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## The San Juan-Chama Project

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### The San Juan-Chama Project

A participating project in the Colorado River Storage Project (CRSP), the San Juan-Chama Project diverts water from the upper tributaries of the San Juan River, through the Continental Divide, and into the Rio Grande Basin primarily for use by the city of Albuquerque, New Mexico. Aside from providing the supplemental water supply to one of the state's key communities, the Bureau of Reclamation has created recreational, fish, and wildlife benefits at the Heron and Nambe Falls Reservoir. The San Juan-Chama Project also allows recreational use of the Army Corps of Engineers' Cochiti Reservoir.

#### Project Location

The collection and diversion sections of the San Juan-Chama Project are located in Archuleta County in southern central Colorado and Rio Arriba County in northern central New Mexico. The original tributary irrigation units planned to serve Rio Arriba, Taos, and Santa Fe counties. The Sangre de Cristo Mountains lie the project's south. The project headquarters is in Albuquerque.

The semi-arid landscape varies from high forested mountain ranges to low and flat desert valleys. The flow of the San Juan River, the water source for the project, originates on the west slope the Continental Divide. The Rio Grande Basin falls within a belt of volcanic activity and immense geologic settlements. A series of mountain ranges form the watershed, while the Rio Grande River flows through deep canyons and alluvial valleys.<sup>(1)</sup>

#### Pre-historic Setting

The Navajo word "Anasazi" means "ancient ones." Non-Indians have used the word to describe the ancestors of the current Pueblo peoples of the Four Corners region. For about 2000 years, several groups of Indians occupied the Four Corners area in small pueblos and cliff dwellings prior to European contact. The Anasazi came into the region around 700 B.C. Their earliest housing took

the form of covered pits. Between A.D. 1000 through 1300, they were constructing sophisticated pueblo and cliff dwellings throughout the arid canyon lands of the region. Around 1300, the Anasazi abandoned their dwellings and moved away. The exact reasons are still unknown, although archaeologists speculate that prolonged drought played a major role. The Anasazi left thousands of ruins across the Four Corners region, many of which archaeologists have excavated and partially restored or preserved.

Several Indian pueblos cluster in the area of Northern New Mexico. Some of the more well known are the Taos and Laguna Pueblos. Six Northern Tewa-speaking pueblos, Santa Clara, San Juan, San Ildefonso, Nambe, Pojoaque, and Tesuque, are located on the west bank of the Rio Grande between Santa Fe and Taos in northern New Mexico. The Santa Clara Pueblo recalls that the Tewa emerged out of a lake in southern Colorado, from which they migrated south. After stopping at Ojo Caliente, the ancestors passed through the Rio Grande Valley to the village of Pecos, building towns along the way. The Tewa-speaking Pueblos thus lay claim to numerous ancestral village sites on both sides of the Rio Grande and the Rio Chama. Most of these sites are west of the Rio Grande, and they reflect a general Tewa concern and familiarity with the country to the north and west of them.

Many of these indigenous groups practiced some form of water control at least 500 years before the arrival of the Spanish and the new technologies they brought. At the Anasazi's well known Mesa Verde, check dams and a four mile irrigation ditch guided the community's water supply. Check dams and diversion dams with canals and headgates supported almost 10,000 people in Chaco Canyon in Northwest New Mexico. The Pueblo communities, particularly those in the east with a more reliable water supply, constructed even more sophisticated irrigation systems with terraces and reservoirs all along upper Rio Grande Valley beginning around 1400. They grew maize, squash, beans, melon, cotton, and chile. The Spanish not only introduced new crops, but new notions of ownership and of a human being's relationship to the land and its resources.

Today's Pueblo people believe they are cultural descendants of the Anasazi, with marked Mogollon characteristics. The sites of the prehistoric pueblos cover a vast area extending over much of New Mexico, Arizona, southern Colorado, and southern Utah. Mogollon and Anasazi farmers developed large communities that reached their cultural peak in the thirteenth century. Many archaeologists contend that drought and climatic changes probably forced the Pueblo population to relocate into the areas occupied when the Spanish first entered the American Southwest in 1540.(2)

### **Historic Setting**

Since Native American groups largely dominated Northern New Mexico, non-Indians did not settle the area along the upper San Juan River until the turn of the century, though even then the non-Indian population remained rural and sparse. By the middle of the twentieth century, the Navajo, Southern Ute, and Jicarilla Apache reservations continued to occupy much of the San Juan Basin. Individual Navajos also held and continue to hold land allotments in a large part of the off-reservation area.

The Rio Grande Valley, however, is the oldest continuously occupied area in the United States and the site of the first Spanish settlement. Ever since, Mexicans, Anglos, and Native Americans settled communities thus giving the region its distinctive tri-cultural character. Coronado, Spain's first explorer to the area, arrived in 1540 in search of the "Seven Cities of Cibola." Spain began to colonize and establish towns, *presidios*, and missions in 1598 and by the eighteenth century, Spanish settlements dotted today's American Southwest, then known as northern New Spain. Native American labor helped build the water systems for these new communities. Settlers later founded Albuquerque in 1706, and it incorporated as a city in 1891.(3)

Mexican independence in 1821 opened trade routes with the United States and by 1840, many American merchants moved into the Rio Grande Basin. Settlers moved east to the upper Canadian River Basin in 1835. By 1870, New Mexico claimed many settlements, but the region remained very sparse in population and largely agricultural. (4)

After the Mexican-American war, the cession of the Rio Grande Valley area in the Treaty of Guadalupe Hidalgo of 1848 opened the area for American settlers. Many settlers moved into locations with mining opportunity like Farmington, New Mexico, in the San Juan Basin, and Durango, Colorado, fifty miles northwest. Discoveries of natural resources like oil, petroleum, and uranium further contributed to New Mexico's population growth. The Rio Grande Valley encompassed one-fourth of New Mexico's geographic area and one-half of its population, much of which clustered around its primary communities like Santa Fe, Albuquerque, Las Cruces, Los Alamos, Taos, Espanola, Bernalillo, Belen, Socorro, and Truth or Consequences. The valley did not see its largest growth, however, until after the Great Depression in the 1930s.(5)

Jay Turley, a surveyor for the local communities of Aztec and Blanco, conducted investigations for irrigation south of the San Juan River as early as 1901.(6) Though he concluded that irrigation could produce nearly 1,300,000 acres of agricultural land in the San Juan and Chaco valleys, Turley could not convince private capital or the Federal government to fund as project. In 1902, Congress passed the National Reclamation Act which offered Federal funding for irrigation projects throughout the West. The law required compliance with state water laws which were primarily based on the doctrine of prior appropriation.(7) However, this idea of prior appropriation often clashed with the water rights the government promised to Indians in Federal treaties. For this reason, the promoters of the San Juan-Chama Project for urban New Mexico had to negotiate its water supply with New Mexico's Native Americans.

In 1908, the Federal court decision of *Winters v United States* upheld Indian water rights reasoning that "the creation of a Federal reservation carries implicit rights of water to serve that reservation." Prior appropriation, the policy by which most states determined water rights, fell at the date Congress established the reservation. Congress established the Navajo Reservation in 1868, a date which preceded most permanent non-Indian settlement in northern New Mexico. Lastly, the decision indicated that Indians, unlike other water users, do not automatically waive their water right if they fail to use it.(8) Essentially, the "Winters Doctrine" held that states could not enforce state water rights laws against the rights of Indian reservations. This decision later proved of great importance to approval of the San Juan-Chama Project. It was approved in the same bill as the Navajo Indian Irrigation Project (NIIP) and Congress included both as participating projects of the Colorado River Storage Project (CRSP). The Navajos could claim a large amount of water from the Colorado River, and thus the San Juan tributary, based on both Winters rights as well as the doctrine of prior appropriation.(9)

New studies for irrigating northern New Mexico began immediately after WWI. During the 1920s, the Office of Indian affairs (OIA) reviewed Turley's 1901 proposal, but after conducting a feasibility study, the agency decided practical economic conditions still did not exist to support such a project.(10) Some time later, a 1933-1934 investigation of Rio Grande water, known as the Bunker Survey, resulted in a proposed project called the San Juan-Chama Diversion Project to deliver water to Albuquerque across the Continental Divide. The National Resources Committee, a unit of Congress, coordinated the Rio Grande Joint Investigations Committee and resumed studies in 1936 to determine the basic facts for allocation of the Rio Grande among the states of Colorado, Texas, and New Mexico. The Navajo Tribal Council passed a resolution that vowed to protect water rights to the lands along the San Juan River.(11) The studies included not only the available water supply, but also water use and requirements, and the development of additional supplies through storage, salvage, and importation.(12)

This 1936 investigation formed the basis for the Rio Grande Compact, approved by Congress on May 31, 1939. The Compact constituted an agreement between the states of Colorado, New Mexico, and Texas to settle future conflicts by agreeing on the appropriation of Rio Grande Water. The Compact included the idea that a trans-mountain diversion could bring San Juan River water in to the Rio Grande Basin. However, the size of the diversion proposed was based on outdated facts about streamflow and runoff.(13)

Under section nine of the Reclamation Act of 1939, Congress designated certain groups as preference customers for its projects. This allowed the Secretary of the Interior to enter into contracts to furnish water or power to various groups by granting sales or lease preference to municipalities and other public corporations or agencies; as well as cooperatives and other non-profit organizations financed in whole or in part by loans made pursuant to the REA (Rural Electrification Administration). The Navajo Indian Tribe qualified as a preference customer for the purchase of power marketed by the Bureau of Reclamation (Reclamation). In 1940, a joint effort by the US and New Mexico with the Office of Indian Affairs (OIA) and Reclamation identified almost 132,000 acres of irrigable Navajo land.(14)

World War II had a particularly profound impact on the demography of rural New Mexico. Albuquerque became one of the fastest growing cities in the nation. New Mexico received more New Deal funds per capita than any other state, and after the war the state had grown to a population of 531,818 or 270% growth since the year 1900. One-third of the population now lived in an urban area. Albuquerque had 22,000 residents in 1930, 36,000 in 1940, and by 1960 New Mexico's largest city boasted 200,000 people. The population growth of industrial and national defense facilities during and after the war created a serious water problem in northern New Mexico. Drought made it difficult to sustain a growing population particularly since Rio Grande River water was fully appropriated according to the terms of the Rio Grande Compact. However, military installations made an adequate water in and around Albuquerque important to the national interest because of the issues surrounding the "Cold War."(15)

In 1946, Reclamation's report on the Upper Colorado River Basin established New Mexico's water right at a total of 800,000 acre feet. It estimated the diversion could reach 300,000 acre feet. In 1950, Secretary of the Interior Oscar L. Chapman appointed representatives of the BIA and regions four and five of the Reclamation to the San Juan Technical Committee. He charged the committee to investigate and report ways to utilize the unappropriated San Juan River within the 800,00 acre feet allotment. The resulting report in 1952 suggested possible diversion at three different levels: 264,000, 235,000, or 163,000 acre feet. They began fieldwork the following year, and discovered that the evolving Colorado River Storage project (CRSP) would have to consider and include the San Juan River water. The Navajo Tribe insisted on becoming part of discussions for CRSP in order to oppose the San Juan diversion and assert Navajo water rights and irrigation needs.(16)

The BIA published a feasibility study for the NIIP in 1955 which included two projects, the Shiprock Project and the South San Juan Project which aimed to primarily serve the Navajos. The report estimated that the Navajos could claim 778,000 acre feet of San Juan River water. At the same time, Reclamation produced a feasibility study suggesting the diversion of 235,000 acre feet in the San Juan-Chama Project to serve Albuquerque. In April of the following year, the legislation in the CRSP Act identified both Navajo Indian Irrigation and San Juan-Chama as participating projects.(17)

Since both NIIP and the San Juan-Chama Project claimed the same San Juan River water supply, Congress would not authorize the projects until further investigations determined them both economically feasible or even that enough water existed for both projects. Each of the affected states had to receive reports to approve before congressional hearings. The project would not

include power facilities, and Reclamation would operate it in compliance with the Rio Grande Compact so as not to interfere with Rio Grande stream flows. In 1958, House Document 424 included a 1957 joint feasibility study between the Bureau of Reclamation and the Bureau of Indian Affairs. New Mexico Representative Daniel Montoya and Senators Clinton P. Anderson and Dennis Chavez introduced the Navajo Irrigation-San Juan-Chama Diversion Bill to Congress in April 1958. Pending cost data, the bill went through several hearing and amendments from 1958 to 1961.(18)

### **Project Authorization**

Congress passed a bill to initiate the first stage of the San Juan-Chama Project on June 13, 1962. The law included the Navajo Indian Irrigation Project, and became the first major Reclamation bill of President John F. Kennedy's administration. Approval for the two projects followed complicated and often heated negotiations pitting Indian water rights against non-Indian claims to the San Juan River water supply. *The Navajo Times* asserted that San Juan-Chama's passage depended on NIIP. Many congressmen reportedly voted for the bill because they did not want to risk the negative moral and political implications of opposing a project for Native Americans. (19)

Water negotiations would have to take Winters rights into account and the Navajos had a sizable claim. However, the upper Great Basin states would only approve of the idea if the "tribe agreed to limit and define its rights to the San Juan River."(20) As a condition of its support for the Navajo project, New Mexico insisted upon a non-Indian companion project that would divert San Juan River water to the Rio Grande watershed called the San Juan-Chama Project and offered to limit its claims to an initial stage involving only 110,000 acre feet of water diversion, rather than the 235,000 acre feet project engineers estimated as possible. The project's initial stage stipulated 57,300 acre feet of municipal and industrial water to Albuquerque as well as supplemental irrigation to four tributary irrigation units in the Rio Grande Basin: Cerro, Taos, Llano, and Pojoaque. Finally, the project plans provided 22,600 acre feet to 81,600 acres in the Middle Rio Grande Conservancy District. The original bill did not provide for fish and wildlife.

Governor Mecham testified at the congressional hearings that the projects had to be discussed together because they were competing for the same water supply-- and since the Navajos have the dominant position-- the water supply needed to be negotiated between the two by sharing water shortages as suggested by the interagency San Juan Technical Committee in 1950.(21) At a 1957 tribal council meeting, the Navajo Tribal Council approved the reduction of their claim to the water in the diversion and agreed to support both projects in exchange for the Federal government's guaranteed delivery system of 508,000 acre feet of water a year to 110,630 acres. Most importantly, the tribe agreed to share its water during periods of water shortage.(22)

Besides the local government, other groups supported the San Juan-Chama diversion. Senator Anderson read a telegram from Martin Vigil, chairman of the All-Pueblo Council urging San Juan-Chama's approval and Robert Woodsen from the Department of Army and Defense testified how San Juan-Chama would benefit the present and future water requirements of New Mexico military installations.(23) Kirtland Air Force Base, Sandia Base, Manzano Base, and the West Mesa Air Force Station purchased their water from Albuquerque.(24) The nearby Tularosa Basin housed the White Sands Missile Range, the Holloman Air Force Missile Development Center, and New Mexico's portion of Fort Bliss. The atomic energy research at Los Alamos elicited special national interest and the United States could not afford to impair the progress of research there. Although these facilities required only 3660 acre feet in 1958, he predicted that they would require 19,650 acre feet by 1975. Woodsen indicated that the San Juan-Chama Project would help reduce the water for these projects.

Senator Chavez asserted that, "In connection with the development of these projects, I want to be

certain that every drop of water to which New Mexico is entitled is put to beneficial use."<sup>(25)</sup> The Pueblo Doctrine, through which California and New Mexico courts agreed municipalities or municipal governments created by old Spanish grants were entitled to all the water of the Rio Grande, also became a part of discussion. Governor Mecham testified that he believed that only the city of Las Vegas could claim a water right based on the Pueblo Doctrine in New Mexico, not Albuquerque or Santa Fe. He insisted that there was no other water available for New Mexico's largest cities. Senators quizzed him further on whether the Federal government should even build projects for municipal use -- though most senators recall this was not the first time.<sup>(26)</sup>

Congress approved of the Senate bill authorizing both NIIP and the San Juan-Chama Project on March 28, 1961 and House version on June 7, 1961. The Senate approved the final house version of bill on May 29, 1962 and President Kennedy signed it on June 13.<sup>(27)</sup> The congressmen who rejected the bill cited the project as economically unfeasible worried over the nation's problems with surplus agricultural products, and insisted there existed better ways to help the Indians. Representatives of the Animas-La Plata and Rio Grande Projects expressed concerns that San Juan-Chama would disturb their systems. William A. Utton, of the San Juan County Farm and Livestock Bureau supported NIIP, but strongly objected to San Juan-Chama. In his testimony before the Senate, he expressed doubt that enough water existed for both projects or that the projects should be linked in any way.<sup>(28)</sup>

Though authorized together, Congress did not treat the two projects equally in appropriations allocations. Some people suggest that Congress' decision to package NIIP with the San Juan-Chama Diversion Project indicates that the Navajo water resource claims became a negotiating tool after the states of Colorado and New Mexico suggested that the Navajo Irrigation project be held up until an agreement that ensured protection for the interests of their states could be reached. Congress, Reclamation, the Bureau of Indian Affairs (formerly OIA), and the Navajo tribe itself subjected NIIP to numerous delays.<sup>(29)</sup>

On March 26, 1964, Congress approved Public Law 88-293 to develop facilities at the Cochiti Reservoir with a permanent pool for fish, wildlife, and recreation at Cochiti Reservoir (a Corps of Engineers project for the Middle Rio Grande project) with water provided by San Juan-Chama.<sup>(30)</sup> To accommodate the change, Albuquerque reduced its water claim by 5000 acre feet. The initial phase of San Juan-Chama provided for the annual diversion of 110,000 acre feet of the San Juan River water to the Rio Grande River basin to irrigate 121,000 acres and provide municipal and industrial water to Albuquerque.

### **Construction History**

The San Juan-Chama Project is essentially a conduit system that includes two storage dams, two reservoirs, three diversion dams (Blanco, Little Oso, and Oso on the San Juan River tributaries: Rio Blanco, Little Navajo, and Navajo Rivers), six carriage facilities, five tunnels, and the Azotea Creek and Willow Creek Conveyance Channels. The diversion dams located on the tributaries divert water through the Continental Divide to Heron Dam and Reservoir through a series of carriage facilities made up of tunnels, siphons, and conveyance channels. Releases from Heron Reservoir pass through the Middle Rio Grande Project's El Vado Reservoir into Rio Chama and eventually the Rio Grande Basin.

The Heron Dam and Heron Dike provide regulation, while the Heron Reservoir on Willow Creek (a tributary of Rio Chama) holds 400,000 acre feet in a deep gorge just above the confluence with Rio Chama. It is a 265 feet high earthfill structure. The project provided for an increase of outlet works at El Vado Dam to avoid interference with Rio Grande flows.

San Juan-Chama's most spectacular feature, Nambé Falls Dam, and its storage reservoir provide supplemental irrigation to the Pojoaque Valley Irrigation District and the San Ildefonso, Nambé, and Pojoaque Pueblos. The Dam stores excess flows from Rio Nambé during high runoff periods and releases water for irrigation during periods of low streamflow.(31)

Originally San Juan -Chama planned to deliver supplemental irrigation water to four different tributary irrigation units, though only Pojoaque is and will be completed.(32) The others included Cerro, Taos, and Llano. Cerro and Taos would have provided reservoirs, while plans for Llano stipulated a diversion dam and a main canal. Though construction for San Juan-Chama did not go as far as anticipated, it was completed fairly rapidly and efficiently. Engineers completed the definite plan report in May 1962 which included a re-evaluation that simplified the project design to a three tunnel conduit system. In 1962, Congress authorized the National Park Service to develop two project facilities for recreation potential. Heron Reservoir would host the larger one, with other sites at Nambé Falls, Indian Camp, and Valdez.(33)

The Project received the authority to proceed on September 6, 1962 once Reclamation had approved the contracts regarding the water supply for the Middle Rio Grande Conservancy District and the City of Albuquerque. The Public Works' appropriation bill for the fiscal year ending June 30, 1963 appropriated \$500,000 for San Juan-Chama's advanced planning and preconstruction activities. Both signed a repayment contract on June 25, 1963 in which they promised to owe the Federal government \$30,926,000 and 3,400,000 respectively.(34) By the end of 1963, the project construction engineer's office employed 66 permanent and one temporary worker. The following April, Reclamation entered into a contract with the village of Chama to supply water to the temporary government camp there.

Congress' 1964 appropriation bill included money for regular construction and a contract for Azotea Tunnel, the tunnel that would cut from the Navajo River through the Continental Divide to Azotea Creek.(35) Congress passed an additional bill on March 26, 1964, allowing the San Juan-Chama Project to provide the water for a permanent pool for fish, wildlife, recreation at Cochiti reservoir on the Middle Rio Grande Project (built 1973-1974). (36) Gibbons and Reed Company, Boyles Brothers Drilling Company, and Dugan, Graham Company of Salt Lake City, Utah, won the first major contract for the Azotea Tunnel and appurtenant structures. The contractors began work on December 19, 1964 using a mechanical boring machine (*aka* the "mole").(37)

Awarded the contract in February 1966, the Boyles Brothers Drilling Company began work on the Oso Tunnel and other appurtenant structures in August which would carry water from the Little Navajo River to the Navajo River. The contract included the Little Oso and Oso diversion works and the Little Oso and Oso siphons. By the end of the year, they had only completed 3.6% of the features in 25.6% of the time allowed. Project supervisors blamed the slow progress on the difficulty of supporting excavation through glacial deposit. The workers eventually used steel channels and timber lagging to solve the problem. In March, the joint venture of Colorado Constructors and A.S. Horner Construction Company began boring the Blanco Tunnel which would travel from Rio Blanco to the Little Navajo River.(38)

By 1967, progress improved. Workers had completed the enlarged outlet at El Vado Dam on the Rio Grande River to catch Heron Dam releases 111 days ahead of schedule. With the alterations to El Vado Dam, Project administrators and engineers assured the Cooperative Water Investigative Program and USGS (United States Geological Survey) that San Juan-Chama did not adversely affect water supplies stipulated in the Rio Grande Compact.. Construction of Azotea Tunnel continued steadily progress with only minor mechanical difficulties.(39)

On March 30, 1967, Colorado and A.S. Horner Constructors holed through the Blanco Tunnel, the

uppermost diversion structure located eleven miles southeast of Pagosa Springs, Colorado and began lining it with concrete. Workers had to divert the Navajo River in order to prepare for work on the Oso Diversion Dam in June. Work continued on the Oso Diversion Dam earlier that June. The Boyles Brothers followed when they holed through the Oso Tunnel in October. Reclamation awarded two more important contracts to Herron-Strong, Incorporated for the earthwork and structures for the Azotea Creek Channelization in August and the next month to Universal Constructors to build the Heron Dam and relocate State Highway 95.

Workers began clearing the Heron Reservoir in 1968, but moved forward with the carriage facilities. On May 8, the contractors finally holed through the Azotea Tunnel and George Fisher and Fred Pettingill received the contract for the Willow Creek channelization.(40) That December, the Colorado-Southern Wyoming Chapter of the American Public Works Association designated the Blanco Tunnel "The Construction Project of the Year" and the other tunnel contractors and project employees received numerous construction safety awards.(41)

In January 1969, the New Mexico Interstate Stream Commission held heard hearings to listen to proposals for the San Juan's unallocated water. The Pojoaque Valley Irrigation District formed in October.(42) In November, a number of ditch organization commissioners met to anticipate the Taos unit of the project. Reclamation's project history reported San Juan-Chama 68% complete by December, with most of the construction limited to collection and diversion elements like the Blanco Diversion Dam and Tunnel. That element of the project was 86% complete, while the features for each of the irrigation units remained only 10% complete.(43)

In November 1970, the Dugan Graham Company finished the Azotea Tunnel and the contractors completed work on the other two diversion dams (Oso and Little Oso) in July. The Heron Reservoir clearing finished, the construction of the dam was 95.5% ahead of schedule. Workers began placing concrete lining in the Blanco Tunnel in August 1970. On June 9th, 1971, workers completed Heron Dam, San Juan-Chama's last major construction feature.(44)

The National Society of Professional Engineers selected the San Juan-Chama Project as one of the ten outstanding civil engineering achievements in 1971. The year 1972 concentrated on the construction on the Operation and Maintenance building for the project headquarters in Chama. Water Industries conducted exploratory drilling by for the Taos and Cerros units, but project leaders primarily struggled with excessively high bids for drilling at Nambe Falls Dam, now a thin arch double curvature concrete dam, 140 feet high and 320 feet long at the crest. They finally awarded the contract in June to Sprague and Henwood, Incorporated from Scranton, Pennsylvania for \$44,038. The task endured slow progress due to weather and additional requested drill holes from Denver office. Engineers announced the project essentially complete in January 1973 when they began constructing the features for the irrigation units.(45)

In June 1974, contractor G.M. Shupe received the contract for Nambe Falls Dam which was would serve to catch runoff from the Nambe River to supplement irrigation on the Pojoaque Unit. The Dam was essentially completed in 1976.(46) Rio Nambe lies at the foothills of the Sangre de Cristo Mountains. The Dam is unique because of the combination of a pre-stressed concrete arch, a massive support block, curved embankment, and a fault zone in the left abutment area, which precluded constructing a thick concrete dam across the valley. Pre-stressing of the central contraction joint of the dam marked Nambe Falls as the first prestressed concrete arch dam in the United States.(47) In October 1975, based on groundwater and economic evaluations, Reclamation decided to cancel the Cerro and Taos pumping units on two of the tributaries. In 1979, Reclamation turned the Nambe Falls water supply system over to the Pueblo and Nambe Indians for operation.(48)

Local opposition had led to termination of the Llano unit, which was to have served the San Juan Pueblo, in February of 1976. Nambé Falls reservoir received recreation facilities in 1977. By 1978, Reclamation had only built the Pojoaque tributary unit to comply with the Rio Grande Compact. It proposed no more project activity, and the interstate stream commission recommended water allocations meant for Cerro and Taos go to municipal and industrial use. (49)

In December 1979, Reclamation reported the highest recorded diversion ever at 164,110 acre feet. The project yielded and sold its first surplus water at Heron Reservoir in April 1983. The following year, the Federal Energy Regulation Committee issued Los Alamos County a permit to investigate the hydroelectric capacity at Heron Dam, but this idea did not appear feasible.(50)

### **Uses of Project Water**

The San Juan-Chama Project provides supplemental irrigation which yields a variety of crops to the Middle Rio Grande Conservancy District (20, 900 acre feet to 89,711 acres) and the Pojoaque Valley Irrigation District (1,030 acre feet to 2,768 acres) including crop alfalfa, hay, irrigated pasture, apples, vegetables, corn , and cotton. Forage crops encompass nearly three-fourths of the irrigated land and farmers market them through commercial feedlots and dairy operations.

The project, however, serves water for municipal, industrial, and domestic use to the cities of Albuquerque (48,200af), Santa Fe (5,605 af), Los Alamos (1200 af) to the Department of Energy, the Twining Water and Sanitation District (15 af), the village of Los Lunas (400 af), Taos (400af), and Espanola (1800 af). Though the project did not benefitted many Pueblo tribes, it did not accommodate everyone. In 1975, the Jicarilla Apache began a large state adjudication case because the project's diversion upstream from their reservation had adverse effects on their fisheries and domestic water supply. As a final benefit, San Juan-Chama's, Heron, Nambé Falls, and Cochiti reservoirs provide fish and wildlife preserves and recreation.(51)

### **Conclusion**

The rapid urban growth of northern New Mexico in the twentieth century required water beyond what the Rio Grande River could provide. The presence and water rights of the state's Native American residents reduced the water that could be claimed by the urban population. In order to ensure an adequate and controlled water supply for all of New Mexico's residents, officials needed to consider the San Juan-Chama Project and the Navajo Indian Irrigation Project together. Promoters argued that the feasibility and success of both projects depended on one another. The negotiations surrounding the San Juan-Chama Project remain a complex example of the delicate balance of state politics, water rights, and Federal responsibilities.

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#### Notes

1. Project History, "San Juan-Chama Project," (1963), 7.
2. Pre-History compiled from web pages by Christine Storey, "Native American Ethnography Project," <[intra.usbr.gov/~cultural/ethno.htm](http://intra.usbr.gov/~cultural/ethno.htm)> and Michael C. Meyer, *Water in the Hispanic Southwest*, (Tucson: University of Arizona Press, 1984), 12, 15, 19.
3. Project History, "San Juan-Chama Project," (1963), 1-2.
4. "San Juan-Chama Project, Colorado-New Mexico," Definite Plan Report, Bureau of Reclamation: Department of the Interior, (May 1963, revised June 1964), C-76.
5. Project History, "San Juan-Chama Project," (1963), 1.
6. Harold J. Boyd and Shirley A. Allison, "A Wait of Many Moons for... Irrigation to the Navajo Tribe," *Reclamation Era* (November 1965), 99.
7. Project History, "Navajo Indian Irrigation District," (1965), 1.
8. In most cases a water right is sacrificed if the owner of that right does not put the water to "beneficial use).
9. Judith E. Jacobsen, "The Navajo Indian Irrigation Project and Quantification of Navajo Winters Rights," *Natural Resources Journal* 32 (Fall 1992); Lloyd Burton, "American Indian Water Rights" in Zachary A. Smith, ed., *Water and the Future of the Southwest* (Albuquerque: University of New Mexico Press, 1989), 155-158.
10. However, the present layout of NIIP roughly reflects the 1920s surveys by Herbert W. Yeo, State Engineer of New Mexico.
11. Judith Eva Jacobsen, "A Promise Made: The Navajo Indian Irrigation Project and Water Politics in the American West," PhD Thesis, University of Colorado, Boulder, (1989), 79, 80; 100; RH Rupkey, "Report on Supplemental Investigations, Shiprock- San Juan River, Navajo Reservation, New Mexico," Office of Indian Affairs, United States Department of Interior, Phoenix

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12. United States Department of Interior, Water and Power Resources Service, *Project Data*, (Denver: US Government Printing Office, 1981), 1116; Project History, "San Juan-Chama Project," (1963), 2.

13. Jacobsen, "A Promise Made," 11, 117, 124; Project History, "San Juan-Chama Project," (1963), 2; Richard K. Peltz, *Federal Reclamation and Related Laws Annotated 1*, (Washington DC: Government Printing Office, 1972), 622.

14. Memorandum by Associate Solicitor Weinberg, April 14, 1961, "Reclamation Project Act of 1939," August 4, 1939, ch. 418 53 Stat. 1187 in Richard K. Pelz, ed., *Federal Reclamation and Related Laws Annotated 1* (Washington DC: United States Department of Interior, GPO, 1972), 650; Brian J. Boman, "Consumptive Use on the Navajo Indian Irrigation Project," Farmington, NM: Bureau of Reclamation, 1984), 2-3.

15. Montoya, Hearings, 1958, 27; Judith Boyce DeMark, "Introduction," in *Essays in Twentieth Century New Mexico History* (Albuquerque: University of new Mexico Press, 1994), 1-11.

16. Project History, "San Juan-Chama Project," (1963); Congress, Senate, Committee on Interior and Insular Affairs, Subcommittee on Irrigation and Reclamation, *Navajo Irrigation - San Juan-Chama Diversion: Hearings*, 85th Cong., 2nd sess., (July 9 and 10, 1958), 2-3, 29; Definite Plan Report, 2-3.

17. Project History, "San Juan-Chama Project," (1963), 4.

18. Hearings, (July 9, 10, 1958), 1-14; Minutes, Navajo Tribal Council, (December 11, 1957), 58.

19. "Victory," *The Navajo Times 2* (May 30, 1962), 1.

20. Burton, Lloyd. *American Indian Water Rights and the Limits of the Law* (Lawrence, KS: University Press of Kansas), 1991, 30-31; Burton, "American Indian Water Rights" in Zachary A. Smith, *Water and the Future of the Southwest* (Albuquerque: University of New Mexico Press, 1989), 30; "All Navajo Problems Can be Solved by Water," *The Navajo Times 1* (May 3, 1961), 7.

21. Hearings, (1958), 11, 29.

22. Navajo Tribal Council, Minutes, (December 11, 12, 1957), 67-89.

23. Hearings, (1958), 37, 73.

24. Hearings, (1958), 73.

25. Senator Dennis Chavez, Hearings, (1958), 23-24.

26. Governor Edwin Mecham, Congress, House, Committee on Interior and Insular Affairs, Subcommittee on Irrigation and Reclamation, *San Juan-Chama Reclamation Project and Navajo Indian Irrigation Project, Hearings*, 87th Cong., 1st Sess., (April 24, 25, 26, and June 1, 1961), 22-24.

27. Project History, "San Juan-Chama Project," (1963), 4- 5.

28. Legislative History, Congressional Record, 1684-85; "Farm Training Program To Train Young Men," *The Navajo Times* 1 (December 27, 1961), 8; Hearings, (1961), 19, 47; Congress, Senate, Committee on Interior and Insular Affairs, Subcommittee on Irrigation and Reclamation, *Navajo Irrigation - San Juan-Chama Diversion, New Mexico: Hearings*, 86th Cong., 1st Sess., (March 16, 1959), 13, 31.
29. Peter Iverson, *The Navajo Nation*, (Westport, CT: Greenwood Press, 1981), 110, 113-114; Burton, 84.
30. United States Department of the Interior, "Permanent Pool, Cochiti Reservoir," Federal Reclamation and Related Laws Annotated. (Washington: Government Printing Office, 1972), 1744.
31. Eric B. Kollgaard and Wallace L. Chadwick, *Development of Dam Engineering in the United States*, (New York: Pergamon Press, 1988), 502.
32. The other tributary units included: Cerro: Red River storage Dam, diversion dams, canals; Taos: Rio Hondo Dam and Reservoir, 30 miles of connecting canals to over 20,000 acres-- 4050 acres belonging to the Taos Pueblos; Llano: diversion dam, 19 miles of main canal distribution and draining system; Pojoaque: Nambe Falls Dam, 2 diversion dams, canal system to serve both Indians and Non-Indians; Llano unit in vicinity of Espanola to Oñate Conservancy district and Indian Pueblos of San Juan and Santa Clara: Llano canal and Velarde Diversion dam; Taos: Indian camp system to 5734 acres south of Taos: recreation facilities constructed by the forest service. Project History, "San Juan-Chama Project," (1970), 4.
33. Project History, "San Juan-Chama Project," (1962), 11, 12.
34. Project History, "San Juan-Chama Project," (1963).
35. Project History, "San Juan-Chama Project," (1963), 8.
36. Congress authorized the National Park Service authorized to develop two project facilities for recreation potential-- Heron Reservoir as the major one as well as Nambe Falls, Indian Camp, and Valdez. Project History, "San Juan-Chama Project," (1987), v-vi.
37. Project History, "San Juan-Chama Project," (1964), 1.
38. Project History, "San Juan-Chama Project," (1966), 12.
39. Project History, "San Juan-Chama Project," (1966), 4-6, 9, 12.
40. Project History, "San Juan-Chama Project," (1968), 4, 7; Project History, "San Juan-Chama Project," (1987), 25.
41. Project History, "San Juan-Chama Project," (1969), 4-6.
42. Project History, "San Juan-Chama Project," (1969), 4.
43. *Ibid.*, 9.
44. Project History, "San Juan-Chama Project," (1970), 16; Project History, "San Juan-Chama Project," (1971), 8.

45. Project History, "San Juan-Chama Project," (1972), 5-11.
46. Project History, "San Juan-Chama Project," (1987), 27.
47. Kollgaard, Eric B. and Wallace L. Chadwick, *Development of Dam Engineering in the United States*, (New York: Pergamon Press, 1988), 504. Reclamation took over Nambe Falls operations in 1983.
48. Project History, "San Juan-Chama Project," (1975), 26; Project History, "San Juan-Chama Project," (1987), 30.
49. Project History, "San Juan-Chama Project,"(1987), 28; Project History, "San Juan-Chama Project," (1978), 26; Project History, "San Juan-Chama Project," (1978), 3,4.
50. Project History, "San Juan-Chama Project," (1987), 30-32.
51. Project History, "San Juan-Chama Project," (1987), 3.

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