

Arbuckle Project

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The Arbuckle Project

In 1962, President John F. Kennedy, authorized construction of a dam and storage reservoir along Rock Creek in south-central Oklahoma. Once a domain of the Chickasaw tribe following their displacement from their homes in Tennessee and Mississippi, the region had been conducting studies for 30 years following the droughts and hard times of the Depression. The goal of these investigations was part of a long-term effort to provide a dependable source of municipal and industrial water for the surrounding communities of Sulphur, Wynnewood, and Ardmore. The project, designated as the Arbuckle Project, would not only provide water to these small nearby towns, it would also become part of a popular recreation area that draws three million visitors a year. There is no irrigation component to this project.

Project Location

The Arbuckle Project is located in south-central Oklahoma along Rock Creek, a tributary of the Washita River, and spans the counties of Murray and Garvin. Arbuckle Dam, the structure that regulates the flow of water, is located on Rock Creek about six miles southwest of Sulphur, Oklahoma. The project gets its name from the Arbuckle Mountains, which are south of the project. Water from the project is regulated for five major locations in the region-- the Ardmore Industrial Air Park in Ardmore, Oklahoma, and the towns of Davis, Sulphur, Dougherty, and Wynnewood. The latter contains a major oil refinery that receives a great deal of Wynnewood's yearly allocation of water. The dam and reservoir, known as the Lake of the Arbuckles, is considered part of the Chickasaw National Recreation Area, a group of recreation sites that includes Turner Falls; it was formerly part of Platt National Park. Tourists and local visitors enjoy swimming, water skiing, boating, and fishing for catfish, crappie, and bass, in a reservoir

that has a surface area of 3,127 acres and holds up to 108,839 acre-feet of water.¹

Historic Setting

The area where the Arbuckle Project is now located was once populated by bands of the Comanche, Kiowa, and Osage tribes, who, for health benefits, used the local artesian springs that percolated from Rock and Travertine Creeks. The region itself is named for Fort Arbuckle, a stone masonry military post that was built near Wildhorse Creek, about six miles northwest of Davis, Oklahoma. The fort, opened in 1851, was named for General Matthew Arbuckle, who had died prior to the opening of the fort.

Prior to the establishment of the fort, indigenous tribes from the southeastern United States were in the process of being relocated to Oklahoma. In 1830, Congress passed a law that created an Indian Territory west of the Mississippi River, in order to appease white settlers who coveted the lands controlled by groups of Native Americans known as the Five Civilized Tribes (Choctaw, Cherokee, Chickasaw, Creek, and Seminole). These tribes were forced to relocate to this new Indian Territory in the late 1830's, traveling along roads that became known in legend as the "Trail of Tears," due to the deaths and hardship that occurred during the ordeal. The Chickasaw arrived last in 1837, and moved onto lands controlled by the Choctaw, who were distant relatives. In 1855, the Chickasaw asked for a separate tribal government; they wrote up a tribal constitution the following year, and moved to the south-central portion of the territory, there to carry on an agricultural way of life during the remainder of their days on the reservation. The Chickasaw struggled mightily in their new home regardless of where in Indian Territory they lived, not just because of the trauma of relocating from their homeland, but also because they were at constant warfare with the Comanche and Kiowa, as well as occasional clashes with

1. Denver, Colorado, National Archives and Records Administration: Rocky Mountain Region, Records of the Bureau of Reclamation, Record Group 115, "Annual Project History, Arbuckle Project, Volume I, 1964, 1; United States Department of the Interior, Water and Power Resources Service, *Project Data*, (Denver: U.S. Government Printing Office, 1981), 5-8.

the other relocated tribes.²

When the Civil War broke out in 1861, the Chickasaw, like many other slave-holding tribes in Indian Territory, sided with the Confederacy, and it was the last tribe to surrender to Union forces in 1865. After the war, a treaty delegation was held at Fort Smith, Arkansas, in September of 1865. The treaty proposed by the government stipulated a number of provisions that the tribes opposed, above all the provision that the former slaves of the tribes would be granted full tribal rights, citizenship, and a land allocation. The Chickasaw and Choctaw opposed this measure so vehemently that they succeeded in reducing the land measure granted to former slaves to 40 acres each. The former slaves would also receive no share in tribal funds, despite their status as inhabitants of Indian lands. It was during these discussions that the name of the new territory, "Oklahoma," was applied to the lands where the tribes lived (Oklahoma is Choctaw for "Red People;" this name for the state was announced by the Presbyterian Choctaw minister Allen Wright during the discussion over what to call the territory. Unfortunately, Wright did not consult the other tribal delegates prior to this announcement; his actions completely caught the other delegates off guard.). The Chickasaw were finally forced onto smaller reservations with the opening of Oklahoma to white settlement in 1889.³

The first of the Anglo settlers in Oklahoma were granted land under the provisions of the Homestead Act of 1862, and set up various communities as their settlements stabilized. The town of Sulphur, adjacent to the Arbuckle Project, was established during this time, but not in its current location. The town was originally founded as Buffalo Lick, a little further south, and it officially became the town of Sulphur in 1895 when the first post office was opened. In 1906,

2. "Keeping the Peace: William H. Emory and the Command at Fort Arbuckle," *Chronicles of Oklahoma*, Vol. 69:3(Fall 1991), 260; Ann Maloney, *A Brief History of Oklahoma* [web site on-line] (Bartlesville, Okla.: Ann Maloney, 1998); available from <http://users.rootsweb.com/~oknawata/OklaHist.htm>; World Wide Web; accessed 20 June, 2000, 4:00 PM

3. Ann Maloney, *A Brief History of Oklahoma*.

the year before Oklahoma became a state, Congress declared an area including Sulphur to be part of Platt National Park, forcing the town to relocate further north on the outskirts of the park.

The cattle industry was a major factor in Oklahoma's settlement by whites, who used the open prairies for grazing, and drove their cattle along such roads as the Chisholm Trail. Eventually, most of the state settled into a crop-based economy supported by dry-land farming techniques, particularly in the western portion of the state. In the Arbuckle region until the 1920's and 1930's, the staple crop of the area was cotton. When the boll weevil arrived in the 1930's, the cotton crops were destroyed, and cotton became a less significant contributor to the region's economy.

The Arbuckle region did not experience the degree of suffering that the inhabitants of Oklahoma, as depicted in the photos of Dorothea Lange and John Steinbeck's *The Grapes of Wrath*, have become popularly known for. The first settlers had also learned of the health benefits derived from bathing in area's artesian springs, and centered their economy during the early statehood period around these artesian springs. At the turn of the century, the town of Sulphur had 20 hotels centered around the springs, of which the largest was the Artesian Hotel (the hotel burned in 1962). Advancements in medical technology following World War II resulted in the decline of this unique part of the Arbuckle region's history.⁴

Project Authorization

In the late 1930's the Oklahoma Planning and Resources Board developed a plan to harness the water resources in the Arbuckle Project area. This plan included a series of 26 reservoirs in the Washita Basin, including Rock and Caddo Creeks. The Bureau of Reclamation conducted their own studies of the area in 1947, in an evaluation of water needs and problems in the Red River Basin. The Arkansas-White-Red Basin Interagency Committee, in conjunction

4. Tom Byrd, Director, Arbuckle Historical Society, Sulphur, Oklahoma. Telephone conversation with author, 3 July 2000.

with Reclamation, conducted studies as well in the early 1950's. The studies showed that reservoirs on Rock and Caddo Creeks could provide the Arbuckle region with a suitable supply of water for both municipal and industrial use, but the exact needs of the area could not be sufficiently defined to warrant further investigations and subsequent development.⁵

By the 1950's, water use in the Washita Basin had increased considerably as population and industry in the area expanded. Water resources came under considerable strain when a series of droughts struck, forcing the local communities to conserve water for human consumption and fire protection by rationing. This prompted civic leaders to organize the Murray County Water Resources Committee (later the Southern Oklahoma Development Association), which began surveys for new water supplies. The organization came to the conclusion that the current site of the Arbuckle Project, on Rock Creek, would be the best location for providing Murray County with a steady and dependable supply of water. In 1956, a meeting with the Bureau of Reclamation took place on the potential of the area as a project site.⁶

Two studies, one conducted earlier by Reclamation in conjunction with the University of Oklahoma, and another one conducted after the 1956 meeting, determined a need for additional water existed, and offered some specific projections as to the amount that would be needed in future years. A subsequent reconnaissance report suggested that the Arbuckle site on Rock Creek would be the best location to build a dam and storage reservoir that would best serve the municipal and industrial needs of the nearby towns in Murray and Garvin counties. The findings of the report were adopted by the Southern Oklahoma Development Association (SODA), who in turn contributed funds for the planning necessary to authorize the project. Reclamation's plan was submitted to Commissioner Floyd Dominy on December 23, 1960; it was subsequently submitted to Congress, and authorized by President John Kennedy on August 24, 1962. In

5. "Annual Project History, Arbuckle Project," Volume I, 1964, 1.

6. Ibid.

anticipation of the project's authorization, the Arbuckle Master Conservancy District(AMCD) was formed on April 24 of that year. This body would contract with the United States for payment of the reimbursable costs of the project through revenues collected from the water users, and would be responsible for operation and maintenance of the project and its facilities when they were completed.⁷

The proposed plan contained three main provisions– construction of the Arbuckle Dam and reservoir, as well as recreational facilities; construction of pipelines and pumping facilities that would deliver water to Ardmore, Ardmore Airfield, Sulphur, Davis, Wynnewood, and the Kerr-McGee refinery; and the purchase and development of lands for wildlife management, which would alleviate losses of upland game caused by the project's construction. After authorization, however, a Definite Plan Report was submitted May 22, 1963, which amended the plan by deferring the Sulphur aqueduct indefinitely. Also eliminated from the plan was a lateral from the Ardmore aqueduct to provide Dougherty with a supply from the reservoir, and a branch line to the Kerr-McGee refinery; the latter would be financed and/or constructed by the refinery's owners.

The authorized version of the project also established a payment plan that placed a ceiling cost of \$13.34 million, with reimbursable costs set at \$7 million, of which forty percent would be paid for by the AMCD in fifty annual installments at 3.046 percent interest. The remaining costs would be covered by the Oklahoma Water Conservation Commission (OWCC). This organization had stepped in as a co-payer on the project when the citizens of Ardmore rejected a payment plan that would have required the payments to be made out of revenues from the sale of water, and allowed the city to issue an ad valorem tax in case there were insufficient funds available. The Ardmore pipeline was subsequently removed from the project plan after the

7. "Annual Project History, Arbuckle Project," Volume I, 1964, 1-2.

city rejected this portion of the repayment plan. The OWCC would pay off Ardmore's share with two separate transactions, one on August 13, 1963, for \$2.322 million, the next on March 10, 1964, for \$2.199 million. Most of the administrative work for Reclamation would be handled by the Regional Office in Amarillo, TX, while a memorandum of agreement was established with the National Park Service for the landscape and architectural development of the project's recreational areas.⁸

Construction History

The construction data for the primary project structures, Arbuckle Dam, the Wynnewood Aqueduct, and the Sulphur Pumping Plant were compiled in 1963 and 1964, with the data for the dam being gathered in 1963. Most of the labor contracts for Arbuckle were awarded between May and December of 1964; Amis Construction of Oklahoma City was given the contract for construction of the dam on June 9. Other contracts that were issued included construction of laboratory and shop buildings for the site; removal of transmission lines in the reservoir area; manufacture of high pressure gate valves and seats for the dam's outlet works; manufacture of trash racks; and protection, arrangement, and alteration of crude oil lines. On June 20, ground-breaking ceremonies were held at the damsite, and featured Secretary of the Interior Stewart Udall, Great Plains Regional Director Leon Hill, and Congressman Carl Albert.⁹

Construction of the dam began June 24 with clearing of the dam foundation, followed by excavation of the foundation and temporary cofferdam. Placement of the embankment was done concurrently as the areas were cleared, with material consisting of Zone 1A, 1B, 1, and 2 materials. Workers used most of the material from area stripping for Zone 1A and Zone 2, and consisted mostly of sand and gravel, with lean to fat clays interspersed. Placement of the toe drains began August 25, and work on the outlet structures began the next month. The latter

8. "Annual Project History, Arbuckle Project," Volume I, 1964, 2-3, 5-7.

9. "Annual Project History, Arbuckle Project," Volume I, 1964, 7-8, 13.

consisted of stripping the areas for the outlet chute and stilling basin, excavation of the spillway area, and placement of invert concrete slabs in the river outlet works.

The construction company Geo Prospector's, Inc., began trenching for the grout cap in late September, then proceeded with drilling on October 8. For drainage purposes, only Zone 1 materials, consisting of a more impervious mix of clay, sand and gravel, were used on the grout cap. The black shale formation of the site made drilling difficult; it was harder to keep the holes open or drill to a specific depth. This problem was solved when the contractor stopped using water as a circulating media for the grout; when the grouting process encountered harder shale formations, water was once again brought back into use. In January 1965, air was substituted for water as the circulating media, due to the requirement of a non-cemented conglomerate in the last four drill holes.¹⁰

Amis Construction received the bulk of awarded contracts in 1965, for the main structures of the project. In addition to construction of the dam, which was currently being carried out, Amis was awarded contract to construct the facilities for the Sulphur sewage effluent plant, the Wynnewood Aqueduct, and the recreation facilities. The construction of the Sulphur sewage effluent plant was necessary for compliance with Oklahoma water quality laws. This plant would collect effluent and distribute it four miles from the project to the Dry Sandy Creek watershed. Other contracts would be awarded to Eugene D Robinson of Cascade, Colorado, for reservoir-clearing, and the Nelson Construction Co. of Sulphur, Oklahoma, for the Job Corps Conservation Center(JCCC), a boarding house and skill-building facility for troubled youths. Further subcontracts for the JCCC were given to other companies for the center's heating and air conditioning, gym, education and recreational facilities, warehouse, and storm shelter.¹¹

10. "Annual Project History, Arbuckle Project," Volume I, 1964, 10; "Annual Project History, Arbuckle Project," Volume 1, 1964, 14, 23-26, 29.

11. "Annual Project History, Arbuckle Project," Volume II, 1965, 4-5, 9-10.

Construction at Arbuckle through 1965 focused on the water delivery facilities. The first river diversion was made in January, along with clearing of the outlet works river channel through Buckhorn Creek to Rock Creek, and clearing of the left abutment. The river outlet works gates were subsequently installed. In the summer, brass cup monuments for sedimentation range lines were placed on the Rock Creek arm of the reservoir, and grouting was completed in July. The conduit sections of the river outlet works and municipal outlet works were installed, while progress continued on concrete placement in the outlet and spillway structures. In August, the measuring flume and wellhouse were completed, and the recreation area was cleared for roads, parking, and boat ramps. The excavation and placing of the embankment with Zone 2 material, on the upstream embankments of the old river channel's upstream toe, and along the foundation of the dam, took place throughout the spring-summer period. When workers reached the foundation, a filter blanket was placed and covered with Zone 2 material, and a toe drain was installed in the blanket. By this time, excavation of the pumping plant was complete, and the concrete base was placed.¹²

In the fall, a great deal of work was done on both the river and municipal outlet works. Concrete was placed for the spillway and the intake structures, the conduit section, gate chamber, chute, and stilling basin. Earthfill, comprised primarily of Zone 1 and 1B materials, was placed around the outlet works, then tied in to the right abutment between the river outlet works and the spillway structures. The inlet and outlet channels were then excavated, which allowed workers to place bedding and riprap on the river outlet works and the outlet channel. Pipe trench excavation and placement also commenced, including backfill placement and compaction. At the end of the year, all concrete had been installed in the spillway river outlet works, measuring flume, and wellhouse. Riprap was placed in the inlet channel and stilling

12. Ibid., 14-41.

basin, and trashracks were installed in the municipal and river outlet works, along with a 36-inch lateral section. Site clearing for the reservoir began in November of that year and continued through to April of 1966.¹³

Work during late 1965-1966 also focused on the recreation area, as well as beginning construction of the Wynnewood aqueduct, which would bring water to the city for municipal consumption and connect to the line being built by the Kerr-McGee oil refinery. Clearing of the aqueduct began in September, proceeding to excavation and embankment for the aqueduct's regulating reservoir, including trenching and pipe-laying to the surge tank, at the end of 1965. After the recreation areas had been cleared, construction of the Buckhorn Rock and Point recreational sites and boat ramps were completed, and construction of parking areas commenced. At the sewage plant, backfill and compaction was essentially completed, and all air valves and gate valves for the blow-off structures and air-valve structures were finished. Murray County also was conducting construction for the project in the form of road relocation, including a bridge over Rock Creek; work on this aspect of the project would continue until May 1966.¹⁴

Work on the project progressed on schedule through 1966. On the dam, level gage installation took place in January and February; embankment was then placed from abutment to abutment, and was completed in May. The last of the riprap and bedding, along with gravel surfacing on the crest, was placed in June, essentially completing the dam. At the sewage plant, a cast iron slide gate and lift was installed on the forebay overflow structure, allowing workers to then wire pumps and erect the building frames necessary for the plant. By May, the pipelines were filled and checked for leaks, and repairs were made with separate closure sections of pipes for the large breaks(which acted as patches), and rubber sheets for the smaller ones. The final

13. "Annual Project History, Arbuckle Project," Volume II, 1965, 41-72; "Annual Project History, Arbuckle Project, Volume III, 1966, 3-4.

14. "Annual Project History, Arbuckle Project," Volume II, 1965, 46-72.

testing of the pipeline and chlorination system took place in July. Construction on a caretaker's residence building and headquarters began, along with the placement of mulch for Bermuda sodding on the downstream face of the dam, and Dikes One and Two of the aqueduct. Due to rainy weather conditions, workers did not finish mulching until October, 1966, while completion of the caretaker's residence and headquarters did not occur until December 1966.¹⁵

Much of the work during 1966 was devoted to finishing the Wynnewood Aqueduct and its accompanying structures. Concrete was placed in the regulating reservoir and surge tank, followed by the installation of steel piping and steel manifolds from the access house to the pumping plant. Columns and tie beams were then installed in the pumping plant superstructure, for the erection of the pumping plant and chlorination buildings, and concrete was placed in the small structures along the pipeline, which included the Davis and Kerr-McGee turnouts. By June the regulating reservoir was finished, followed by the regulating tank for the Davis turnout in July. Excavation and backfilling of pipe trenches were completed, and the last of the concrete pipe and the regulating tanks for the Davis turnout and terminal structures was installed. Backfill was then placed and compacted along all tanks and turnouts. Excavation then commenced on the grounding mat, conduit, service yard, and sewage disposal field, and a grounding system was installed for the pumping plant, chlorination building, access house, and fencing around the pumping plant's service yard. By November 1966, control pipings and fittings were in place for the Davis turnout and terminal structure, and all earthwork was completed in December.¹⁶

One of the side projects that occurred during the latter part of 1966 was the excavation and relocation of graves from the Guy Sandy Creek Indian Cemetery to the Sandy Baptist Church Cemetery. Although details are limited as to the relocation process, this event illustrates

15. "Annual Project History, Arbuckle Project," Volume III, 1966, 14, 21, 42, 55, 66, 83.

16. Ibid., 14-83.

the importance of the site as a sacred ground for Native Americans. It is not known if the cemetery held members of the Chickasaw tribe, or if the graves held members from many different tribes.¹⁷

By 1967, most of the work on the project had been completed, but wrap-up work on the aqueduct, a water system, and access road kept construction crews busy from late 1966 until September of 1967. The aqueduct in particular saw some overruns on time, although no known reasons were given by the extant sources. In January, all of the work was completed on the concrete paving and placement of riprap for the spillway chute, allowing for the initial storage of water with the closing of the river outlet works intake structure. Conduit and electrical wiring was then completed at all project turnouts, the pumping plant, and chlorination buildings.¹⁸

The water system was the primary project for the remainder of the construction period, although other work would be completed on the aqueduct and its structures as well. The contractor built a water treatment plant, and installed all operating equipment for the Wynnewood pumping plant, including pumps, motors, and hydraulic gate valves. This allowed the first automatic water deliveries to take place in September, 1967. By the end of 1967, the reservoir itself held 30,000 acre-feet; in May of 1968, flood control measures were initiated for the first time, when the reservoir filled to the top of the conservation pool.¹⁹

The Arbuckle Project spans Rock Creek, a tributary of the Washita River, in south-central Oklahoma, bordering the town of Sulphur on the southwest side. The dam is a zoned embankment structure that impounds 72, 399 acre-feet of water to an elevation of 872 feet for active conservation, and a total of 108,839 acre-feet to an elevation of 885.3 feet for purposes of flood control. The dam is 1,890 feet long and 150 feet high at the crest, and is protected from

17. Ibid., 79.

18. "Annual Project History, Arbuckle Project," Volume IV, 1967-1968, 4-6, 12.

19. Ibid., 7, 15, 18, 20, 24-26, 30.

erosion by a two-foot thick layer of riprap on the upstream face of the dam, and by vegetation on the downstream face.

Two small dikes are located on the reservoir rim, upstream from the left abutment. Dike No. 1, the nearest to the dam, is 25 feet high, with a crest length of 231 feet; Dike No. 2 is 75 feet long and 15 feet high. The spillway is located at the dam's right abutment, and consists of an uncontrolled morning-glory style drop-inlet to a circular conduit that discharges into the stilling basin via a concrete chute that is 243.5 feet long. The spillway can handle discharges up to 3,400 cubic feet a second (cfs) at a water surface elevation of 914.2 feet. Approximately 170 feet to the left of the spillway is the river outlet works. This structure is a rather complex piece of machinery that contains a 385 foot long pressure pipe, and a conduit which splits into two branches at the concrete gate chamber, through which waterflow is controlled by each branch's own emergency and regulating slide gates. The releases from these outlet works pass into the modified horseshoe conduit, to an 88-and-a-half-foot long chute, to the stilling basin, and finally to the common discharge channel. The full discharge capacity of the outlet works, with both gates fully open, is 2,340 cubic feet per second at a surface elevation of 914.2 feet.

To the left of the river outlet works is the municipal outlet works. Water is drawn through this structure via two vertical intakes on the upstream face of the dam, then flows to two 276½-foot long steel-lined conduits encased in concrete. These flows are controlled by a slide gate within the gate chamber. These conduits merge into a single pressure pipe that runs inside a horseshoe-shaped concrete access conduit. The water is then released to the downstream pumping plant for further distribution.²⁰

The other major structure on this project is the Wynnewood Aqueduct, 17.87 miles long.

20. Memorandum from Kevin Gagner, Civil Engineer, P.E., to Manager, Inspections and Emergency Management Group, "Examination Report, for Comprehensive Facility Review for Arbuckle dam–Arbuckle Project, OK–Great Plains Region," United States Department of the Interior, Bureau of Reclamation, Denver, CO, 5-6,

This structure begins just downstream of the dam at the Wynnewood Pumping Plant, where water is lifted by four pumping units and delivered to the regulating reservoir at a design flow of 9.6 cubic feet a second. The regulating reservoir is located 3.6 miles from the plant and holds five acre-feet of water. Water is then delivered along the pipeline to the Wynnewood turnout, where it is then distributed to the city via a regulating tank constructed by the USBR. The aqueduct also contains turnouts to the city of Davis at mile 6.6 and to the Kerr-McGee refinery at mile 16.4. At the terminus of these pipelines are regulating tanks, and there is also a surge tank located between the main regulating reservoir and the Wynnewood pumping plant. There is a chlorination plant, a caretaker's residence and warehouse downstream from the dam on State Road 7, near the aqueduct crossing. The project also contains basic recreation facilities, such as firepits, boat launching sites, restrooms, and picnic tables.²¹

Post-Construction History

One of the projects that Reclamation oversaw at Arbuckle was the construction of a Job Corps Conservation Center for troubled youths. Administered by the Bureau of Reclamation, the center was activated by the agency on November 17, 1965. Although the center was technically complete, the ground had been torn up from the construction process, and the winter rains turned the ground to mud soon after the first corpsmen arrived. Thanks to nature, one of their first tasks was to make the grounds and center presentable. By the time the center was officially dedicated on April 23, 1966, all the buildings were underpinned, breezeways were installed at the building entrances, and a rock garden had been planted, as well as a variety of vegetation. The JCCC provided training in a variety of vocational disciplines, including carpentry, forestry, metalworking, and mechanics, applying those skills while at the center primarily to upkeep of the recreation areas. The center also provided the means for its participants to acquire an

21. *Project Data*, 5-6.

education. The participants followed two-week schedules, working on vocational skills one week, then educational tasks the next. On June 30, 1969, the center was closed down; it was among a number of centers which were closed by the Nixon administration when funding was withdrawn.²²

The Arbuckle Project in its short history has experienced continual modification processes, as well as disputes over water allocations. The first of these modifications were done in 1969 shortly after completion of the project, when spray bars were installed at the Sulphur sewage effluent plant and the float switch settings were raised a foot. This was done to prevent multiple cycling of the pumps, which wears down the pumping equipment much faster. After a backflow occurred on April 17 of that year, a new gate on the overflow outlet was installed. A more serious problem was encountered on October 8, 1970, when a rainstorm, averaging six inches of precipitation, flooded the town of Sulphur, and causing an inflow to Arbuckle Reservoir of 82,000 cubic feet per second. Rock Creek overflowed, then overtopped the dike at the effluent pumping plant; fortunately, most of the equipment at the plant remained salvageable, while the total cost of repairing the facility was about \$1,500 in labor and materials.²³

In September of 1971, a Review of Maintenance Examination recommended that the toe drains be dug out and extended underneath the Southern Oklahoma Water Company's water line; this was accomplished in October. In 1972, a study was conducted which revealed that the oxygen content of Arbuckle reservoir below thirty feet was non-existent, prompting a proposal for aeration and destratification of the dam. Reclamation proposed an experiment with a bubble-gun aerator, which was conducted in from July to November of 1973, and discontinued in June of 1974 when the program proved to be inefficient. The destratification apparatus was installed

22. L.R. Andersen, "World of Work and Training at Arbuckle," *Reclamation Era* 53, no. 1(February 1967): 20-23; Jaime Pettiti, Bureau of Reclamation, Retired, Assistant to Head Engineer on Arbuckle Project, telephone conversation with author, 30 June 2000.

23. "Annual Project History, Arbuckle Project," Volume V, 1969-1970, 8-12.

beginning March 29, 1977. Another important aspect to the project's maintenance has been weed control measures; this was accomplished through mowing along the embankments, copper sulfate in the regulating reservoir at intervals necessary to kill aquatic weeds, and the use of chlorine at the Sulphur Effluent Plant. Although the AMCD has had to remain vigilant in regards to small maintenance problems that occur with any large reclamation project (from 1971 to 1976, there were 21 maintenance projects in the water storage and conveyance facilities alone), in the early years, the staff at the project and its administration kept it relatively well-maintained.²⁴

However, its location near the Wichita-Ouachita earthquake zone resulted in the classification of the dam as "conditionally poor," when a Safety Evaluation of Existing Dams report (SEED) was done in 1985. The foundation of the dam consists of shale, limestone, and conglomerate bedrock beneath about 20 feet of various residual, colluvial, and alluvial soils. It was found that the potential for piping (a process where an embankment dam begins to leak, eroding a "pipe" into the embankment, thus resulting in internal erosion) existed at the main embankment. The SEED report revealed that the highest risk for this hazard existed in the clay and gravel foundation strata, as well as through contact between alluvial gravels (deposited sediments), and the clay and Zone 1 material in the northern portion of the dam. If an earthquake greater than, or equal to, a magnitude of 6.3 occurred, it could potentially liquify the embankment foundation; this would in all probability cause the dam to fail, and inundate the town of Dougherty two miles downstream. This risk was exacerbated by the calculation that if the probable maximum flood level was greater than 65%, the dam could overtop and potentially cause dam failure. Reclamation recommended the installation of piezometers, which would allow the AMCD to monitor the dam's seepage and conduct piping investigations. Most recently, in 1998, a Review of Operation and Maintenance report revealed that Arbuckle Dam

24. "Annual Project History, Arbuckle Project," Volume VI, 1971-1976, 22-25; "Annual Project History, Arbuckle Project," Volume VII, 1977-1980, 36-37.

was in satisfactory condition, and recommended simple procedures such as cleaning the debris from the spillway conduit, and repairing and resurfacing the river outlet works chute.²⁵

Because the Arbuckle Project serves six towns, the recreation area, and in its early years, the Goddard Youth Camp and the JCCC, there has been a great deal of debate since its completion as to who gets allocations of water and the quantity of those allocations. When water deliveries from the project first began in September 1967, the water was delivered through the Wynnewood Aqueduct to Wynnewood and Davis, Oklahoma, as well as the Kerr-McGee refinery. Dougherty tapped into the reservoir via its own pipeline, and the recreational areas and Goddard youth camp used their own facilities. In 1969, arrangements were made with the Southern Oklahoma Water Corporation(SOWC) to sell the organization a portion of the water. A contract for the AMCD to supply the SOWC with a million gallons of water a day at a cost of \$50 per day was signed, and installation of the water lines began July of 1970. The Arbuckle Reservoir Monitoring project was also established during 1970, for the purpose of testing the water quality of the reservoir. This included such factors as minerals, bacteria, and chemical tests from pre-impoundment to post-impoundment, including diversion of the area's creeks.²⁶

Perhaps the biggest fight over Arbuckle's water resources occurred in 1970. The city of Lawton, Oklahoma, attempted to buy a portion of the unallocated water resources in Arbuckle Reservoir. The city of Ardmore, which originally was supposed to receive project water but had pulled out at the last minute. Ardmore sued Lawton in order to prevent sale of the water and to acquire the resources for themselves. The case went to the Oklahoma Supreme Court, which ruled that Ardmore, since it was within the project's delivery district, was entitled to first rights of the water. Contracts were subsequently drafted and executed in May of 1971 calling for

25. United States Department of the Interior, Bureau of Reclamation, Division of Dam Safety, *SEED Report on Arbuckle Dam*, Great Plains Region: July 1985.

26. "Annual Project History, Arbuckle Project," Volume IV, 1967-1968, 8; "Annual Project History, Arbuckle Project," Volume V, 1969-1970, 7-8.

delivery of 11 million gallons a day to Ardmore, including construction of a pipeline, at an estimated cost of \$4.776 million to the city. Graduated payments on the project would begin Septmeber of 1973, and continue until 2018. Another change in water allocation occurred in 1975, when the Dougherty Public Works Authority requested and received an increase in its water allocation from 15 to 112 acre-feet a year; for some time, the city had been taking out a total of 30 acre-feet a year prior to the increase in their allocation.²⁷

Recreation is another important aspect of the project, as evidenced by the inclusion of such facilities in the project's original plans. The reservoir and its recreational facilities are known as Lake of the Arbuckles, and it offers a wide variety of activities to its visitors each year, including camping, boating, and fishing. After the facilities were completed, the administration was turned over to the National Park Service, while the wildlife and fishing areas are administered by the Oklahoma Wildlife Conservation Commission. In 1976, Platt National Park, where the project is located, became part of the newly-formed Chickasaw National Recreation Area, which also included Turner Falls. All the facilities offered similar recreational opportunities. After the recreation area was formed, the project was divided into two sections: the east side land and water areas were designated for administration of recreational areas, while the west land and water areas were set aside exclusively for construction, operation, and maintenance activities of the Bureau of Reclamation. The recreational facilities have recently undergone renovation, especially on the campsites. Simple tent sites and restrooms, now includes showers and electric and water hookups for trailers and campers.²⁸

Settlement of the Project

27. "Annual Project History, Arbuckle Project," Volume V, 1969-1970, 9; "Annual Project History, Arbuckle Project," Volume VI, 1971-1976, 20-21, 51.

28. "Annual Project History, Arbuckle Project," Volume V, 1969-1970, 7; "Annual Project History, Arbuckle Project," Volume VII, 1965, 4-5, 9-10. Judy Kohler, Chickasaw National Recreation Area, Oklahoma, telephone conversation with author, 30 June 2000.

The waters of the Arbuckle Project are strictly for municipal and industrial use, with recreational benefits. As such, the project did not target any lands for settlement. Although it is unclear exactly how much urban growth in the area can be attributed to the project, the project itself currently serves the municipal and industrial water needs of over 42,000 people combined. This indicates that the presence of the project has a broad impact on the water supply for a significant number of people, and if it has not been a major factor in the area's urban growth, it has certainly stabilized the region's water supply.²⁹

Uses of Project Water

The Arbuckle Project provides a stable, reliable source of water to the cities of Sulphur, Davis, Dougherty, Ardmore, and Wynnewood, including the Kerr-McGee oil refinery and Ardmore Industrial Air Park. The project also provides flood control benefits for the towns it serves; from 1972-1976, the benefits ranged from \$2,000 to \$115,000 per year, accomplished through monthly releases that ranged from 586 acre feet to 26,351 acre-feet.

Although the project is primarily for municipal and industrial use, the reservoir and the surrounding areas provide full recreational facilities that have proved immensely popular since completion of the project. The Lake of the Arbuckles is a prime spot in Oklahoma to fish for bass, perch, catfish, and crappie, due to the fact that the nature of the project's use demands little drawdown during the summer months. Boat ramps built during the construction period ensures a means of recreation for boaters, and there is a swimming beach and camping facilities in the region. Hunting is also allowed, in season. Between 1975 and 1976, the annual visitation was over 200,000 visitor days, while the overall visitation for the Chickasaw National Recreation Area is approximately 3.5 million. In 1992, the Lake of the Arbuckles attracted nearly 250,000

29. United States Department of the Interior, Bureau of Reclamation, *1992 Summary Statistics* (Denver: US Government Printing Office 1992), 64.

visitors.³⁰

Conclusion

The Arbuckle Project has proven in its short existence to be vital contributor to the economy and society of the Arbuckle Mountain Region. The visitors who frequent the reservoir and its recreation areas receive a glimpse of the pristine beauty of the Lake of the Arbuckles in the Chickasaw National Recreation Area that the local residents enjoy on a daily basis. Nearby towns receive a stable supply of water for many of the municipal and industrial needs that ensure healthy living and strong economic environment. As the source of these benefits, the Arbuckle Project will continue to be the hub of the Arbuckle region for many years to come.

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30. "Annual Project History, Arbuckle Project," Volume VI, 1971-1976, 4-5; Judy Kohler, Chickasaw National Recreation Area, Oklahoma; *Project Data*, 5-6; United States Department of the Interior, Bureau of Reclamation, *1992 Summary Statistics*, 114.

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