior and paramount water rights. As a practical matter, this has meant that El Vado was unavailable for use by MRGCD during the many years of Compact history that New Mexico was in debit status.

How does the Rio Grande Compact apportion the water in the mythical "average" year?

	Flow*	Delivery Required	Depletable
Colorado	975,000	308,480	666,100
New Mexico - Middle Valley	1,194,000**	887,000***	307,000
Texas including EBID, Mexico	887,000	887,000	707,000****

*all in acre-feet
**Otowi Gage plus downstream inputs
***Elephant Butte Index requirement plus one year evaporation on lake
**** Elephant Butte Index requirement

Otowi Average (which sets requirement)	1,100,000
Downstream Inputs (Jemez, Rio Puerco, etc.)	94,000
Subtotal	1,194,000
Elephant Butte Index requirement	(707,000)
plus evaporation loss on water	(180,000)
New Mexico Delivery Requirement	(887,000)
Depletable in mid-Valley	307,000
Riparian Evapotranspiration	(147,000)
Net Available	160,000

The 160,000 a-f would allow 76,190 acres of irrigation at 2.1 a-f per acre depletion, not counting City of Albuquerque and others' depletions.

Why did New Mexico agree to Compact?

Historian Ira G. Clark in *Water in New Mexico, A History of Its Management and Use*, 1987, explained:

> "In analyzing the compact, the New Mexico state engineer concluded that it was a settlement which all considered equitable and which should benefit all signatories. The agreement was based on a thorough investigation of the Rio Grande and the history of forty-three years of water use during which the normal flow would have met the needs for all but seven years, with only four of critical shortage. There was no time when New Mexico would have exceeded its maximum deficit. All present water users including the New Mexico-Texas Rio Grande project were amply protected, upstream reservoirs could now store waters presently being wasted and permit each major basin to put them to best available use, and each state would receive credit for increasing the supply whether by water salvage, drainage, or inter-basin transfer. It should, in short, resolve forty years of interstate conflict in a manner satisfactory to everyone." (p. 221)

The relative amounts of water among the three Compact parties should be pondered. In the mythical average year assuming perfect Compact compliance, Colorado gets to deplete about 670,000 a-f out of 975,000 passing through its lands; New Mexico between the Otowi Gage and Elephant Butte Reservoir can deplete about 300,000 a-f of the flows amounting to about 1,200,000 a-f passing through Otowi and generated downstream within the Middle Valley; New Mexico downstream of Elephant Butte, Texas, and Mexico receive about 890,000 a-f into Elephant Butte Reservoir. After lake evaporation losses, about 700,000 a-f can be delivered for use. Thus, under the Compact both Colorado and Elephant Butte downstream get more than twice the amount of water than the Middle Valley. Why didn't the Middle Valley, the cradle of development by the Pueblo Indians and then the Spanish and Mexicans, get a bigger bite from the apple?

The New Mexico Middle Valley simply had no leverage to bargain for more, absent war whose odds for success would have been comparable to the one to four water ratio received compared to the Colorado/south of Elephant Butte pincer. The Compact reflected the status quo of the time which was an already over-appropriated limited supply with already existing and incipient over-demand for the limited resource. In fact the net 160,000 a-f, after riverine evapotranspiration losses, allows irrigation of about 76,000 acres (assuming 2.1 a-f depletion per acre), which was more than was being irrigated within the MRGCD when the Compact was negotiated and near the peak since. The District estimates that between 65,000 and 70,000 acres are currently irrigated. And there was a low Middle Valley population. The City in 1940 had about 35,000 people who used **only** groundwater, with the specter of then current effects on the River and effects after growth not yet a matter of concern.

Colorado was already actually diverting the large amount it obtained—albeit remaining without the reservoir lusted for during the embargo years—and New Mexico south of Elephant Butte, Texas and Mexico were using or able to use their portion and more. The water allocated under the Rio Grande Compact to the Middle Valley amounted to a tacit recognition of the water limits to growth. In defiance, the Albuquerque metropolitan area alone has grown to contain about one-third of the state's population.

I think it interesting and instructive to compare the Compact of the Rio Grande with that of the Colorado River system. From my perspective, the former was a dour, painful affair (a necessary dose of cod liver oil) of nickeling and diming the relative pieces of an over-exploited and very limited pie. The Colorado compacts on the other hand were negotiated with some millions of a-f of water still up for grabs, a much cheerier state of affairs than on the Rio Grande. The various states' goals were to secure their respective rights for development and growth into the future. Just to give a glimmer of relative differences between the magnitudes in the two systems, there is about 16.5 million a-f per year apportioned to the Colorado compacts' states and Mexico, compared to less than two million a-f in the Rio Grande Compact area. The Phoenix area has managed to slice about 1.4 million annually depletable a-f of water from the Colorado system pie through the Salt River and Central Arizona Projects. New Mexico's upper Colorado share of the total pie is less than 5 percent, which still amounts to about 730,000 depletable a-f per year. As will be covered later, the City of Albuquerque and the New Mexico Rio Grande basin area as a whole got a piece of this water through the San Juan-Chama transbasin diversion project over the strenuous objections of many in northwestern New Mexico.

Life Under the Compact

Colorado underdelivered or was in debit status 21 of the first 28 years, 1940-1967, of the Compact. Notwithstanding the Compact-mandated limit of a 100,000 a-f debit, cumulative Colorado under-delivery exceeded 100,000 a-f from 1952 through 1984, peaking at 944.4 thousand in 1967. The debit decreased to 512.1 thousand before the Elephant Butte spill of 1985 erased it. These underdeliveries had the effect of rippling downstream both in the sense of less water with a chance to pass through the Middle Valley and also leaving New Mexico with a lower delivery obligation to Elephant Butte. Since 1967, when Colorado stipulated in a lawsuit—brought earlier by Texas and New Mexico to gain compliance—to subsequently strictly meet the delivery schedules, Colorado has met and exceeded its annual delivery requirements to date, except for 1979, when it underdelivered by 4,300 a-f.

As indicated before, the New Mexico record and ability to insure full Compact delivery is somewhat equivocal. As such, there was a Texas v. New Mexico lawsuit filed in 1952 alleging New Mexico/MRGCD violation of the Compact, dismissed on the grounds that the U.S. was an indispensable party. New Mexico's debit exceeded the 200,000 a-f limit from 1948 through 1968 but has not exceeded the debit limit since. From 1940 to 1967, New Mexico underdelivered 16 of the 28 years. In the succeeding 25 years, New Mexico has underdelivered 9 years, the most recent being 1989 and 1990. New Mexico hasn't developed the ability to determine and regulate diversions to insure meeting its delivery schedule as has Colorado, and is frequently dependent upon thunderstorm impacts downstream of Otowi to meet its obligations.

This dry statistical history of the Compact translates to hardship for the farmers. *El Independiente* of July 24, 1959, reported "a week's shutoff of irrigation in Bernalillo and Sandoval Counties in an attempt to get enough water to Valencia County to save alfalfa and fruit trees . . . with only Indian lands . . . allowed water in Bernalillo and Sandoval Counties during the several days." The report went on:

> "Seriousness of the irrigation water shortage can be seen in the fact the Rio Grande flow past Otowi, at the northern end of the Middle Rio Grande Conservancy District, has been only 186 cfs. . . . Supplying of normal irrigation needs of the district requires 1500 second-feet. Indians, who have top priority on use of water, will continue to get it this week. . . . Release of another 8000 acre feet of water has started from El Vado reservoir for Indian lands. This will leave about 21,000 acre feet in the reservoir."

Elephant Butte Reservoir Levels

While Elephant Butte usually has had significant quantities of water, it has in fact been drawn down to unusable levels several times in its history, with its all-time low since first receiving water in 1915 of 9,900 a-f on August 6, 1954. Other lows for Elephant Butte include 17,300 a-f in February 1951, 24,200 a-f in September 1956, 48,600 a-f in September 1963, 30,600 a-f in September 1971, and 53,200 a-f in August 1972. For perspective, these numbers should be contrasted with the present reservoir capacity of 2.1 million a-f and the all-time high of 2.3 million a-f with Elephant Butte spilling June 16-18, 1942. These lows show that the farmers downstream fared similarly to the Middle Valley.

Elephant Butte spilled from 1985-1988 with a total of 1,176,400 a-f spilling, and has been determined to have spilled at least some Colorado and New Mexico credit water in 1994.

THE BUREAU OF RECLAMATION'S ROLE IN THE MIDDLE VALLEY

By the late 1940s, the MRGCD was having serious problems. The 1941-42 floods and time had taken its toll on the District's works. Drought and inefficient water delivery to Elephant Butte and resulting debits under the Rio Grande Compact created a double whammy to District irrigators. Drought created low flows which were all the farmers could use, with El Vado unavailable most of the time to supplement flows because of the Compact debits. And the District was in financial trouble. By 1944 title to about one-third of the MRGCD's non-Indian land passed to the state for non-payment of taxes and assessments; assessments on almost all the farmland were chronically delinquent. The Middle Valley needed flood protection and it sought help from the federal government.

Flood Control Acts

The Flood Control Acts of 1848 and 1955 provided the District with federal assistance. On September 24, 1951, the Bureau of Reclamation and the MRGCD signed an initial contract for a rehabilitation program. Under this and subsequent contracts, the Bureau acquired all existing district debt, in return for which it received the District's property rights in the works, as a security interest, including lands that had passed to the State because of delinquencies in taxes and assessments. The Bureau rehabilitated El Vado dam and the District's irrigation and drainage works and improved the channel of the Rio Grande.

One large element of the Bureau's channel rectification was construction of the Low Flow Conveyance Channel from Bernardo to Elephant Butte, San Acacia to Elephant Butte narrows. It was put into use in 1958 to enhance New Mexico delivery of water to Elephant Butte for Compact purposes, designed to bypass flows up to 2000 cfs that would otherwise be in the floodway in this reach. The channel acted to bypass a large sediment plug developed in Elephant Butte head waters that was derailing deliveries. It was used, with some discontinuities, the major one from April '81 to October '83, as the primary delivery mode from May 1959 into March 1985. Since then, high lake levels have both rendered it not needed for the time being and in large part under water, silted in and unusable.

The Bureau took over operations and maintenance of the District during this period, and the District's field staff became federal employees. In 1975, the District resumed management responsibility except for El Vado operations, which are still run by the Bureau.

MIDDLE VALLEY FLOODS AND THE FLOOD CONTROL DAMS

By 1940, El Vado Reservoir on the Chama was in place and the MRGCD works were completed. The MRGCD plan as envisioned before its construction for flood control was for the levees to permit flows of 40,000 cfs above Albuquerque, 75,000 cfs through Albuquerque, and 50,000 cfs downstream at San Acacia. Reality intruded in 1941 and 1942 when Otowi Gage ran 2.7 million a-f in 1941 and 2.1 million a-f in 1942, against the 1.1 million average.

Peak flow in mid-May of 1941 was almost 25,000 cfs through the Albuquerque reach, staying above 15,000 through the month and except for a few days in mid-June above 10,000 cfs for that month (Figure 7). Flow dropped below 5,000 in mid-July. The levees were breached throughout the

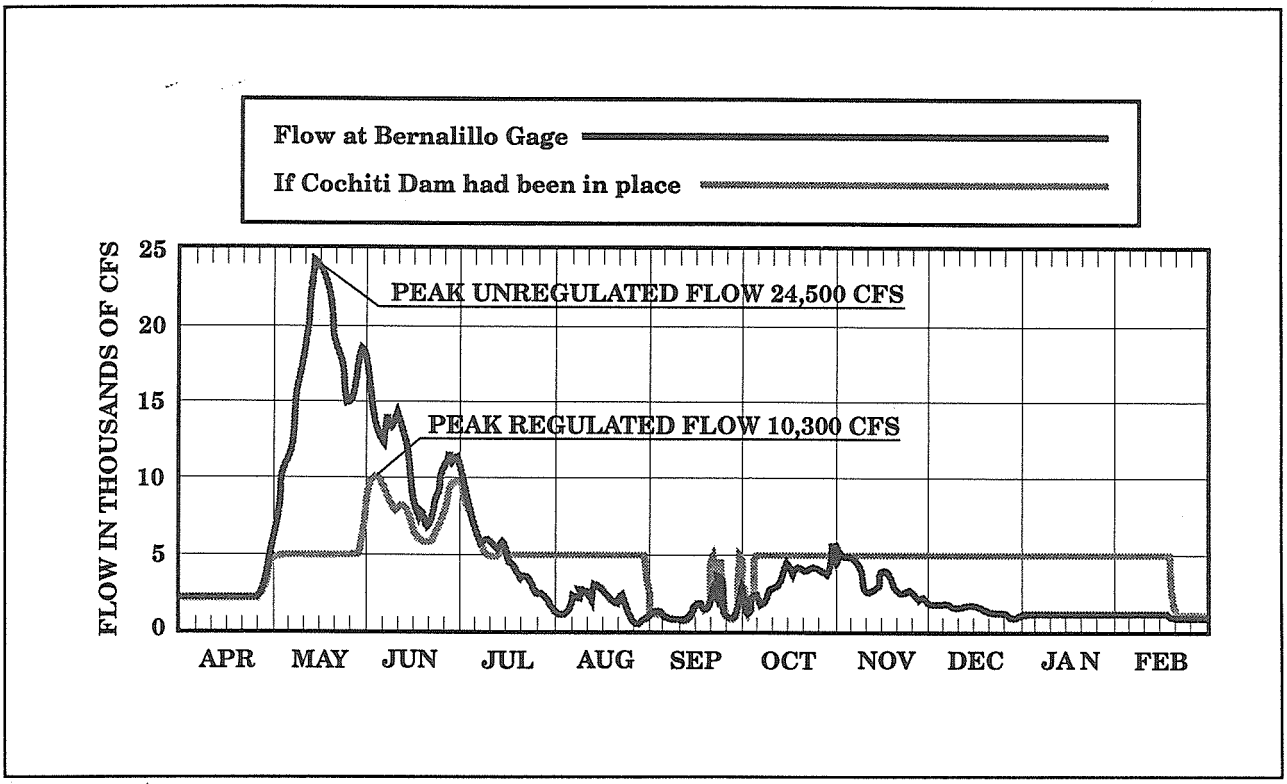

Figure 7. Peak unregulated and regulated flows during the 1941 Rio Grande Flood had Cochiti Dam been in place.

Valley. With a break at Alameda, north of Albuquerque, the railroad tracks through downtown defined the River course for some weeks, bridges were destroyed, and thousands of acres of the irrigated Valley were under water. 1942 provided a little less water but continuous serious flood damage. Elephant Butte filled and spilled 470,000 a-f water in 1942 with this second year of almost double average flow.

This flood replicated flood events of similar scope and destructiveness along the River that had occurred in previous years within the memory of those still living. The progressive aggradation of the River combined with urban, agricultural and commercial development with the railroad coming through in 1880, increased both the frequency and the amount of flood damage. In an 1874 flood, the River escaped above Alameda in a precursor to the 1940s flood. In the official plan for the MRGCD, San Marcial, just above Elephant Butte, was described as "eminently threatened." The riverbed was estimated to have risen between 12 and 14 feet in fifty years. As plans for flood control for the town were being considered, it was destroyed in the 1929 flood.

The flooding of 1941 and 1942 through the Middle Valley created an impetus for flood-control dams on the Rio Grande and its tributaries and improved levees. Beginning with studies and legislation from various flood control acts through 1960, the present configuration of flood control dams on the system was authorized. Major dams included Jemez Canyon Reservoir on the Jemez River just upstream of its confluence with the Rio Grande above Bernalillo (completed in 1954); Abiquiu downstream of El Vado on the Chama about 30 miles above its Rio Grande confluence (completed in 1963); and Cochiti Dam on the Rio Grande about 50 miles north of Albuquerque (completed in 1975) and now constituting the nominal northern boundary of the Middle Valley and the MRGCD. Major levee improvements have been made, including the Albuquerque reach of the River, while improvements in others, such as Corrales, Belen, Los Lunas are planned.

What have been the effects of the dam building and improvements in levees? With Cochiti and the

Albuquerque levee improvements in place, with protection to 42,000 cfs, the 1941 flood would probably have safely passed Albuquerque. Other nearby areas would not fare so well. Cochiti would spill with the 1941 hydrograph and result in flows of over 7,000 cfs for the most of a month, peaking at about 10,000 cfs. Levees at Corrales, the Mountain View area of Bernalillo County, Isleta and Los Lunas currently are vulnerable to flows sustained for more than several days at or over 7,000 or 8,000 cfs. Clearly the MRGCD did not attain the goals it set for itself. The actual post-Cochiti side of the coin is given by 1985, with 2.17 million a-f passing Otowi (Figure 8). Without Cochiti, flows would have been above 8,000 cfs for some two months, peaking at about 11,000 cfs, leaving the same areas vulnerable to levee breaks.

As the MRGCD was maturing and the new law of the River, the Rio Grande Compact was being imposed, World War II was upon us and the City of Albuquerque boomed.

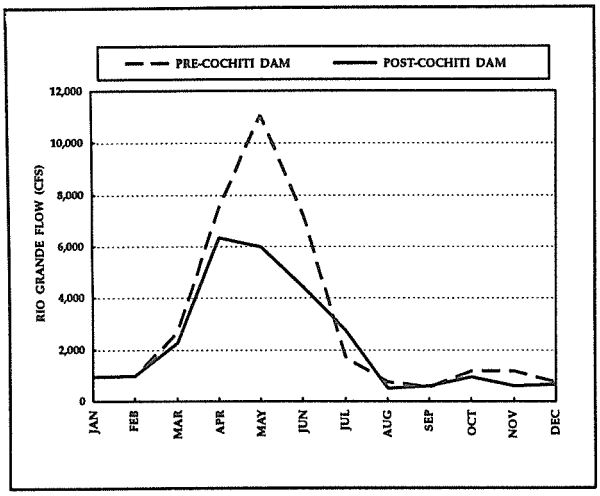

Figure 8. Rio Grande flow hydrographs. High stream flows at Albuquerque in 1985, pre-Cochiti Dam and post-Cochiti Dam.

DECLARATION OF THE RIO GRANDE UNDERGROUND WATER BASIN

The then new State Engineer Steve Reynolds created a firestorm of opposition in the City of Albuquerque, from the MRGCD and many others in the Middle Valley, by declaring the Rio Grande Underground Water Basin. The sole reason for declaring the Rio Grande Basin was to give the State Engineer jurisdiction to control new large increases in the diversion of groundwater by urban growth and imminent large-scale irrigation development and thus protect the Rio Grande from the effects of increased pumping. The tacit limits to groundwater exploitation in the Middle Valley contained in the Rio Grande Compact became known with gnashing of teeth in both the headlines and bylines of Albuquerque papers in the weeks following the declaration.

As a backdrop, let's look at the City and its water use in the previous 15 years. The City population in 1940 was 35,500, its water usage was 4,340 a-f, for a 109 gallons per capita per day (g/c/d) use. In 1950, the numbers are 96,800 people, 16,300 a-f, and 151 g/c/d and in 1955, 155,000 people, 16,460 a-f, and 153 g/c/d. At the start of 1957, the Albuquerque population was estimated at 174,100. Rapid growth and steady increases in per capita consumption characterize the period. The State Engineer decided the River was starting to notice.

The City had been receiving warnings through the previous years. In 1952, the chief of the Bureau of Reclamation came to town as reported by the *Albuquerque Journal* on November 11:

> "City is Warned:
> May Face Fight on Water Supply"
> Albuquerque may find itself in a hot fight over its domestic water unless it looks soon to another source of supply, the chief of the U.S. Bureau of Reclamation, said here today. Michael W. Straus . . . said in an interview that farmers downstream are losing about 20,000 acre feet of Rio Grande water yearly because of the city's heavy pumping. Water drawn from underground supplies here must be replaced by water from the river, he said. As a possible new source of supply, he suggested diversion of San Juan River basin runoff . . . 'The Elephant Butte district got down to the dregs last year. The per capita demand for water and the land area to be irrigated have been skyrocketing in the area for the last five years. Meanwhile, the per capita use of water in Albuquerque has doubled in the same time and the population has doubled. There just isn't enough water for everybody, even if all water available was being utilized to the utmost.'

The City reacted:

> Manager Walter Blume of the city water department today said he is "dubious" of a statement that farmers downstream on the Rio Grande are losing about 20,000 acre-feet of water yearly because of the city's heavy pumping for its domestic water supply. . . . Questioning the statement about the 20,000 acre-foot drain on the Rio Grande, the water manager said he knows of no adequate means in the Albuquerque area for checking the loss of river water due to city pumping . . . . The water manager commented that the President's Water Resources Policy Commission last year reported that Albuquerque is in the center of a 'socially and economically sick area' largely because of inadequate water supply. . . . 'The City should continue its case for an allotment of its share of water from the proposed San Juan-Chama project and urge its approval by the necessary governing bodies.' (*Albuquerque Tribune*, November 12, 1952)

From today's perspective the reported statement of 20,000 a-f of River drawdown caused by City pumping does seem to contain some hyperbole since 1952 was the first year the City exceeded 20,000 a-f and there was wastewater return flow of about half that amount.

In an editorial of the next day, November 13, the *Tribune* fired a warning salvo:

> "We're Entitled to It"
>
> Mr. Straus said that farmers down the Rio Grande from Albuquerque are losing 20,000 acre feet of water annually because of Albuquerque's heavy pumping to supply the needs of its residents. . . . There is an additional pertinent fact that Mr. Straus did not mention. That is the fact that thousands of acres of valley land have been taken out of cultivation as the city's residential area has spread during the past many years. Logically and justly the city is entitled to the water that formerly was used for irrigation. When this fact is taken into consideration it is doubtful that the City is taking all the water that it is entitled to take from the underground supply in the Rio Grande Valley. In the meantime, farmers of the lower valley appear to be putting more and more land under irrigation and using more and more water which is made available to them only because somebody was lax in protecting the rights of the Middle Valley when the building of the Elephant Butte Dam was authorized. It will be a fine state of affairs when an Albuquerque resident will have to get permission from some farmer down below Elephant Butte in order to get himself a drink of water.

A couple of years later, Steve Reynolds' predecessor politely resumed the theme begun by the Bureau Chief:

> "Buy Water Rights, Erickson Urges
> City Using River Water From Wells,
> Engineer Says
> 'Might Be Thing' for Albuquerque,
> Expert Declares"
>
> Albuquerque has not seen fit to buy up water rights as the city expands, State Engineer John Erickson noted briefly in a speech here today on 'Water - New Mexico's Greatest Problem.' However, he told the Journal that buying surface rights 'might be the thing for Albuquerque to do.' . . . He said that he was not saying that anyone is to blame for the situation but that 'essentially the water the city is taking from wells is river water.' And this means that 'Albuquerque is getting water from the river without paying anybody for it.' . . . (*Albuquerque Journal*, June 5, 1954)

In a presentation at which the results of a consultant study showed that the "Albuquerque water supply is adequate," the prescient City Water Engineer, Conrad Gonzales, was also quoted by the Tribune as saying: "Eventually, the State may find it necessary to close the Middle Rio Grande Valley to further expansion of water usage. . . ." (*Albuquerque Tribune*, Thanksgiving Day, November 22, 1956). "Eventually" happened one week later.

In a dispassionate first page article the *Albuquerque Journal* of November 30, 1956, reported:

> An area roughly 280 miles in length and up to 25 or 30 miles wide in spots, extending from Elephant Butte Dam to the Colorado Line, Thursday was proclaimed 'the Rio Grande

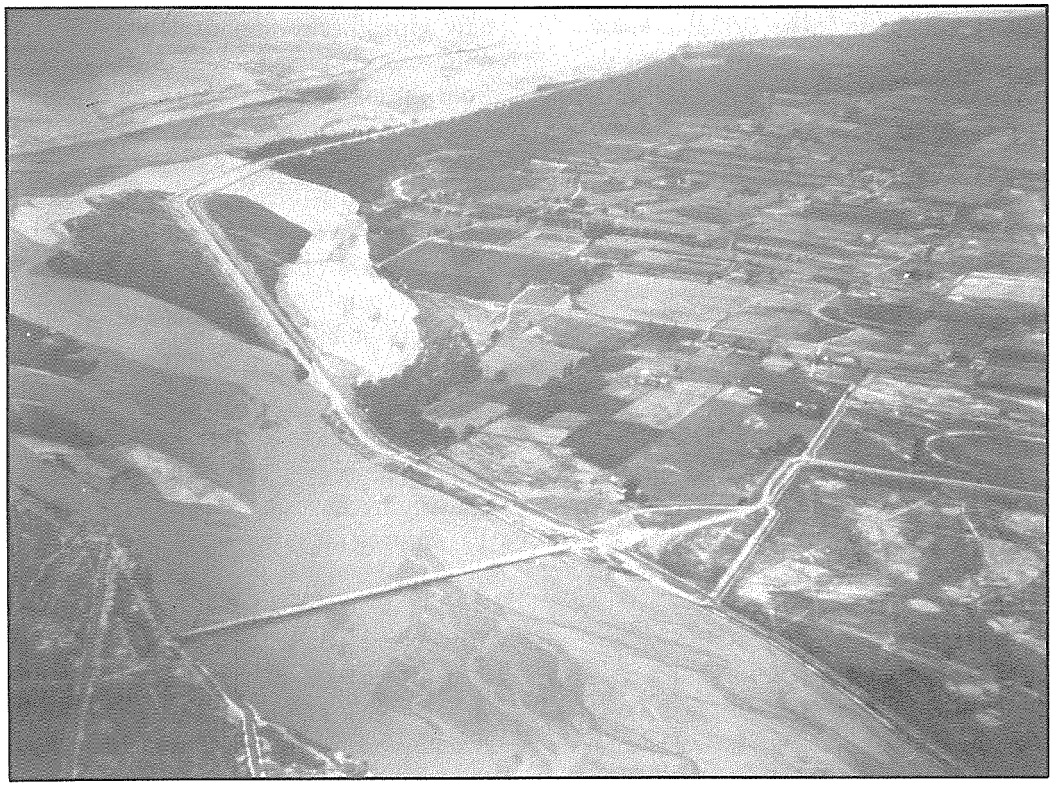

Figure 9. Central Avenue bridge, May 26, 1930. Photo courtesy Middle Rio Grande Conservancy District.

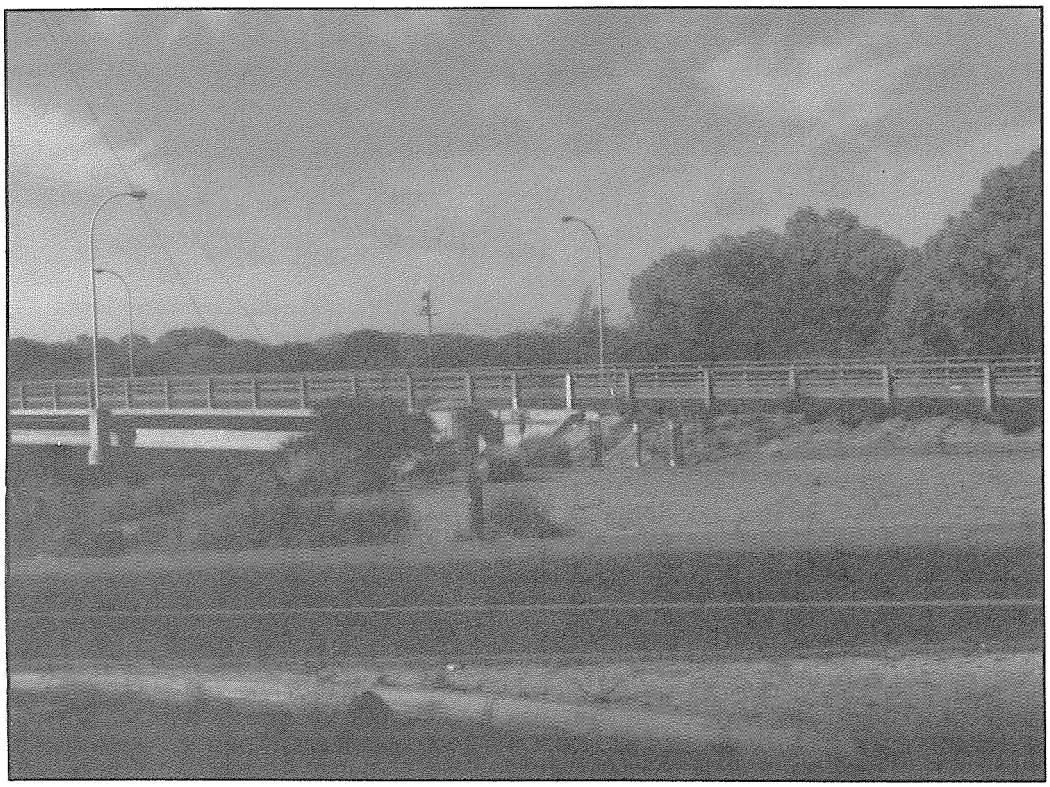

Figure 10. Central Avenue bridge, fall 1994. Photo by Gary Daves.

underground water basin.' The declaration by State Engineer S.E. Reynolds after extensive and highly secret planning is expected ultimately to increase the water supply prospect for Albuquerque's municipal and industrial uses, Reynolds said. . . Reynolds, in a statement to a special news conference said the establishment of the basin will:

- Implement the protection of existing valid water rights in the Rio Grande basin.
- Not restrict the exercise of existing groundwater rights.
- Permit the increase of beneficial use of water in the Rio Grande Valley over a number of decades, without impairing existing rights.
- Encourage industrial development in the valley by providing for the acquisition of firm water rights.
- Permit maximum utilization of the underground water reservoir.

. . . Asked whether he thought the declaration of the basin would be controversial, Reynolds said: "**It is difficult to assess what the public reaction may be. But when this is fully understood, we feel it probably will not be controversial.**" (emphasis added) Reynolds said it is imperative that such an action as that taken Thursday be planned "under wraps." Publicity given to the plan, he said, could have resulted in a veritable "land rush" by persons wanting to beat the deadline and drill wells before they otherwise would have to obtain required permission. . . . He said the state engineer's office for years 'has been cognizant of the complex water problems that beset the state's largest and most populous river valley. In particular officials have felt concern regarding the inadequacy of available water supplies to meet the potential water demands of growing municipalities and of expanding agricultural and industrial development.' The new basin's boundaries enclose lands on which wells of significantly large yields probably can be obtained - wells whose production would affect appreciably the flow of the Rio Grande within the next few decades . . ."

The basic control intended and implemented with declaration of the Basin was to require that new groundwater appropriations be offset by the retirement of surface water rights or use of water from the nascent San Juan-Chama project as Rio Grande flows were diminished by diversions under the appropriations. As it turned out, the timing and extent of the retirements were vastly overstated in the rhetoric over the order. Of particular note is that increased use of water for "a number of decades" was contemplated but that "eventually the usage should be stabilized at **approximately the present total rate.**" (emphasis added, *Albuquerque Journal*, December 1, 1956). This reflected the ultimate limits of Middle Valley use of its water to the legally-useable surface supply. Thus, in response to the City Commission Chairman's plaint (December 17, *Journal*) that the order would create a "desert" a "dust bowl" in the Valley, the State Engineer stated that he didn't think the Valley will be a desert "for many years to come in view of the San Juan-Chama diversion" (December 18, *Journal*).

The following collection of snippets from headlines and stories will give some more flavor of the reaction of the City and the Middle Valley:

"Mid-Rio Water Officials
Balk at New Order;"

"Recent action of the state engineer . . . drew a sharp blast from City Commission Chairman . . 'my inclination will be to ignore it and if necessary go to the courts.'"

"Gov Elect Edwin L. Mechem has no intention of having the newly-created Underground Water Dissolved when he takes office."

"A proposal with extremely heavy support went into the Legislature today which, if passed into law, would wipe out the . . . Rio Grande Underground Water Basin and put things back like they were. . . (The) Majority Leader . . . introduced legislation which bore 28 signatures—barely under half the membership of State House of Representatives."

"(City) Remains Firm in Opposition to New District."

"Whether Reynolds is right or whether his restrictive order is within or without the law, the . . . directive has stirred anew the water con-

troversy between this area and the Elephant Butte Irrigation District . . . However justified Mr. Reynolds may think his order, it could have been held in abeyance until the people . . . whose very existence depends on an adequate water supply had the privilege freely and openly to debate the pro and con . . ."

> "Farm Bureau Seeks to Halt Order on Water."
>
> "The 'water grab' of Texas and southern New Mexico has hurt the state enough as it is. The restrictions which apply to water usage in the northern part of the state should also apply to the southern portion."

and

> "City Psychiatrist Defies Edict on Water Wells."

The city sued.

City of Albuquerque V. Reynolds

In 1957 the City applied to the State Engineer for permits to drill four new wells some six or seven miles east of the River. The State Engineer proposed to grant the City the permits under certain conditions but the City refused to accede to the conditions and thus the permits were denied. The essential condition was that the City would have to acquire and retire surface water rights in an amount equal to the new appropriations' effects on surface flows on the River. The City then appealed to what turned out to be the friendly forum of the local district court and won.

Among the arguments in its claim for the additional appropriation, the City stated that:

> ". . . as the successor to the Pueblo de Alburquerque y San Francisco Xavier founded not later than 1706, it had the absolute right to the use of all waters, both ground and surface within its limits, for the use and benefit of its inhabitants."

Steve Reynolds had ignored this claim, but District Judge MacPherson didn't.

As an aside, I would note a couple of facts. As an anomalous element of New Mexico water law, in 1958 the town of Las Vegas was found by the New Mexico Supreme Court to have so called "Pueblo Rights" to appropriate water without limits for its inhabitants even as the town grew. The finding was based upon a grant from the Republic of Mexico, an earlier sovereign. It was perhaps a touch presumptuous for Albuquerque, created along and with the coming of the railroad, to claim succession to the "Pueblo de Alburquerque." "Old Town" was not annexed into the City (and not vice versa) until 1949. Did it follow as a matter of law that such swallowing extends the rights of the swallowed to the swallower?

Judge MacPherson apparently thought so and bought the City's argument of Pueblo Rights and reversed the State Engineer who promptly appealed to the State Supreme Court. As to the "Pueblo" claim, the Supreme Court agreed with the State Engineer that he had no authority to adjudicate the pueblo water rights claim, could properly ignore it, and further that it was improperly relied upon by the District Court. The Court stated, perhaps with tongue in cheek, that:

> "As to the argument of the City that no other legal avenue is open to it by which this claimed right can be adjudicated. . . . We will not in this opinion attempt to outline the way, but one will no doubt be found should the City continue its claim of prior and paramount right to the use of all the water of the Rio Grande Stream and Underground Basin to the extent necessary to supply its inhabitants."

I would guess the Court had in mind that the City take its case to King Ferdinand of Spain or his successor and if successful there convince the King to try to assert his jurisdiction over Steve Reynolds.

The real issues in the case as determined by the Supreme Court were derived from the applicable statute (now Section 72-12-3-E, NMSA 1978) to the effect that in consideration of an application to appropriate water in a declared basin:

> ". . . . the State Engineer shall if he finds that there are in such underground . . . reservoir . . . unappropriated waters, or that the proposed appropriation would not impair existing water rights from such source, grant the said application and issue a permit to the applicant to appropriate all or a part of the waters applied for, subject to the right of all prior appropriators from said source."

Figure 11. View looking north from Tingley Beach Drive. Note volcanoes in the background (March 23, 1931). Photo courtesy of Middle Rio Grande Conservancy District.

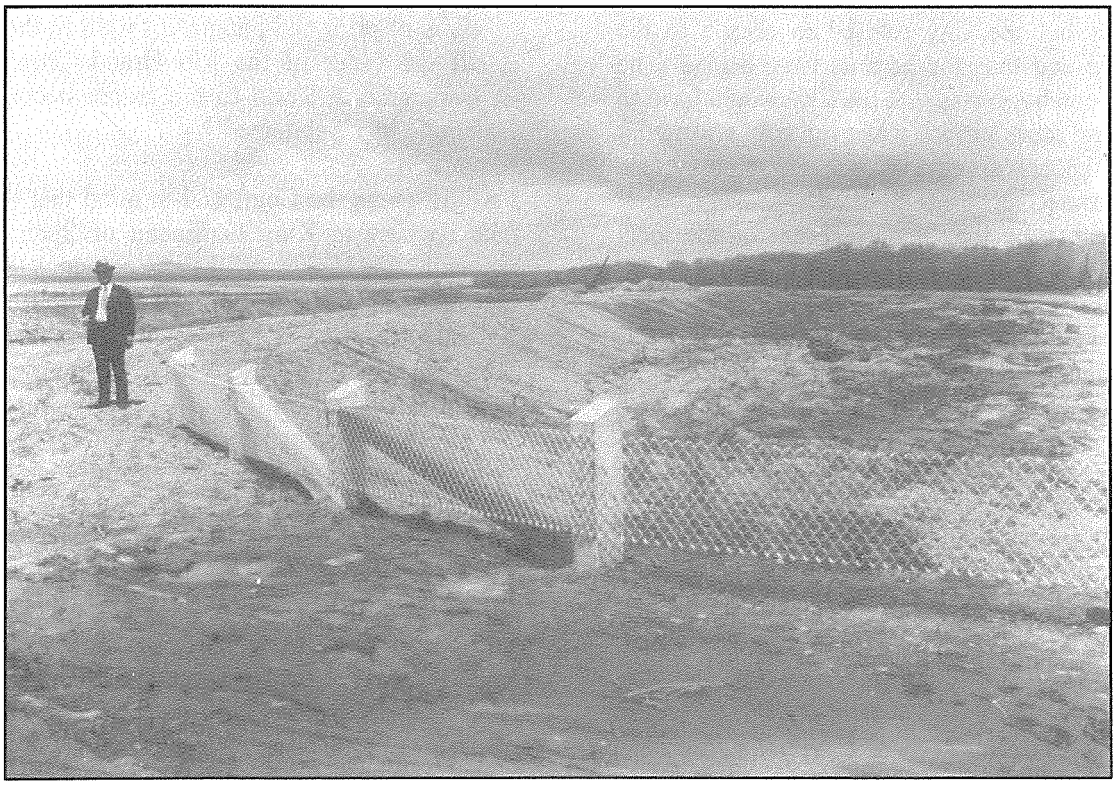

Figure 12. View showing completed "Tingley Scenic Riverside Drive." Note volcanoes in background (July 13, 1931). Photo courtesy Middle Rio Grande Conservancy District.

The Supreme Court noted that the State Engineer had found, apparently without argument to the contrary from the City, that (1) the surface waters of the Rio Grande were fully appropriated and (2) the groundwater, which the City's wells would tap, contributed substantially to that flow and thus constitute a source of the stream flow, and (3) the grant of the applications would impair existing surface rights. The City valiantly responded to all this, "So what?" Boiling the issue down, the City argued that, notwithstanding impairment to surface rights from City pumping, the State Engineer had no authority to commingle ground and surface water law. The Supreme Court agreed again with the State Engineer, holding "as the only known way to prevent impairment," the conditions the State Engineer imposed on the City of Albuquerque, and other similar groundwater appropriators, seeking to increase its consumption of groundwater: (1) that the amount of water pumped be measured, (2) that the amount of return flow be measured, and (3) that existing rights to the consumptive use of surface water be retired to the extent necessary to offset the effects of the appropriation on the Rio Grande. The Supreme Court ruled in December 14, 1962; rehearing was denied March 15, 1963. Reynolds made law and the law made sense.

Back at the original announcement of the order declaring the Basin, Reynolds suggested that there would be no "controversy" after it was "fully understood." The City fully understood. The controversy was over. The City could no longer freely drill more wells and pump more water. In 1963 the City formally signed up for water from the San Juan-Chama project.

THE SAN JUAN-CHAMA PROJECT

We start with excerpts from a 1957 *Albuquerque Tribune* Steve Reynolds Column:

> "The authorization of the Upper Colorado River Storage Project by Congress and its approval by the President was easily the event of 1956 most important to the development of New Mexico's water resources. The project sets the stage for New Mexico's full utilization of the 838,000 acre-feet of water (since revised down to about 730,000 a-f) for consumptive use which was allowed us by the Upper Colorado River Compact. We currently are using only about 100,000 acre-feet of our share of the water of the Upper Colorado River system. . . . The legislation also . . . gave priority to the study of . . . the San Juan Chama Diversion Project. . . . The San Juan-Chama Diversion Project will bring from the San Juan Basin water urgently needed in the Rio Grande Basin for municipal and industrial purposes and to supplement irrigation supplies."

The San Juan-Chama diversion was contemplated in Article IX of the 1938 Rio Grande Compact:

> "Colorado agrees with New Mexico that in the event the United States or the State of New Mexico decides to construct the necessary works for diverting the waters of the San Juan River, or any of its tributaries, into the Rio Grande, Colorado hereby consents to the construction of said works and the diversion of waters from the San Juan River, or the tributaries thereof, into the Rio Grande in New Mexico, provided the present and prospective uses of water in Colorado by other diversions from the San Juan River, or its tributaries, are protected."

And in Article X:

> "In the event water from another drainage basin shall be imported into the Rio Grande Basin by the United States or Colorado or New Mexico, or any of them jointly, the State having the right to the use of such water shall be given proper credit therefore in the application of the schedules."

The San Juan-Chama project came to be almost entirely as a result of the efforts of Senator Clinton Anderson beginning in the 1940s and culminating in preliminary Congressional action in the mid-1950s and final project authorization in 1962. Some City fathers of the 1950s felt that Senator Anderson was helped by a conspiracy with Steve Reynolds in his locking up the Rio Grande basin and thus forcing the City to participate by blackmail. Those same City fathers are now considered wise for their foresight in buying into the San Juan-Chama project. Senator Anderson's support for the transfer of New Mexico Colorado River water out of the San Juan where its natural flow was through

northwest New Mexico was not without controversy. In July 1950 the Senator in support of the project noted "the special (water) requirements of the (Albuquerque) area's growing defense establishments and expressed willingness to settle for a 'middle option' of 279,000 acre-feet (for Albuquerque)."

In an editorial, the *Farmington Times* (September 7, 1950) reacted by charging the Senator's efforts to divert water from the San Juan to Albuquerque were motivated by the need to irrigate his own "529 arid acres" along the Rio Grande. (Baker, *Conservation Politics-The Senate Career of Clinton P. Anderson*, 1985, p. 57)

The City generally committed in concept to participation in the project through testimony in Washington in the mid-1950s. With the recent memory of *City v. Reynolds* in mind, that tentative commitment was quite firm at the time the project was authorized in 1962 along with approval of Navajo Dam and the Navajo Irrigation Project. And in 1963 the City contracted with the United States, through the Bureau of Reclamation, for an annual allotment of 48,200 acre-feet (as amended in 1965) out of a total project of 96,200 acre-feet of San Juan-Chama water, or about 6.6 percent of New Mexico's share of upper Colorado River water.

Opposition From the North

The following history is a product of the days before the project's final approval:

> ". . . Anderson inserted in the hearing record a telegram that the San Juan County New Mexico Farm and Livestock Bureau had sent to Wyoming Senator J.J. Hickey (D). Residents of the northwestern New Mexico region claimed they had been blocked in their efforts to submit testimony in opposition to the San Juan diversion. Anderson responded that his committee had received neither the request nor the written testimony. He added, 'I am shocked at the telegram. I cannot believe it.' Although Anderson professed shock over the telegram, he could not have been particularly surprised. Two months earlier, his office had received a resolution adopted by "the 250 farm families" that composed the bureau. The bureau members saw the San Juan diversion measure as part of a "thinly disguised plot" by Albuquerque interests eventually to take large amounts of water from the region, thus crippling the economy of northwestern New Mexico. They urged Congress to pass the Navajo project independently of the diversion project, allowing the latter to 'stand on its own merits.' . . . Anderson wrote to Lincoln O'Brien, publisher of San Juan County's *Farmington Daily Times*, to inquire whether the area's opposition was serious and broadly based. O'Brien reported that there was 'no appreciable body of intelligent opinion' opposed to the diversion project as part of the favored Navajo project. O'Brien added there were 'a few cranks, but they are of no consequence.' . . . I.J. Coury, chairman of the New Mexico Interstate Stream Commission and the state's director of the National Reclamation Association . . . reported on a March 1 area meeting that he characterized as heatedly 'anti-Anderson' and filled with charges that the 'Middle Rio boys' were out 'to steal our water.'" (Baker, p. 242)

Downstream Opposition

The Elephant Butte Irrigation District had joined the State of Texas in the 1952 suit against the Middle Rio Grande Conservancy District and the State of New Mexico, alleging failure to make deliveries of water required under the Rio Grande Compact. Both it and the El Paso Irrigation District feared that additional upstream reservoirs, to be constructed for the San Juan-Chama project, would be used to retain water allocated to the districts under the Compact. The debates on authorizing the San Juan-Chama project occurred against the backdrop of the 1950s drought and the inability of both New Mexico and Colorado to make their Compact delivery requirements. Both were in Compact debit status in excess of allowed limits. The two districts indicated grudging acquiescence of the project with suggested strenuous conditions such as that all works of the project including diversion structures used by project contractors be operated by the Bureau of Reclamation, the State and Middle Valley were bluntly not trusted. Another proposal was that unless New Mexico could reduce its debit to within the Compact limits, the imported water be first applied to debit reduction.

The Project

The 1962 authorization of the San Juan-Chama project was for a scaled-down "initial stage" considered at that time to result in a total annual yield of 110,000 a-f/yr (1,350,000 a-f diversion limit in any 10-year period and maximum one-year diversion of 270,000 a-f). Currently the annual yield is considered to be 96,200 a-f.

Physically, the project consists of the Blanco Diversion Dam on the Rio Blanco and Blanco Tunnel to Little Oso Creek, the Little Oso Diversion Dam and Oso Tunnel to Oso Creek (the creeks are tributary to the San Juan River), the Oso Diversion Dam and Azotea Tunnel through the Continental Divide and crossing from the State of Colorado to an outlet to Willow Creek in New Mexico and Heron Reservoir and Dam where the imported water is stored before delivery to contractors. The Dam and outlets are just a short distance upstream from the Rio Chama above El Vado. San Juan-Chama water allotments in a-f are:

Cochiti Reservoir Recreational Pool	5,000
City of Albuquerque	48,200
Middle Rio Grande Conservancy District	20,900
Los Lunas	400
Bernalillo	400
Belen	500
Santa Fe County	5,605
Espanola	1,000
Department of Energy (Los Alamos)	1,200
Taos	400
Twining	15
Pojoaque Valley Irrigation District	1,030
Jicarilla Apache Tribe	6,500
Red River	60
Taos Area (reserved)	2,990
San Juan Pueblo (reserved)	2,000

What did we "Mid Rio boys" get from the water we "stole" from the folks in the northwest? With a touch of embarrassed envy at Phoenix, a more successful bandit in the water wars, I wish we had come closer to Senator Anderson's self-characterized modest "mid-option of 279,000 a-f per year for Albuquerque" or even for the whole project. Nevertheless, what we got provides people with almost another 100,000 a-f of depletion rights in the Rio Grande basin, with over 75,000 a-f, counting the Cochiti pool, useable in the Middle Valley. The present "wet water" impacts of the San Juan-Chama water will be discussed below. As for the City, the right to this water has postponed the City Commission Chairman's feared immediate creation of a Valley "dustbowl," forced by Steve Reynolds, by retirement of irrigation rights some 70 years into the future (2028) before, under State Engineer calculations, the City will have to retire a single acre of irrigation rights. Since the first deliveries of the imported water in 1972, the combination of the use of generous portions of City San Juan-Chama water and its own, the MRGCD has not run out of water for its irrigators, in the past a chronic problem. This is despite the record dry year of 1977 and several other dry years. And despite fears downstream of Elephant Butte, New Mexico has performed much better under the Compact during this time.

San Juan-Chama "Wet Water" Impacts

The "wet water" impacts of the San Juan-Chama project have been quite significant. Before its completion, the mainstem of the Rio Grande in New Mexico above Elephant Butte and the Chama consisted of the native flows originating in New Mexico and the amount required of Colorado by the Rio Grande Compact to be delivered to New Mexico. Abiquiu and Jemez Canyon existed as flood control reservoirs (Cochiti was authorized but not built) with no ability, due to Rio Grande Compact constraints, for the creation of even minimal sediment retention permanent pools. El Vado routinely would trap spring runoff flows for use in forthcoming irrigation seasons, frequently only for Indian land irrigation given New Mexico's chronic Compact debit status, in the 30,000 to 175,000 a-f range, depending upon winter snow pack and spring precipitation, to be drawn down to the dead pool of about 1,000 a-f as the water was used by irrigators in the growing season with the remainder sent downstream to Elephant Butte in the late fall under Compact delivery requirements. This prevented the creation of a lake fishery in the reservoir.

With the advent of San Juan-Chama water, the situation is dramatically different. From no reservoirs with permanent pools, there are now five with significant pools of varying degrees of

permanency that will most likely continue for a period of at least 25 to 30 years.

Deliveries to contractors can occur throughout the year, but presently take place primarily in the fall, winter and early spring. The bulk of water diverted into Heron occurs during the spring runoff, during which time it is annually filled as flows allow.

With the MRGCD's own San Juan-Chama water, along with some of other contractors, El Vado has had some San Juan-Chama water in it from the first delivery in 1972. Its lowest level since then has been 18,000 a-f in the winter of 1977 and 22,000 a-f the following year. Keeping in mind that the 1980s was a recently unprecedented wet cycle, in only one year, 1979, has El Vado otherwise gone below 75,000 a-f since 1974. This post San Juan-Chama experience is in dramatic contrast to the history of the 1950s and 1960s when the reservoir was drawn down to its dead pool almost every year.

Both Abiquiu and Jemez have significant pools, about 170,000 a-f and 30,000 a-f respectively, of imported water that could not have existed before the San Juan-Chama project. In the middle 1960s, Congress authorized the creation of a 50,000 a-f permanent recreation pool in Cochiti Reservoir, to be filled and maintained with San Juan-Chama water. The estimated 5,000 a-f needed annually to maintain the pool was taken from the amount of 53,200 a-f originally contracted for by the City with acquiescence of the City.

While Elephant Butte usually has had significant quantities of water, it has in fact been drawn down to unusable levels several times in its history, as noted above. Because of this history, Congress authorized the Bureau of Reclamation to create a 50,000 a-f recreational pool in Elephant Butte for ten years, with a subsequent agreement between State Parks and Albuquerque to maintain it beginning in 1985 through 2010 with City San Juan-Chama water. Ironically, Elephant Butte spilled for only the second time in its history in 1985 and then successively through 1988, with the result that the recreational pool was spilled. After being created a second time, the pool again spilled in 1994.

Thus, from a situation where none of these year-round lakes existed, the San Juan-Chama project has resulted in three major pools—Heron, El Vado, and Abiquiu—on or at the Chama, pools at Cochiti and Jemez Canyon in the Middle Rio Grande Valley, and a pool in Elephant Butte. At the very least, with the exception of Jemez, this has resulted in a very dramatic increase in the flat water recreation and fishery resources in the Rio Grande Basin.

The addition of the San Juan-Chama water to the Chama-Rio Grande stream also has resulted in benefits with the potential for more. Management of water deliveries to offset depletions and for downstream storage creates the opportunity for enhanced stream-related fisheries and recreational values. The City and MRGCD are in the fourth year of a ten-year agreement whereby the MRGCD maintains a minimum 250 cfs flow in the Albuquerque reach during the irrigation season, which in the pre-San Juan-Chama days was frequently zero late in the irrigation season, in exchange for 20,000 a-f of City San Juan-Chama water annually.

As previous discussion indicates, a large impetus for the San Juan-Chama water was for use to offset River depletion caused by groundwater pumping. In the following discussion, we learn that was determined a feasible and necessary use, particularly by the City of Albuquerque, a view that has been the operating and master-planning assumption until very recently. A new view throws this assumption very much into doubt.

GROUNDWATER STUDIES

The focus of most of the first half of the twentieth century in the Middle Valley was the River—how to divide its flows and how to deal with its shortages and floods. The perceptions and concerns gradually shifted as groundwater use increased with the rapid growth of Albuquerque.

An extensive groundwater study of the Middle Valley was part of the "Joint Investigations" from which the Rio Grande Compact was negotiated. This work very clearly shows an understanding of the fact that groundwater was in hydrologic connection to the River, otherwise the work would have been irrelevant. However, in neither the "Investigations" nor the negotiations for the Compact were scenarios of future groundwater use projected in terms of Compact implications and

limitations. Knowledge of these was implicit; they were addressed without direct mention by the obligations of water deliveries of the two upper basin states. In 1938, the Rio Grande was fully appropriated; there was no water left to accommodate a Los Angeles on the mid-Rio Grande. To its deep dismay, Albuquerque learned, with the post-Thanksgiving 1956 declaration of the Rio Grande Basin, that the groundwater beneath the City was not its business alone to be exploited with impunity.

Following City water shortages to its customers in the late 1940s and into the 1950s, actually due to insufficient wells, reservoirs and mains whose capacities were outstripped by rapid growth, the first questions about the adequacy of the groundwater supply were raised. This concern was heightened with the inception of the refrain that City pumping was taking River water from downstream farmers. These two issues remain the core issues of the Albuquerque groundwater basin in 1995.

This led to the first of the City-commissioned USGS groundwater reports. In a distant echo of the refrain today, the parameters and goals of this study were described by Clyde Conover, USGS District Supervisor, in an October 11, 1956, talk to the Albuquerque Rotary Club:

> "The present study of the Albuquerque area will require 4 or 5 years and will show the interrelation of the ground and surface waters, the effects of pumping upon the river flow, the expected lowering of water level with a given pumping and well spacing, the change in chemical quality of the water with time, the amount of ground water in instream storage, and other information necessary to an evaluation of the supply. The information obtained will be useful also in instream determining whether the San Juan River water can be utilized by infiltration directly from the river to the water-bearing formation or whether surface diversion structures must be built."

The study came out in two parts: State Engineer Technical Report 21 in 1961 by Bjorkland and Maxwell, *Availability of Ground Water in the Albuquerque Area, Bernalillo and Sandoval Counties, New Mexico*, and Technical Report 33 in 1967 by Reeder, Bjorkland and Dinwiddie, *Quantitative Analysis of Water Resources in the Albuquerque Area, New Mexico 1960-2000*. These reports satisfied the needs of the time and served adequately as "reality" from the 1960s through the 1980s with only the occasional and quickly forgotten naysayer.

With a bit of equivocation the reports concluded there were 5,000-plus feet of good water-bearing rocks underneath Albuquerque that were efficiently connected to the River. There was plenty of water that could be easily pumped and it was replaced by leakage from the River. The connection to the River meant it was replenished, but it also meant we had to worry about the River to which our San Juan-Chama water was accordingly dedicated. The San Juan-Chama water could be used by the citizen who paid for it simply by opening the gate at Heron and letting it run down the River, an elegantly cheap alternative to diversion, treatment and delivery to the customer.

In fact, the equivocal conclusions of these reports gradually became a widely, strongly and sincerely held perception of a cornucopia of water illustrated by press reportage in the following years. The December 12, 1970, *Albuquerque Tribune* headlines a letter from the editor, "Does Albuquerque sit atop a great underground sea?" and then went on to inform its readers that indeed it did, noting among the multiple iterations of the "unbelievable quantity" that "the most surprising thing is that so little is known about the vast 'sea' of water. The one way to find out, of course, is to drill a number of holes testing . . . down to about 5000 feet." And the July 19, 1972, *Tribune* reported on a Chamber of Commerce Water Resources Study Task Force progress report, by former City Water Engineer Conrad Gonzales, that concluded, "Albuquerque sits on a vast 'underground lake' of water-bearing sands, gravel and clay. This 'lake' is almost 30 miles long, fifteen miles wide and from 6,000 to 10,000 feet deep." But further investigation and study was urged "where data and information are unavailable, non-existent or incomplete. One way to get that information would be to drill deep exploration wells."

The quintessential and totally authoritative zenith of the "sea" or "lake" under Albuquerque was found in a Steve Reynolds' column in the *Tri-*

bune on September 11, 1980, headlined "Albq's water supply probably best in Southwest." The column gave a figure of 2.3 billion a-f of recoverable fresh groundwater in the Albuquerque basin that would serve "the entire state for about 575 years at the current rate of withdrawal." Its pictorial equivalent was an ad commissioned by Albuquerque Mayor Kinney in the October 1984 *Albuquerque Living* magazine. Under the caption, "Name a Great American City on a Large Body of Water -- Albuquerque," was a picture of Albuquerque, the Sandia Mountains in the background, floating on a lake, "larger than Lake Superior."

Even as the word of Albuquerque's bountiful supplies became widely known and accepted, reality began to compound and qualify the perception. The naysayers and those who said, "But we live in a desert!" would begin to be listened to. Unexpected drawdowns in City of Albuquerque wells whose pumps had to be lowered and then lowered again, the failure of the City's Lomas well field long before the millions paid for it was recovered led to consternation, thought and finally action to relearn what we thought we knew. In 1984, City water department staff recommended and began to work toward an updated water resource management study and plan, the core of which involved a much more detailed and comprehensive investigation and modeling of the Albuquerque basin. With many a slip between cup and lip, projected five-year completion of this in 1984 remains a realistic goal for five years from now.

But work started getting done. A groundwater geologist, Kelly Summers, was hired and under his direction, deep hole drilling, whose lack led to the mild equivocation of the results of the 1960s studies and the 1970s optimism, was carried out. These taught us, in the vernacular and understanding of this writer, that much of "Lake Superior" unfortunately was silting in even as it was being created. A February 21, 1989, *Albuquerque Journal* account of this is instructive in its reporting results of the deep hole drilling:

> "Pumping water from the aquifer beneath Albuquerque could be expensive if the city has to sink deep wells in the future to meet demands . . . If the water in the aquifer's shallow depths is exhausted, 'then the cost to recover water from greater depths is going to be . . . three, four, five times greater to recover than the shallow' said (City) geohydrologist, W.K. Summers. . . . His conclusions are based on preliminary analyses of rock and soil samples taken late last year in test holes . . . The samples indicate there is substantial clay and silt at the 3,500-foot depth of the drill holes—more than geologists thought existed at that level. . . . 'The picture people have, I think, is that we have the same kind of rocks everywhere as far down as we want to go, and that's not true,' Summers said. 'It's not a pile of sand or gravel that can be tapped to any depth.' The question is . . . to what depths the city will have to go to pump water and whether the recovery will be possible economically . . . What it all means, Summers added, is that 'we're going to have to be smarter about how we get our water, think more about well placement and ultimately institute some conservation measures.'"

The Albuquerque Tribune provided its own provocative slant to the information. "Water Supply Report Too Optimistic, Researcher Admits" (and we don't even have Mike Wallace). "A federal researcher who wrote an influential 1975 report on Albuquerque's water supply has joined other researchers who say his work may have been too optimistic." and "N.M.'s Lake Superior? Ad Lied About Water Supply" (February 25, 1989). And with great investigative perspicacity, reported that ". . . Albuquerque's aquifer is at least four times smaller than Lake Superior, if Environmental Protection Agency statistics are correct. Lake Superior contains 9.7 billion acre-feet of water according to EPA. In 1975, the USGS estimated Albuquerque's aquifer at about 2.3 billion acre-feet." In riposte to the *Tribune*, courtesy of the March 15, 1989 *Journal*, Albuquerque geologist Bob Grant both confirmed and clarified the lake question, that Mayor Kinney's ad had been one or two Great Lakes too high; it was a Lake Michigan instead.

Mr. Grant's column also made the very good point that ought to be the perspective in thinking of our water history. In defending the researcher the *Tribune* had "admitting" to being over-optimistic, he wrote that the paper had "sensationalized what is so far a non-event" and "in the process (questioned) the professional integrity of some outstanding

groundwater investigators as well as the motives of those who used their data. . . . West (the researcher) did an absolutely outstanding job predicting . . . groundwater availabilities in the Albuquerque basin with the extremely limited data that existed when he was performing his studies . . . To second guess his results on the basis of considerably more extensive and sophisticated data obtained since then is at best inappropriate." I would echo that our water history is not constructively viewed as a series of mistakes, peopled with scoundrels and schemers, as the hubris of present "truth" loves to do. Rather, we should try to understand it to understand where we are, to avoid the wrong turns the past might have made, and to work for a future that preserves the value of the past as its present is served.

That aside, the City continued its pursuit of the implications of the results of the deep test holes and other "extensive and sophisticated data" obtained since the investigations of the 1960s. It commissioned an updated geologic analysis by the New Mexico Bureau of Mines and Mineral Resources of the geology of the Albuquerque basin using this data. (Open File Report No. 387, *Hydrogeologic Framework of the Northern Albuquerque Basin*, September 1992) This analysis was the basis for a subsequent effort by the USGS to characterize Albuquerque basin groundwater. An initial report went far toward moderating down the rosy picture of the previous 20 years (*Geohydrologic Framework and Hydrologic Conditions in the Albuquerque Basin, Central New Mexico*, USGS Water Resources Investigation Report 93-4149, August 1993). Fundamental conclusions are that the zone of the highly productive aquifer is much less extensive than had been assumed and that the hydrologic connection of the Rio Grande to the aquifer is much less efficient than had been assumed. Just as the Scarecrow's diploma from the Wizard formalized/created his intelligence, the USGS report formalized/created a new "reality," much more modest in water, and much less efficient in delivery.

To recapitulate, the 1950s initiated USGS study established an equivocally huge aquifer—that evolved into an underground Lake Superior before being bounced down to Lake Michigan—with a good connection to a leaking Rio Grande, such that Albuquerque could sustain growth indefinitely and use its San Juan-Chama water through the leaking River. That got us into the 1980s with peace of mind. Now just as we would begin to use our San Juan-Chama water under those assumptions, we've provisionally learned that the aquifer might not sustain the stresses it is receiving and that use of San Juan-Chama water, more important than ever, will likely require the expense and impact of using it directly. Bear in mind the carefully chosen words of the State Engineer when he declared the Rio Grande Underground Water Basin: He happily pointed out that increased use of water was possible for "a number of decades," through exploitation of groundwater in storage, but that "eventually the usage should be stabilized at approximately the (1956) total rate," a rate necessarily related to the Middle Valley's piece of the Rio Grande pie plus the added San Juan-Chama water. The recent conclusions tell us that this "eventually" is on the horizon.

With this I leave the story, knowing that in spite of the prolixity, whole elements, many of recent concern and import, haven't been covered—water quality issues, ecological/bosque concerns, endangered species, ever-continuing political and water management and allocation issues. I'm happy nevertheless to quit at this point and assume the reader at this point is happy that I have.

CONCLUSION

This has been an attempt to present a picture that I hope is both interesting to the reader and of some help as context for understanding the present water picture in the Middle Valley and Albuquerque basin. One thing that strikes me as I've studied the history is, as noted by Bob Grant in his above-cited column, the "deja vu all over again" and again character of the Middle Valley water picture and debate. The once and for all solutions of the past resolved issues and fixed problems for a time but not for all time. That pattern can be expected for the next range of solutions that must emerge from the issues of today. A critical fact that needs to be stressed is the very modest water supply that history, politics and nature have conspired to provide the Middle Valley. There is no great elasticity of tens of thousands of acres of irrigated land

that can be retired to serve unlimited growth and still retain the esthetic of the green and beautiful Valley as it now exists. Restraint is needed in all quarters—for golf courses with expansive fairways of blue grass, the goal of highest and best use of all our undeveloped land without regard to our limited water, and even in our exuberance for restored wetlands and more bosque and a wetter River for a fish who has survived a much drier environment. The limits to the resource, ground and surface, need to be reunderstood and deliberate action taken to live prosperously, equitably, esthetically and environmentally within the limits. The baton we've inherited is not too bad; the one we hand off to our children should allow them something to pass on to theirs.

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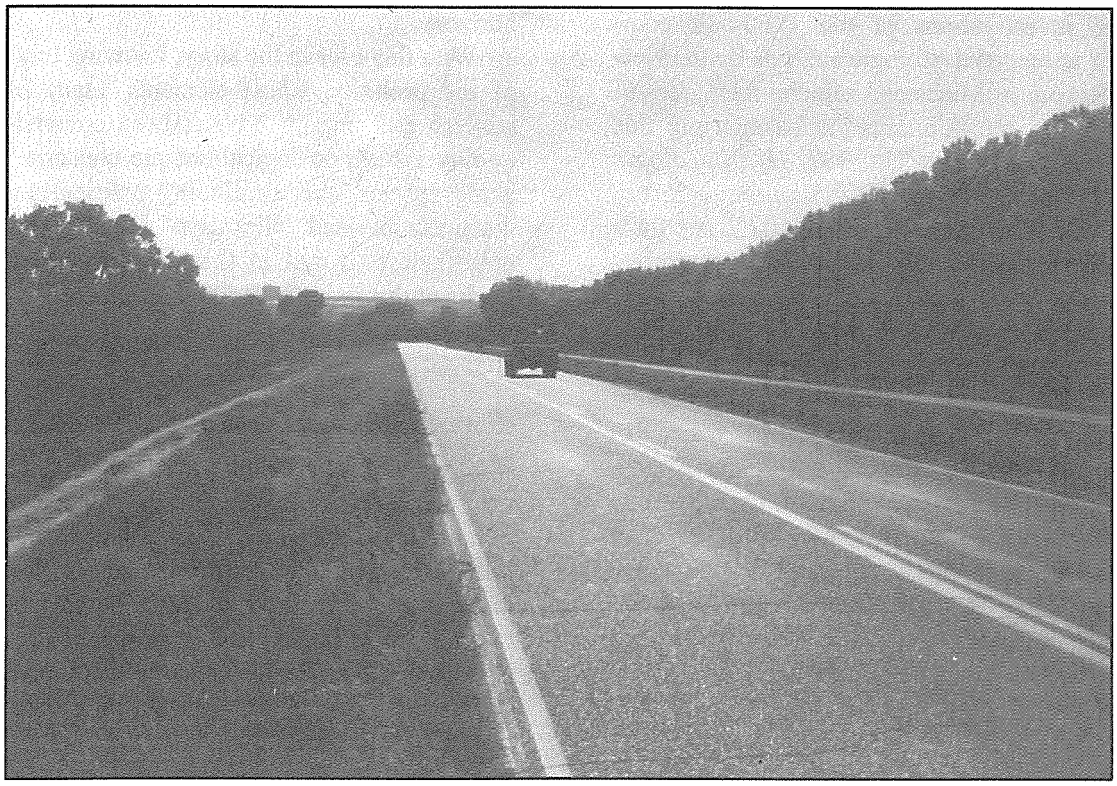

Figure 13. Tingley Drive looking south (fall 1994).

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