Colorado-Big Thompson Project

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Colorado-Big Thompson Project

From planner's dreams to blueprints to everyday operation, notoriety has been the companion of the Colorado-Big Thompson Project at every step. The challenge of harnessing the Western Slope headwaters of the Colorado River to service the state's Eastern Slope plains came with a series of natural and man-made roadblocks. In confronting this challenge, Reclamation not only tackled a mountain range and the laws of gravity, it fought fraternal squabbles with other Federal agencies, dealt with protests over the preservation of Rocky Mountain National Park, oversaw squabbles between Western Slope and Eastern Slope Colorado, and waited through labor disputes, water rights wrangles, material and manpower shortages, and delays resultant from World War II.

Reclamation designed the Colorado-Big Thompson, or CBT, to collect and deliver up to 310,000 acre-feet of water annually from the Colorado River Basin. High in the Rocky Mountains, the project gathers snowmelt for four dams and pumps upwards to a similar number of reservoirs. Moisture is transported west to east 3,800 feet beneath the Continental Divide through the 13.1-mile Alva B. Adams Tunnel. On the eastern third of its journey, the water cascades down to the different diversion structures for delivery to farms and an increasing number of housing developments. The entire project contains more than 100 major features, 125 water user organizations, 60 reservoirs and many distribution canals. In two decades, this Rocky Mountain saga helped transform Northern Colorado into one of the nation's most productive agricultural regions, and laid the foundation for a tract-home land rush along the state's Front Range.

Project Location

It starts with white snows and gray winters and runs from the pine trees and peaks down beneath the 14,000 foot Continental Divide before stopping in the tall grass prairies of Colorado's northeastern corner. The terrain covered by the Colorado-Big Thompson is a tour across the climates and regions within the state's borders. The CBT Project spans 250 miles east-to-west from Brush on the high plains of Eastern Colorado to Kremmling in the high

mountains of Western Colorado. The service area stretches 65 miles north-to-south from near the Wyoming border to the city of Boulder. The CBT furnishes supplemental water to approximately 720,000 acres and more than 400,000 people in the South Platte River Basin. It also provides power to the towns of Longmont, Loveland, Boulder, Fort Collins, Greeley, Fort Morgan, and Sterling, and overall, eleven communities receive municipal and industrial water from the project.

In Colorado, precipitation is the treasure that gets harder to find farther down the peaks or on the eastern slope. Elevations over 10,000 feet usually receive 30 inches or more a year of moisture in the form of rain, snow, sleet, and hail. Only in July and August does the average daily minimum temperature work its way above freezing. At Grand Lake, (elev. 8,369 feet), yearly moisture averages 16 inches. East of the mountains average annual totals drop to 12.5 inches at Greeley, but increases to 16.5 inches a year at Julesburg, near the Nebraska line. The eastern slope is the extreme western Great Plains, and has a climate of warm, sunny days during the spring and summer and cool nights favorable for agriculture.[1]

Historic Setting

Directed by newspaper editor Horace Greeley's admonition to "Go west and grow up with the country," the settlers of the Union Colony, later to become Greeley, Colorado, built their community in the spirit of the pundit's words. They soon discovered their new settlement desperately needed water. The shallow valleys and flat prairies of the South Platte River and its tributaries were home for the buffalo, but dry, bare of trees and other vegetation. Soon after their arrival in the 1860s, northeastern Colorado pioneers plowed small ditches from nearby creeks to irrigate a few acres of land.

In 1870, the Union Colony boasted 2,000 people and irrigated about 12,000 acres along the Cache la Poudre River. The following year, the colonists built the first planned irrigation

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1. U.S., Department of the Interior, Water and Power Resources Service, *Project Data*, (Denver: United States Government Printing Office, 1981), 251-61; U.S., Department of Interior, Bureau of Reclamation, *Colorado-Big Thompson Project: Technical Record of Design and Construction*, Vol. 1, (Washington, D.C., Government Printing Office, 1957), 5; U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Colorado-Big Thompson Project, Colorado*, Vol. 22, 1959, 8.

ditch in Colorado Territory, the 27-mile long Greeley Canal No. 1. Similar irrigation enterprises followed at Fort Collins, Longmont, and Loveland. A series of water rights disagreements among different small towns led to the creation of Colorado's innovative irrigation laws. The lessons learned on the high plains were enacted into the state's water codes and establishment of water districts in 1879. The close of the nineteenth century saw a spate of reservoir construction in northern Colorado aided by a decade of above average precipitation. By 1910, the limitations of the reservoirs then in use stimulated discussion among farmers, businessmen, and engineers on the possibility of transmountain diversion to the plains.[2]

The idea of mastering the Colorado River had been kicking around the state for at least thirty years. In 1889, the legislature appropriated $20,000 for a survey led by state engineer K. P. Maxwell. His job was to research the feasibility of drilling a tunnel from Monarch Lake on a Colorado River tributary to St. Vrain Creek, a tributary of the South Platte. The legislature also spent $3,000 to survey the possibilities of diverting water from the North Platte, Laramie, and Colorado Rivers to the South Platte. No action resulted from either study. During this era, the expanding political and economic influence of agri-business heightened the demand for water along the Front Range. Between 1890 and 1905, beet sugar factories owned by Great Western Sugar Company opened in Loveland and Greeley and two other smaller communities. The sugar beet crop increased the value of land in Weld, Larimer, and Morgan Counties, where most of the crop grew. Great Western Sugar eventually operated 11 of their 17 plants from the foot of the Rockies to the Colorado-Nebraska border.[3]

In 1904, the newly established United States Reclamation Service (USRS) concluded a report which suggested raising the elevation of Grand Lake 20 feet. At the lake's outlet, a dam would create a reservoir storing about 140,000 acre feet of water. The plan included construction of a 12-mile tunnel from Grand Lake to either the Big Thompson River or St. Vrain

2. U.S. Congress, Senate, *Synopsis of Report on Colorado-Big Thompson Project, Plan of Development and Cost Estimate Prepared by the Bureau of Reclamation, Department of Interior*, 75th Congress, 1st session, June 15, 1937, 5-6; J. M. Dille, *A Brief History of the Northern Colorado Water Conservancy District and the Colorado-Big Thompson Project*, (Loveland, Colorado: NCWCD, 1958), 3.

3. U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Colorado-Big Thompson Project*, Vol. 1, 1938-9, 3-4; U.S., Department of Interior, Bureau of Reclamation, *Accomplishments of Irrigation Weld County, Colorado*, (Denver: February 1952), 4.

Creek. The report languished for years, but in the thoughts of many Northern Coloradans, its proposals were worth pursuing. Eleven years later, Congress passed a bill creating the 260,000-acre Rocky Mountain National Park, 50 miles northwest of Denver. That bill shaped the direction of future transmountain diversion in the area. The measure specifically granted permission for the USRS to "enter upon and utilize for flowage or other purposes any area within said park which may be necessary for the development and maintenance of a Government Reclamation Project."

On November 22, 1922, the federal Colorado River Compact apportioned the river's water between the upper and lower basin states. Later in the decade, the Boulder Canyon Act provided funds for determining the amount of lands under irrigation in the Colorado River Basin. In the 1920s, as Washington regulated the Colorado's future, the first summers of the Dust Bowl crossed the plains bringing heat and blowing soil to wither nearly $47 million in crops. The increasing ferocity of the weather convinced Colorado's Democratic Senator, Alva B. Adams, to push the federal government for the adoption of a transmountain diversion project. The former banker from Pueblo, described as "on the conservative side," endeavored to convince the "New Deal" administration of President Franklin D. Roosevelt that a mammoth water project would benefit not only the state's agri-business, but its other local economies as well.[4]

As Adams worked his way through the highest levels of bureaucracy in Washington, back on the high plains, some local citizens sought to attack the problem from a different angle. On August 14, 1933, a meeting between George M. Bull, Colorado engineer for the recently formed Public Works Administration (PWA) and the Commissioners of Weld County hashed over the feasibility of this public works venture. Those in the room saw the creation of a "Grand Lake" project as a counter-attack against the Depression. Locals claimed Weld County was the world's largest area under irrigation, 4,022 square miles -- a region the size of Connecticut -- and

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4. U.S., Department of Interior, Bureau of Reclamation, *The Story of the Colorado-Big Thompson Project*, (rev. ed.), (Washington, D.C.: Government Printing Office, 1968), vi; Vaughan Mechau, "East Meets West," in *The Reclamation Era*, (August, 1947): 171; Daniel Tyler, *The Last Water Hole in the West: The Colorado-Big Thompson Project and the Northern Colorado Water Conservancy District*, (Niwot, Colorado: The University Press of Colorado, 1992), 44-5. The Secretary of the Interior Harold L. Ickes made the observation about Senator Adams.

in need of more water to further stimulate the agriculture-dominated economy. Soon, the plan was the center of discussion in Northern Colorado's dusty town halls, clubs and lodges, and private offices. O. G. Edwards, president of the Greeley Chamber of Commerce, appointed a group known as the "Grand Lake Committee" in June 1933 to undertake surveys and solicit funding. By 1935, the committee had evolved into the Northern Colorado Water Users Association (NCWUA).

Contributions to an expense fund poured in from Weld and neighboring Larimer Counties, the Greeley Chamber of Commerce, and private citizens. The NCWUA sought large companies with a big stake in the economic well-being of Northern Colorado: Great Western Sugar, the Union Pacific Railroad, and Burlington Railroad. These firms would benefit in some way after their investments to get the project off the ground. The expense fund's first major expenditure went to hire two local engineers to prepare a report on the diversion potential of Grand Lake. Simultaneously, those private citizens with a taste for economic and civic activism decided to ask the PWA for a grant and a loan and try to get Reclamation interested in the project.[5]

Every region desirous of Reclamation's arrival always had one or two energetic representatives to issue invitations to the government to come and build, but few had as many resources as Charles Hansen. From 1902, until his death in 1953, Hansen was editor of the *Greeley Tribune* newspaper. A good deal of that career was spent fighting for transmountain diversion to the Colorado plains. Known as the "Godfather of the CBT" in his later role as president of the Northern Colorado Water Conservancy District (NCWCD), Hansen organized high plains farmers, businessmen, and local politicians to familiarize Reclamation and the federal government with the advantages of Northern Colorado. Hansen was an apostle of "quiet evangelism" as he coaxed all parties involved to support this work. One writer wooed by Hansen's objectives stated, "He would talk in a low voice to anyone who would listen; then he would take you down in the basement of the *Tribune* and show you the worksheets, the

5. J. M. Dille, *A Brief History of Northern Colorado Water Conservancy District*, 11-2; *Denver Post*, 2 June 1936, p. 16.

preliminary drawings, the calculations. You would come away convinced that the CBT project would somehow, some day, come into being." Hansen's mission continued until the last days of his life, as he would come into the *Tribune* offices and confer with conservancy district officials and his staff and "his questions to all were most frequently concerning the progress of the project."[6]

By the mid-1930s, progress toward the CBT was underway. The people of Northern Colorado, state government, and decision makers in the Federal government believed in the project, but backers were about to face opposition from an unexpected source.

Project Authorization

Similar to many Reclamation projects, the road to authorization for Colorado-Big Thompson was often regionalized and raucous, but unlike other projects, this battle was pitched, public, and an item of national debate. On January 21, 1935, a little publicized transaction occurred when the Public Works Administration (PWA) allotted Reclamation $150,000 to survey Grand Lake-Big Thompson. In early spring, W.C. Mendenhall, director of the U.S. Geological Survey, agreed to provide an impartial report on the Grand Lake proposal.

In June, flamboyant Secretary of the Interior Harold L. Ickes asked the National Park Service if they had any apprehensions over beginning the Grand Lake project. The Park Service responded with a laundry list of worries over the future of Rocky Mountain National Park. A proposed covered conduit blocking park vistas, dumping rubble from the tunnel excavation inside the park and an overall decrease in park attendance troubled by construction, were the Park Service's primary complaints. On July 3, putting their concerns to one side, Reclamation Commissioner Elwood Mead proceeded with a survey after an agreement was reached between his Bureau and the Park Service.[7] On October 7, 1935, U.S. Attorney General Homer S. Cummings ruled the Grand Lake venture was a "Government reclamation project," and the

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6. *Rocky Mountain Herald*, 5 November 1955, p. 1; *Greeley Tribune*, 24 May 1953, p. 1; *Rocky Mountain News*, 1 November 1955, p. 36. Impressions of Hansen came from Colorado's "poet laureate" Thomas Hornsby Ferril.

7. Brit Allan Storey, "Putting the Secretary on the Hot Seat: The Bureau of Reclamation and the National Park Service at Odds," paper delivered at Western History Association Annual Meeting, Austin, Texas, October 18, 1991, 10.

Bureau of Reclamation now asserted permission to enter upon and use any area within the Rocky Mountain National Park necessary for the development of the project.[8]

The following year, 1936, momentum for and against Grand Lake grew in both Colorado and Washington. On February 8, Porter J. Preston, Reclamation's senior engineer in Denver, delivered a preliminary report containing an estimate of $43 million to complete the Grand Lake-Big Thompson Transmountain Project. Later that month, Park Service officials went on the record stating, "the National Park Service must take a position in opposition to this legislation because of the impairment to the Rocky Mountain National Park."

For most of 1936, the transmountain diversion project was under attack. The grassroots resistance to the proposed Grand Lake project was one of the few examples of natural resources activism between the Progressive Era and the ecology movement of the 1960 and 1970s. In March 1936, an avalanche of angry telegrams and letters buried Ickes' desk. Protests reaching Interior's offices ranged from Western Slope newspapers, the National Lumber Manufacturers Association, the American Association for Advancement of Science, the National Association of Audubon Societies all the way to the Westchester County Conservation Association of White Plains, New York. In spite of Reclamation proposing both portals be located outside the park and promising minimal abuse to the natural surroundings, opponents strongly felt the park and Grand Lake would be ruined by construction and tunneling. Additionally, they feared wildlife would be harmed by fluctuation in Grand Lake. Ecologists accused the state, federal government, and Reclamation of conducting a "scheme of deception" to run the Grand Lake project past the American public.[9]

Residents of Colorado's western slope also opposed any plan that would remove their access to the Colorado River. To the casual observer, the sparsely populated region appeared to have little clout protesting the charge of a Federal bulldozer, but the "dean of the United States

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8. U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Colorado-Big Thompson Project*, 1938-9, 4; U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Colorado-Big Thompson Project, Colorado*, Vol. 46, 1983, 74.

9. U.S., Department of Interior, Bureau of Reclamation, RG 115, General Correspondence File, 1936 and October 1937 through September 1939; Box 377, Folder 970; "This Deadly Assault to be Repeated," in *The Living Wilderness*, (November 1936): 11.

house of representatives," Edward T. Taylor spoke as their voice. In congress since 1909, Taylor's stature was such that he was known as Colorado's "father of reclamation." More importantly, he served as chairman of the powerful House Subcommittee on Interior Appropriations. Taylor sought acre-foot for acre-foot compensation for any water taken from the Colorado River. Representatives from eastern and western Colorado were locked in debate over a fair solution. Compromise eventually won out, as both sides an agreed to add a 152,000 acre-feet compensatory storage reservoir providing for existing and future Western Slope growth and development. The agreement would result in the Green Mountain Reservoir, 13 miles southeast of the town of Kremmling. The settlement, and a turn in opinion in favor of the project once the economic benefits of CBT were disseminated among the general public, won over this important man and group to the government's side.[10]

Reclamation worked with local supporters and the NCWUA in an attempt to win the hearts of the public. Plaster models of the proposed works were exhibited across the United States and swayed public opinion and congressional appropriations. The miniature dams, reservoirs and tunnels illustrated the point that transmountain diversion would benefit Colorado with little damage to the park's natural beauty. Leading the campaign Reclamation's Chief Engineer R. F. Walter, suggested the name of the Grand Lake project change to prevent any further public antagonism. According to Walter, the name Grand Lake was, "to a certain class of people, like waving a red flag at a bull." More a statement of purpose than a name change, Walter added, "The project is to divert the waters from the upper Colorado River into the Big Thompson River. It therefore seems consistent and it is recommended that the official name of the project be changed to Colorado-Big Thompson project." Commissioner John Page agreed and the rechristening occurred on July 18, 1936.[11]

The argument over CBT lingered for another year in the media and the executive and

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10. Storey, "Putting the Secretary on the Hot Seat," 22; *Denver Post*, 4 September 1941, pp. 1, 9.
11. *Annual Project History, Vol. 1, 1938-39*, 5; U.S, Department of Interior, Bureau of Reclamation, Record Group 115, Engineering Correspondence File, 1936, Box 377, Folder 970. According to Walter's letter, J.C. Stevens of the National Planning Board came up with the idea to change the name of the project. (Record Group 115 hereafter identified as RG 115).

legislative branches of government. Loggerheads were broken on June 24, 1937, as the 75th Congress unanimously passed Senate Document 80, a plan of development and cost estimates. On August 9, Congress appropriated an initial $900,000 for CBT as part of Interior Department Appropriations Act in accordance with Senate Document No. 80. Congress may have given the green light to CBT, but there remained one final public discussion. On November 12, 1937, Ickes showcased all his rhetorical powers at a public hearing on CBT held in Washington, D.C. Succumbing to a touch of martyrdom, Ickes paternally requested peace between both departments, "Fortunately, or unfortunately, both the Reclamation Bureau and the Park Service are in the Department of the Interior -- and I love them both. . .It is largely a question of fact, it seems to me, whether the park would be adversely affected, or, if it should be affected, whether there could be any compensation for that." Although Congress granted Reclamation authority to pursue CBT, the Secretary's opinion of the project was so well known during the hearings a headline on the front page of the November 12, *Denver Post* read: "Ickes Says He is Forced to Favor It." Appealing to the conservationists, the former Chicago newspaperman turned environmental defender explained, "If I hold this project infeasible, I will probably go to the guillotine. If I should go to the guillotine, how many of you would go with me?"[12]

Those willing to stand by Ickes on the scaffold included Sen. Adams, and Colorado's Representatives in the House, Edward T. Taylor, Lawrence Lewis and Fred Cummings. Among those sharpening their blades during testimony were a Park Service spokesman who darkly predicted the project would be "the opening wedge which would eventually lead to destruction of the national park system." Colorado's pro-CBT newspapers described those speaking against the project as "Richly dressed women civic planners. . .landscape architects of national reputation and zealots." One woman against CBT evoked a greater power than the federal bureaucracy when she thundered, "if God had wanted crops grown there (Northern Colorado) he

12. U.S., Department of Interior, Bureau of Reclamation, RG 115, *Statements Presented at the Hearing before the Secretary of the Interior on the Colorado-Big Thompson Transmountain Water Diversion Project, November 12, 1937*, General Correspondence Files, October 1937 through September 1939, Box 377, Folder 970; *Denver Post*, 12 November 1937, p. 1.

would have provided the water to do it with."[13]

Construction was contingent on the development of a conservancy district to contract with the federal government. In 1937, the first step taken by the Colorado Legislature was passage of the Colorado Water Conservancy Law. In Colorado, a conservancy district can be organized by any district court by petition from a pre-arranged number of property owners. Land owners, and those who benefit from project development, must contribute to a project's cost and operation in proportion to those benefits. The law provided that a district could hold property, levy taxes and assessments, allot water, and contract with the Federal government. An eleven member board, headed by Hansen as president, organized and met as the state's first water district on September 28, 1937. The Northern Colorado Water Conservancy District would serve as the fortress against the controversies the CBT faced. The NCWCD covers 1.5 million acres of Colorado including almost all of Larimer, Boulder, and Weld Counties and portions of Morgan, Washington, Logan, and Sedgwick Counties.[14]

On July 5, 1938, a contract agreement between the NCWCD and the federal government maintained the district had to repay half the estimated $44 million in construction authorized by the 1938 Interior Department Appropriation Bill. Under the Bill, the district's maximum obligation is $25 million over a 40-year period and without interest. The contract also asked the NCWCD to pay for additional design features it requested to be built into the project but not covered by the original contract. The contract was amended to increase the District's fixed construction obligation by $1,031,000, and $2.9 million additional revenues from water service preceding the start of repayment installments for applications against increases in the construction costs. The total fixed construction obligation, plus revenues from water rentals is $28.9 million. In 1957, the district took control of facilities integral to its project area and began its 40-year repayment schedule. The district paid fixed annual water rental charges through 1961, and made annual payments on construction charges for the ensuing 40 years. The district

13. Nello Cassai, "Big Tom, Colorado's Fruitful Giant," *Denver Post Empire*, 1 December 1968, p. 60; *Rocky Mountain News*, 13 November 1937, pp. 1, 3.
14. Dille, *A Brief History of the Northern Colorado Water Conservancy District and the Colorado-Big Thompson Project*, 12.

meets its obligation through water assessments and a one-mill ($1 on each $1,000) ad valorem tax on property in the district. The federal government assumed half of the costs, most repaid by power revenues.[15]

Three important elements surrounding CBT's authorization make it different from previous Reclamation projects. First, it provided supplemental water to existing farmlands and was not designed to reclaim uncultivated land. Second, water users were exempted in the project's authorization law from the 160-acre per person limitation of the 1902 Reclamation Act. Northern Colorado's agriculture was already in place and the amount of water each farmer received from CBT would not drastically increase the value of their properties. Finally, almost 50 percent of repayment costs would be liquidated by hydroelectric generation.[16]

On December 21, 1937, President Roosevelt approved the findings of the feasibility study and work on CBT could now commence. In a Dec. 28, 1937, press release, Ickes commended those against CBT for conducting a "splendid fight to protect Rocky Mountain National Park." The park's defenders could take some solace from the final document Roosevelt signed. Reclamation agreed to abstain from construction within the park boundaries by running a diversion tunnel underneath the park. The east portal of the proposed tunnel would be 300 feet beyond the east boundary of the park while the west portal would be dug a quarter of a mile outside the western border. In addition, the Park Service had right of approval for any plans and specifications on lands scheduled to be added to the park, and the Park received both full electricity and a firm supply of water from CBT. On this agreement, Ickes pledged, "under my direction as Secretary of the Interior the interests of those devoted to the cause of our national parks will be protected." After two years of personal involvement, Ickes may not have totally supported CBT, but he understood the first rule in the role of a bureaucrat -- follow orders from

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15. "Green Mountain Dam, Colorado-Big Thompson Project, Colorado," in *The Reclamation Era*, (December 1938): 255; Tyler, *The Last Water Hole in the West*, 250; U.S., Department of Interior, Bureau of Reclamation, *Repayment of Reclamation Projects*, (Washington, D.C.: United States Government Printing Office, 1972), 100. The NCWCD moved to Loveland in 1954 to be closer to the project's water distribution facilities. Reclamation followed a month later building a project office near NCWCD headquarters.

16. "The District and the Bureau: Thoughts on a Partnership," in *Waternews*, (September 1987): 22. *Waternews* is published by the Northern Colorado Water Conservancy District (NCWCD).

above.[17]

Construction History

On an unusually warm October 12, 1938, private engineers from around the country, Reclamation staffers, and other interested parties met in downtown Denver's Customhouse to watch the opening of five bids on construction of the highest and largest earth-fill dam ever built by the Bureau. A little more than a month later in Washington, Ickes announced the first contract awarded to the Warner Construction Co. of Chicago on a low bid of $4,226,206.20. The contract covered the building of the Green Mountain Dam and power plant located on the Blue River. Warner had 1,620 days to complete the dam and power plant -- approximately May 1943. The design of the earth and rockfill dam called for it to stand 309 feet high with a crest of 1,150 feet and hold 4.5 million cubic yards of material. An adjoining reservoir would cover 2,000 acres and hold 152,000 acre-feet. Construction of Green Mountain Dam came first because of the agreement with Western Slope water users. Assuring water diverted to the fields and towns of Eastern Colorado would not impinge on Western Slope water rights, Green Mountain delivers 52,000 acre-feet a year to the Western Slope of Colorado.[18]

On Dec. 1, 1938, perhaps as a result of the pre-construction media overkill, the *Denver Post* buried the story of the first official day's work deep in its editions, while the other Denver daily, the *Rocky Mountain News*, did not bother to cover the story at all. Some work began two months earlier when Reclamation commenced preliminary clearing of a campsite and stringing of power lines from Dillon to the damsite. In that first winter in the mountains, Warner's men completed the camp, moved in equipment, eventually boring the diversion tunnel for Green Mountain Dam. In May of 1940, the tunnel was completed as workers dug 150,000 yards of

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17. U.S., Department of Interior, Bureau of Reclamation, RG 115, "United States Department of the Interior, Memorandum for the Press, Dec. 28, 1937," General Correspondence File, Box 377, Folder: Colorado-Big Thompson, Engineering Reports, October 1937 through September 1939; "Colorado-Big Thompson Project," in *The Reclamation Era*, (April 1947): 83.
18. *Denver Post*, 13 October 1938, p. 34; U.S., Department of Interior, Bureau of Reclamation, *Colorado-Big Thompson Project: Technical Record of Design and Construction*, Vol. 2, (Washington, D.C.: Government Printing Office, 1957), 5,8.

earth.[19]

The dam embankment contains about 3.5 million cubic yards of clay, sand, and gravel roller compacted in six-inch layers. The capacity of the reservoir is 154,600 acre-feet. The width of the embankment's base is 1,500 feet eventually narrowing to a 40-foot wide crest. The dam's downstream face is made up of 740,000 cubic yards of cobblestones and coarse rock. Green Mountain also contains outlet works, a 1,070 foot concrete-lined open channel spillway, and a hydroelectric generation plants containing two generators. The primary source of rock came from a borrow pit on the left abutment above the dam site. Overseeing activities were Reclamation construction engineer R. B. Ward and Warner general superintendent J. D. Fogg.[20]

Because of the site's remoteness and the severity of high country winters, most construction at Green Mountain Dam was seasonal. Attempting to avoid excessive delays, Reclamation extended the existing road from Kremmling -- the nearest railroad point -- to the dam and camp. Warner built a small town on the left bank of the Blue River, 1,200 feet upstream from construction. The camp consisted of 25 bunkhouses, commissary, mess hall, warehouse, and field offices. On average, the bunkhouses sat 200 chilly feet away from the community bathhouse. Early in construction, trailers, small shacks, and tents bloomed near the work site. In an attempt to comply with sanitary regulations, Warner laid gravel roads and installed water, sewer and street-light systems. Workers had to pay $6 per month for a space of 30 x 40 feet, electricity, use of the laundry room, and trash collection and disposal. Reclamation's headquarters camp was a thousand feet upstream from the southwest end of the dam. A one room school barracks held 39 to 46 grade school children and five to eight high-schoolers. During CBT's next eighteen years, the government built four other camps on the project (Estes, Shadow Mountain, Loveland and Fort Collins) to house laborers.[21]

Controversy again followed CBT during its first spring and summer of construction. On

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19. *Denver Post*, 2 December 1938, p. 21; "Green Mountain Dam," in *Western Construction News*, (March 1941): 80.
20. "Green Mountain Dam, Colorado-Big Thompson Project, Colorado," *The Reclamation Era*, 255.
21. "The Contractor's Camp at Green Mountain Dam," in *The Reclamation Era*, (April 1940): 120-1, 123; "School Facilities and Instruction at Green Mountain Dam," in *The Reclamation Era*, (April 1940): 120; *Colorado-Big Thompson Project: Technical Record of Design and Construction*, Vol. 2, 177.

July 12, 1939, a strike was called by five American Federation of Labor (AFL) craft unions to support demands for collective bargaining recognition and a closed shop. The State Industrial Commission called the shutdown illegal, because union officials failed to comply with a Colorado statue requiring 30 days notice of intention to strike. The NCWCD also came out against labor's walkout, saying they were in favor of an open shop to hire non-union men. For two-and-a-half weeks, there were no direct negotiations between the union and Warner. A Department of Labor mediator, P. W. Chappell, separately consulted with both factions to resolve the issue. Reclamation chose to stay on the sidelines, according to engineer Preston, as the strike was "a matter for the contractor and workers to settle between themselves."[22]

Summit County, home of Green Mountain Dam, swirled in rumors of local unionists phoning Denver's AFL headquarters for 500 reinforcements and "dozens of cars and trucks carrying an estimated five hundred Mexicans, Negroes and hard cases" on route to the mountains to join the strikers. Warner tried to hire strikebreakers, and at 4:30 on the afternoon of August 1, an anti-union caravan headed toward the main gate only to find the road littered with structural iron and equipment. Leading the strikebreakers' charge was a local blacksmith, Dan Hore, who "drove his car squarely against the wooden gate, smashing it down." Behind Hore, a "back to work" force of "100 former employees and 100 ranchers and businessmen," quickly dispersed the pickets. Described by a Denver newspaper, the strikebreakers were, "Jumping from their cars," driving "the picket force aside by sheer force of numbers." At the end of the day, two picket lines had been broken. The sole injury belonged to one strikebreaker, his scalp cut by a flying rock.[23]

On August 4, Colorado Governor Ralph Carr called out a National Guard force equipped with rifles, machine guns, and two tanks. The Governor wished the disturbance would resolve itself not only for the state's image, but the Guard was draining the state treasury at a rate of $1,000-a-day. Carr declared Martial law in Grand and Summit counties, as negotiations between all parties continued. On August 22, Warner and the AFL reached agreement, and the union won

22. *Rocky Mountain News*, 2 August 1939, pp. 1-2; *Fort Collins Express-Courier*, 20 March 1939, p. 1.
23. *Rocky Mountain News*, 2 August 1939, pp. 1-2; Tyler, *The Last Water Hole in the West*, 110.

permission to sign a closed shop agreement on September 15. In Greeley, the NCWCD Board expressed its anger at Warner for ending the strike by voting to bill the company for the cost of sending men to Green Mountain to participate in the negotiations. In Washington, Ickes resented NCWCD meddling in the hiring of men on a federal project. Early in September, he told a press conference, "The Northern Colorado Water Conservancy District favored an open shop policy to encourage hiring of workers from the area . . . an area of chiefly unorganized labor." He added, "The proposition that non-urban labor should have first call on the jobs appears unfair to me in the face of the great unemployment in labor in the larger cities."[24]

In the following years, one other major labor flare-up happened. In February 1941, approximately 100 AFL members excavating the Alva B. Adams tunnel stopped work protesting the federally mandated wage scale for tunnel bore workers. The Department of Labor's minimum wage scale remained, but the union struck a deal with S. S. Magoffin Co., of Englewood, Colorado, contractors of the first tunnel boring unit. Wages increased from 80 cents to $1.10 an hour for tunnel miners and from $1.10 to $1.25 for mechanics and mucking machine operators.[25]

With the agreement between Warner and the AFL, management, engineers and laborers now began to concentrate on the crowning feature of the CBT. On June 15, 1940, a dynamite blast signaled the beginning of a six year odyssey. It was man against rock in a test of wills to carve out the world's longest tunnel drilled from two locations. Back in the pre-authorization and planning days of 1936, discussions among Reclamation engineers took place on how to clear the tunnel without damaging the surrounding environment. Explosive charges, or shots, would be placed at a depth where they would not blow out a hole, but only heave the surface slightly so as the leave no noticeable scars. Care also had to be exercised in placing the charges far enough away from trees. Contracts for excavation were divided among several firms. Platt Rogers, Inc. of Pueblo, would excavate the first 6,600 feet from the west portal. The first 8,000 feet of the

24. *Fort Collins Express-Courier*, 8 September 1939, p. 10.
25. "Magoffin Co. Awarded Colorado Tunnel Job," in *Western Construction News*, (March 1941): 96. Under the agreements between Reclamation, the unions and the contractors no restrictions were placed on independent arrangements between the contractors and the workers for pay increases.

east portal contract belonged to S.S. Magoffin Co. On February 3, 1941, Magoffin won an additional agreement to continue excavation from the east portal. On June 26, 1941, Stiers Brothers Construction Co. of St. Louis received the contract to continue from the west portal.[26]

In December 1941, while work on the Continental Divide Tunnel continued, teams of laborers and engineers began the centerpiece of the West Slope collection structures, Lake Granby. The bowl shaped lake stores 539,800 acre feet for diversion to the Eastern Slope. The man-made lake is 5.5 miles northeast of the town of Granby and ten miles down stream from Grand Lake. The rock and earthfill Granby Dam and four dikes collect water from the Colorado River and its tributaries and saves it for pumping into Shadow Mountain and Grand Lakes. Lake Granby's additional storage comes from the waters of Willow Creek, a westerly tributary entering the Colorado River below Granby Dam. Built between 1951 and 1953, moisture caught by the Willow Creek Dam is lifted 175 feet by pumps into Lake Granby. Willow Creek reservoir holds 10,443 acre-feet and has a 400 cubic feet per second (cfs) feeder canal extending two miles from the reservoir to the Willow Creek pumping plant. On Lake Granby's northeast corner is another pumping plant standing 12-stories high, partly submerged in the bank of the reservoir.[27]

Between Lake Granby, and below Grand Lake, sits Shadow Mountain Lake. The lake is formed by Shadow Mountain Dam, 11 miles northeast of Granby on the north fork of the Colorado River. Lake Granby water rises 125 feet from the Lake Granby Pumping Plant into a canal on a 1.8 mile journey to Shadow Mountain Reservoir. From the reservoir water flows into Grand Lake and then over a fixed weir into the mouth of the Adams Tunnel. A rockfill embankment, the East Portal Dam, is 750 feet below the east portal of the tunnel. The dam creates a pond for the regulation of outflow from Adams Tunnel and provides a headworks for the Aspen Creek Siphon to deliver water to Marys Lake. Construction on Shadow Mountain Dam and dikes lasted from April 1944 to August 21, 1946.[28]

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26. "Alva B. Adams Tunnel – Longest Ever Driven From Two Faces," in *Western Construction News*, (February 1944): 55; R. F. Walter [Chief Engineer] to John Page [Acting Commissioner], RG 115, Colorado-Big Thompson, Project Correspondence File 1936, Box 377, Folder 970.
27. U.S., Department of Interior, Bureau of Reclamation, *Colorado-Big Thompson Project: Technical Record of Design and Construction*, Vol. 3, 36, 38, 17.
28. *Colorado-Big Thompson Project: Technical Record of Design and Construction*, Vol. 2, 23, 27.

World events intervened in the completion of the CBT. On November 15, 1942, the War Production Board (WPB) suspended all work to conserve steel and other vital war material. On the last day of 1942, construction on all project features came to a halt, except Green Mountain Dam and Powerplant. By the last week of May 1943, the Green Mountain Powerplant generating units supplied power to war plants in Denver. Work brought to a standstill included the Granby Dam diversion outlet tunnel, Granby Dikes 1,2, and 4 and the remaining 2.5 miles of the Continental Divide Tunnel. Northern Coloradans with a large stake in the project's quick completion met with several administrative agencies in the nation's capital. Their efforts prompted a project review by the War Food Administration, Reclamation, and the WPB, and resulted in resumption of work on the tunnel in August 1943.[29]

On March 31, 1944, crews drilling the Continental Divide Tunnel from the west heard blasts from the eastern face 4,245 feet away. For safety's sake, work on the west side stopped June 7, 1944. On June 10, at 12:24 p.m., light was seen through both ends of the tunnel, as NBC Radio broadcast the moment live to the rest of the nation. Twenty minutes later, nine charges of dynamite blew out the remaining rock and that afternoon men from both sides met face to face under the Divide. On December 21, 1944, President Roosevelt signed legislation posthumously honoring Senator Adams for his support for and belief in the Colorado-Big Thompson Project. The Continental Divide Tunnel would begin service as the Alva B. Adams Tunnel.[30]

After excavation, and before the tunnel provided deliveries, the 9-foot, 9-inch unreinforced tunnel was lined with a one-foot thick concrete ring for water passage. A 69 Kilovolt transmission line, encased in a pipe running along the roof of the tunnel, connected east and west slope power facilities. At the beginning of 1945, war material demands curtailed work on the tunnel one final time. However, the organization responsible for allocating workers to federal project, the War Manpower Commission (WMC), permitted both contractors to hire

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29. Dille, *A Brief History of the Northern Colorado Water Conservancy District*, 35; W. Q. Reeves, "Green Mountain Dam Finished," in *Western Construction News*, (December 1943): 540; *Story of the Colorado-Big Thompson Project*, viii. Reeves was Reclamation's office engineer on the Green Mountain Dam project.
30. Tyler, *The Last Water Hole in the West*, 136; Dille, *A Brief History of Northern Colorado Water Conservancy District*, 37. In his second term as Senator, Adams died on December 1, 1941.

one shift of workers to complete the tunnel lining. In August, both the war and government restrictions ended, construction slowed only for delayed congressional appropriations, Reclamation scheduling, and temporary shortage of some materials.[31]

Time spent in excavating and lining the tunnel was either anxious or monotonous with flashes of the unexpected. Tunnelers spent long hours underground in the dark, moving forward, shot by shot. Everyday worries included cave-ins, discovering an underground stream that could flood excavation, and power cables blowing up and throwing the tunneling into complete darkness while concrete continued to flow. In the winter, numbingly cold temperatures formed ice stalagmites.[32]

In spite of these hindrances, when the two headings met under the Continental Divide, the difference in alignment and grade closure could be covered by either a penny or a quarter, depending on whose measurement you believe. The accomplishments of these men is found in the impressive statistical record of their accomplishments. Breaking through the Divide required removal of 308,503 cubic yards of earth, and installation of more than 4.2 million pounds of steel and 124,411 cubic yards to line 13 miles of tunnel. Excavation from the east portal lasted 37½ months with an average of 1,146 feet driven each month, while west portal contractors worked 31 months and averaged 833 feet per month. Through the tunnel, maximum flow could reach 550 cubic feet per second. East of the Adams Tunnel, the diverted water falls 2,900 feet as it flows through a series of tunnels, canals, powerplants and regulating reservoirs. Two fatalities occurred during 2.8 million man-hours of contract work on the tunnel.[33]

The morning of June 23, 1947, signaled the close of the most arduous aspect of the project now respectfully nicknamed "Big Tom," and the first of a series of ceremonial openings at each project feature. At 11:15 a.m., Colorado Governor Lee Knous pushed a button opening the west portal gate to water from Grand Lake. A crowd on the other side of the mountains

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31. Dille, *A Brief History of Northern Colorado Water Conservancy District*, 37.
32. *The Story of the Colorado-Big Thompson Project*, 18-9; "Alva B. Adams Tunnel -- Longest Ever Driven From Two Faces," 57-9.
33. U.S., Department of Interior, Bureau of Reclamation, "The Colorado-Big Thompson Project," (brochure), (Region 7, South Platte River District, no date), 16; A. R. Hines, "Safety on Reclamation Projects," in *The Reclamation Era*, (September 1947): 206. The most excavation performed in a 24-hour period was 74 feet.

mixed with dignitaries and dry-land farmers expected a rush of water, but instead saw an 18-inch wide stream emerge from the east portal a little after 2 o'clock that afternoon.[34]

At a banquet in Loveland that evening, Reclamation Commissioner Michael W. Straus emphasized the importance of CBT in the future of Reclamation, "If it (CBT) fares well and fulfills its promise, the rest of the plans -- the plans that will move forward for almost a century in both the Missouri Basin and the Colorado Basin -- will proceed. If it fails, the plans will falter and the hopes of many of your neighbors will be dashed."[35]

Resulting from the war's conclusion, construction materials and manpower were increasingly available. In spite of heavy snows, worked resumed in the autumn of 1949 on Granby Dikes 1, 2 and 4 and contracts were awarded for Granby Dam and Horsetooth Reservoir Dam.

After 1949, the construction on east side projects were in different states of completion. On September 4, 1947, the horseshoe-shaped Rams Horn Tunnel near Estes Park was finished. On July 14, 1948, Prospect Mountain Tunnel went into service followed by Spring Canyon Dam on August 11. October 1948 saw completion of three projects: Dixon Canyon Dam on the 19th, Marys Lake Dikes on the 20th, and Aspen Creek Siphon on October 30. The last major features of the decade, Solider Canyon and Horsetooth Dam, finished on July 20th and 21st, 1949. Both dams are on the perimeter of the 151,800 acre-feet capacity Horsetooth Reservoir. The reservoir is fed by the Horsetooth Section of the Horsetooth Feeder Canal. Soldier Canyon Dam is provided with an outlet with an outlet forming the Dixon Feeder Canal. The earth and rockfill dams are located in short, deep canyons which necessitated steep upstream and downstream slopes to contain the embankments within the canyon limits.[36]

On September 23, Olympus Dam went into service. Olympus is an earth embankment dam with a concrete gravity type spillway section. The dam forms the 3,070 acre-feet capacity Lake Estes. It also serves as the afterbay for the Estes Powerplant and is used for re-regulation

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34. "East Meets West," in *The Reclamation Era*, (August 1947): 172; *Greeley Tribune*, 24 June 1947, p. 1.
35. "East Meets West," 172.
36. *Annual Project History*, Vol. 46, 1983, 76; *Colorado-Big Thompson Project: Technical Record of Design and Construction*, Vol. 2, 67, 75.

of canal flow and river control. In 1947, excavation began on four tunnels to provide flow from Lake Estes to Flatiron Reservoir: Olympus (1.8 miles), Pole Hill (5.4), Rattlesnake (1.7) and Bald Mountain (1.3). From Flatiron, water travels north to Horsetooth Reservoir and the Poudre River. Transporting the water is the Horsetooth Feeder Canal (renamed in 1956 the Charles Hansen Feeder Canal).[37]

The canal crosses the Big Thompson Canyon about 1.5 miles upstream from the mouth of the Big Thompson River. The canyon is rugged with steep cliffs on both sides, and the canyon floor barely has enough room for the river and U.S. Highway 34. The canal crosses the river and highway in a 9-foot-diameter steel siphon. The siphon carries a capacity of 930 cfs to the Big Thompson River and 550 cfs to Horsetooth. A control structure ahead of the siphon provides water for irrigation to the Big Thompson River. It also bypasses surplus water and releases flow to the Big Thompson Powerplant, nine miles west of Loveland. A supply conduit diverts water one mile upstream from the Big Thompson River from the control structure and transfers it by tunnel to the Hansen Feeder Canal. The water provides generation at the power plant, supplies users in the Big Thompson Valley, or is stored in Horsetooth Reservoir. North of the Big Thompson River the canal passes through four concrete-lined tunnels, and the outlet of the last tunnel discharges water into the Horsetooth Reservoir. In 1949, work started on the canal and completed in 1953.[38]

In 1947, work advanced on the Estes Park Aqueduct and power system. Beginning at the east portal of the Adams Tunnel, a 1.3 mile buried siphon carries water to Aspen Creek and then on to the Rams Horn Tunnel. Out of the tunnel, water flows through a short pipeline, or penstock, to the Marys Lake Dikes 1 and 2 and reservoir, all located 2.5 miles from Estes Park. The reservoir created by these dikes is the afterbay for the Marys Lake Power Plant. Past Marys Lake, water travels through a 3,143 foot conduit to the Prospect Mountain Tunnel. The conduit's inlet structure is submerged five feet below the minimum reservoir elevation to avoid ice build-up. In June 1949, the aqueduct and power system was completed.

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37. *Annual Project History*, Vol. 46, 1983, 76.
38. U.S., Department of Interior, Water and Power Resources Service, *Project Data*, 257, 267.

Pole Hill Diversion and Afterbay Dams are earth and rockfill structures at the Estes Park Aqueduct, 10.5 miles east of Estes Park. Pole Hill Diversion Dam directs the flow of Little Hell Creek away from the Pole Hill Powerplant toward Rattlesnake Tunnel and Reservoir. Pole Hill Afterbay Dam contains a siphon spillway and outlet creating the headworks for Rattlesnake Tunnel conduit leading to Rattlesnake Powerplant. In 1952, construction on Pole Hill began and completed a year later. Built of earth and rockfill, Rattlesnake Dam, provides an additional afterbay for Pole Hill Powerplant and a forebay for Flatiron Powerplant. The dam is 12 miles east of Estes Park and first stored water in 1954. The Flatiron Afterbay Dam is an earth and rockfill structure located on Chimney Hollow Creek eight miles southwest of Loveland. The reservoir created by the dam is the afterbay of the Flatiron Powerplant.[39]

In July 1951, the last dedication of a major west slope fixture took place at the north end of Lake Granby. The Granby Pump Plant generated power by passing water through the Estes Park Power Plant turbines, delivered back through the Adams Tunnel transmission line. The structure had been completed in 1949, but installation of pumps, motors and hydraulic pipelines and testing took two years. At completion, Granby Pump Plant stood sixteen stories high, although on only three stories are visible above ground. Commissioner Straus, back in Colorado for another ceremony, visualized Granby's pumps as the "beating heart" and the Adams Tunnel the "jugular vein" of the CBT energizing the entire state of Colorado.[40]

Over a twenty year period, construction took place on many fronts in Colorado. Those who manned the equipment, dug the tunnels, and set the dynamite, saw their wages increase and went about their jobs in relative safety. In 1940, contract employees made 83 cents an hour while government employees received 85 cents an hour. Pay grew gradually from $1.84 an hour in 1947 to $2.23 an hour in 1953. A two month strike in the spring of 1949 and a month long shutdown in May 1950 were the only periods of labor trouble during the post-Adams Tunnel era. Through the summers of 1947 to 1951, there was work for a thousand men, and then the number of employees would drop to around 800 in winter. There were some fatalities among those

39. *Colorado-Big Thompson Project: Technical Record of Design and Construction*, Vol. 2, 48, 53, 59, 67.
40. Tyler, *The Last Water Hole in the West*, 219.

working to bring water over the mountains. Four men died in 1948, two in 1949, and an additional three in 1950. These accidental deaths resulted from cave-ins, machinery malfunction, electrocution, and a tractor rolling over and crushing its operator.[41]

By the mid-1950s, Reclamation could look back at almost twenty years of sustained achievement. Their work resulted in 13 dams and 10 reservoirs storing a total capacity of 994,340 acre feet of moisture. Power generation supplies an additional 18 pumping plants and 11 powerplants. Following is a list of the capacities and dimensions of the Reclamation designed dams and reservoirs of the Colorado-Big Thompson Project:

Table I. Dams and Reservoirs on Colorado-Big Thompson Project

Dam	Hydraulic Height of dam (ft.)	Crest length (ft.)	Reservoirs	Reservoir Capacity (af)	Shoreline Miles
Green Mountain	264	1,150	Green Mountain	154,600	19
Granby	223	861	Lake Granby	539,800	40
Willow Creek	95	1,100	Willow Creek	10,600	7
Shadow Mountain	37	3,077	Shadow Mt. Lake	18,400	8
Marys Lake	20	820	Marys Lake	900	1
Olympus	45	1,951	Lake Estes	3,100	4
Rattlesnake	100	1,100	Pinewood	2,180	3
Flatiron	55	1,725	Flatiron	760	2
Carter Lake	190	1,235	Carter Lake	112,200	8
Horsetooth	111	1,840	Horsetooth	151,800	25
Solider Canyon	203	1,483			
Dixon Canyon	215	1,265			
Spring Canyon	198	1,120			

Source: U.S., Department of Interior, Bureau of Reclamation, *Colorado-Big Thompson Project Technical Record of Design Construction*, Vol. 2, (Washington, D.C.: Government Printing Office, 1957), vi.

Sustained by "Elaborate models of flumes, surge tanks, canals and dams," Reclamation successfully built a "cadillac system" designed to resist Colorado's winters, summers, floods, and droughts. The "machine" soon paid dividends in the mid-50s, when Colorado's weather deviated from moderate seasons into a cycle of dry, arid weather, presenting the completed project's with its first significant challenge.[42]

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41. U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Colorado-Big Thompson Project, Colorado*, Vol. 11, 1949, 2-3, 42; U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Colorado-Big Thompson Project, Colorado*, Vol. 12, 1950, 4, 53.
42. Tyler, *The Last Water Hole in the West*, 218.

Post Construction History

The dry winter of 1954 blurred into a warm spring, and continual days of sunshine withered the fields of the Front Range and high plains. Northern Colorado's first serious drought in exactly 20 years provided the opening test for CBT's design. In a projected normal year, CBT delivered 250,000 acre feet, but day and night during 1954 the Adams Tunnel delivered 300,352 acre feet to the east slope. Had Northern Colorado farmers depended on local rainfall and reservoirs for water, crops in the NCWCD would have produced a projected $19 million in 1954, instead of their actual value of $41 million. The project did not deliver its quota of water until 1957, averaging 232,000 acre-feet per year since that date.[43]

On a rainy August 11, 1956, the last step in an eighteen-year journey ended in Loveland, as Reclamation celebrated completion of CBT. In a speech shortened by a downpour, Reclamation's Commissioner Wilbur Dexheimer, defended the Bureau's efforts against those who thought CBT was not worth the funding and the risk, "It has been demonstrated again and again that the hard cash returns to the federal government far outweigh its investment in irrigation projects."

As President Dwight D. Eisenhower's choice for head of the Bureau, Dexheimer's remarks ignored the litany of New Dealers who dreamed of this day two decades previous. The CBT's early supporters (Hansen and Adams) and initial detractors (Taylor and Ickes) were all gone, but those who gave their lives drilling tunnels, operating equipment and running power lines bringing the project to life were remembered that afternoon.[44]

All major features were complete except for the Big Thompson Powerplant. In 1959, that plant's first year, it generated 4,500 kilowatts. After construction, Reclamation maintained a co-operative presence in Colorado's mountains and plains. The Bureau operates all west slope including power, storage and diversion. Reclamation also manages similar works on the eastern slope above the supply canals leading from Carter Lake and

43. Don F. Martin, "Disaster Averted," in *The Reclamation Era*, (February 1955): 1-2, 18-9.
44. *Loveland Reporter-Herald*, 13 August 1956, p. 6.

Horsetooth Reservoirs. The NCWCD operates and maintains other diversion features supplying their service area. Both organizations' expertise would come in handy in overcoming two successive natural dilemmas in the mid-1970s.

On July 31, 1976, the eve of Colorado's centennial, rain fell quickly in the Big Thompson Canyon between Loveland and Estes Park. Storms of varying intensity poured during the night, as some areas recorded as much as 12 inches of precipitation while others received only a trace. Many campers, residents and occupants of the flood plain refused to vacate low lying terrain even after successive warnings from local police that a deluge was coming. Compounding the confusion, the National Weather Service's radar system was inoperative.

Reclamation first identified trouble on the dials of monitoring devices registering rising water in Dry Gulch. Staffers in the Bureau's Loveland project office moved quickly, but nature had some reclamation plans of its own. At 8 p.m., water released from Lake Estes to the Big Thompson River was cut off, followed an hour later by shutting off flow from the Adams Tunnel. At the same hour, a peak of 31,200 cfs blasted down the canyon. The tunnel shut-off withdrew water from Lake Estes at the maximum rate and sent it to the Pole Hill and Flatiron Powerplants to prevent a strain on the lake. The shut-off also put the Marys Lake and Estes Powerplants out of commission.

Close to midnight, the 220-foot siphon spanning the Big Thompson River was whipped off its supports by the floodwaters. Traveling at 15 m.p.h., the siphon moved 600 yards downstream before it smashed into a house. The quarter-million ton device now looked like a crushed cardboard tube and water could no longer be sent to Horsetooth Reservoir. Reclamation also had to deal with the Hansen Feeder Canal which was out of service and three of the projects' five powerplants not working. Reclamation's Loveland Project Manager Bob Berling described the shock he felt when he arrived on the scene late that night: "We couldn't quite believe what we had on our hands to start with. Fortunately,

we did react very quickly."[45]

After it was over, the Big Thompson Flood was the state's second largest natural disaster, responsible for 139 deaths, six missing people, 316 homes destroyed in the canyon and over $35 million in property damage. Only one resident of the canyon had flood insurance. Reclamation replaced 6,000 cubic yards of material eroded from the base of Olympus Dam, and the Bureau and the NCWCD shared the $1 million cost of restoring the siphon. The Big Thompson Powerplant was back in service a week after the flood, and a new siphon was on the job 88 days after the storm. According to Berling, a "team effort" between Reclamation, other federal organizations and the NCWCD meant clean-up, repaving roads and the ripraping of damaged structures lasted only a year.[46]

Colorado's mercurial climate provided another surprise the following year. Beginning in the fall of 1976, a serious drought baked the state. The 1977 spring runoff bore half its usual amount, and the Colorado River ran at one of the lowest levels in its recorded history. Water deliveries from the project accounted for 50 percent of the water used by farmers. By the harvest in the fall, project water accounted for crops worth $134 million.[47]

One late developing controversy followed CBT from the 1960s into the 1980s. In 1966, six east slope cities began seeking CBT's unused capacity to bring more than 30,000 acre-feet of water from Windy Gap Reservoir, on the Colorado River below Lake Granby at the mouth of the Fraser River. Reclamation backed the plan, but environmentalists and Western Coloradoans were livid. West slope residents were afraid of "total depletion" of the Colorado River by greedy farmers and communities across the Divide. In spite of opposition, construction started in 1981, and on June 29, 1985, the sponsors dedicated the project. The dispute over Windy Gap may not have been as thunderous as the CBT

45. *Fort Collins Coloradoan*, "The Big Thompson: A Special Report," August 1976, p. 7; Interview with Robert Berling, Loveland, Colorado, Jan. 12, 1994. Tape located in Bureau of Reclamation office, Denver.
46. *The Big Thompson Flood of 1976*, (The Geological Society of America, 1976), 3-4; Interview with Robert Berling, Jan. 12, 1994.
47. Northern Colorado Water Conservancy District, *1977 Annual Report*, (Loveland, Colorado: 1977), 6, 8; U.S., Department of Interior, Bureau of Reclamation, *Colorado-Big Thompson Project*, no date, brochure located in *Annual Project History*, 1983, 7.

authorization, but many on both sides of the issue hoped aloud that this would be the last transmountain diversion project planned for the Rockies.[48]

Settlement of the Project

Besides flowing through Colorado's diverse topography, CBT also supports many different lifestyles. Water from CBT quenches many needs, ranging from Longmont and Loveland's evolution from agricultural to urban communities, to the isolated mid-western atmosphere of Fort Morgan and Julesburg, to the practiced eccentricity of Boulder.

Since Colorado's birth in 1876, the northern third of the state relied on the storage of water for its existence and subsequent prosperity. In 1949, 175,000 people lived within the boundaries of the NCWCD, most making a living from farming and related industries. In 1990, the area's population increased to 454,125 people, and its economy had branched widely from agriculture.[49]

Beginning in the late 1960s, corporations like IBM, Hewlett-Packard, Kodak, Samsonite, and Martin-Marietta created sprawling business complexes in Northern Colorado. In a 1968 interview with the *Denver Post*, Bob Barkley, secretary-manager of the NCWCD boasted that the consumption-stimulated American Dream was a way of life on the Front Range, "A three-bedroom house with double garage to accommodate a boat is commonplace for thousands who have come here from the big cities. The formula is basic: adequate water plus productive soil equals the production of new wealth and a stabilized or growing economy."[50]

Since then, water has been present for success for Northern Colorado, but the covetous eyes of the Front Range may look again toward the Colorado River for more water.

Uses of Project Water

Every evening along Colorado's Front Range, a necklace of lights burns well into

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48. Tyler, *The Last Water Hole in the West*, 301. The six communities seeking additional water were: Boulder, Loveland, Estes Park, Greeley, Longmont and Fort Collins.
49. *Annual Project History*, Vol. 11, 1949, 14; U.S., Department of Interior, Bureau of Reclamation, *1990 Summary Statistics: Water, Land and Related Data*, (Denver: 1990), 254.
50. Cassai, *Denver Post Empire*, 1 December 1968, pp. 60-1.

night. Powering this display is the headwaters of the Colorado River. Designed to help farmers through the uncertainties of agriculture, CBT's electrical supply propelled Colorado's Front Range closer to the Los Angeles modern rendering of the "city-state" model of urban development. The physical attractiveness of the eastern slope would have been a magnet for growth without CBT, but its creation provided a necessary foundation for the region's urbanization over the last third of the twentieth century.

In the 1940s, nine communities held allotments from the CBT of 44,950 acre-feet. By the 1980s, 25 communities received supplemental supplies, numbering 65,000 acre-feet. In growing Front Range cities like Boulder, Longmont, Loveland, Fort Collins, and Greeley, the aggregate population quadrupled from 1950 to 1980. These communities continued to bloom while desperately trying to maintain a balance between a slow rural pace and urban conveniences.

Keeping Colorado in electricity requires a complicated power distribution system. Transmission facilities include nearly 677 miles of transmission lines, 35 permanent substations, two mobile substations, one mobile transformer and 22 metering stations. Annually, the CBT sells more than 670 million kilowatt hours of power, producing $6.8 million in total revenues. The Department of Energy markets the power and a percentage of the revenue goes toward repaying CBT project costs. Each year, the project produces an average of 760 million kilowatt-hours with 690 million kilowatt hours of that total marketed to customers in northern Colorado, eastern Wyoming, and western Nebraska. The water and power control center in Loveland acts as the central nervous system for the Western Division of the Missouri River Basin.[51]

Colorado-Big Thompson's west side story differs from the east slope. Correcting the visual damage around Rocky Mountain National Park during the completion of the Adams Tunnel, Reclamation used waste rock left over from construction and landscaped the area around the portals. Project structures blended into the natural surroundings as much as

51. U.S., Department of Interior, Bureau of Reclamation, *Colorado-Big Thompson Project*, 7; *Project Data*, 258, 260.

possible. A stabilized water supply in west slope lakes has generally improved conditions for fish and wildlife. Fishing is good below many reservoirs because of the steady flow of water released downstream. If agriculture and business supplies the muscle keeping eastern Colorado going, outdoor recreation enlivens the west slope towns of Grand Lake, Granby, Fraser, Hot Sulphur Springs, and Kremmling. Project lakes lure sightseers to Grand Lake, Green Mountain, Willow Creek, Granby and Shadow Mountain.[52]

The foundation of CBT's existence, agriculture, continues to benefit from the project's presence. In 1938, the district was home to 6,400 irrigated farms supporting a population of nearly 40,000. Exactly thirty years later, the NCWCD had only 4,000 farms and 17,000 people living on the land. By the 1990s, there were only 2,700 farms and 9,400 project lands. Between 1938 and 1990, the average irrigated acreage per farm increased from 97 acres to more than 200 acres. In 1990, crops from project land rose in value to $330.9 million.

In 1952, Reclamation conducted a study to determine the immediate effects of CBT on Weld County. According to the survey, 69 percent of Weld County homes had phones. Without the electrical power supplied by CBT, Reclamation estimated only forty-one percent would have had this convenience. After CBT, 90 percent of Weld County residents had electricity, seventy-seven percent had an electric water pump, and nineteen percent had direct access to hard-surfaced roads. If the CBT had never existed, only sixty-two percent would have had electric service, thirty-six percent electric water pumps, and only two percent access to paved roads.[53]

The focal crop of Northern Colorado is the sugar beet, this squat root historically directed the region's agribusiness, politics, and culture for a century. At the beginning of the last decade of the twentieth century, sugar beets accounted for $36.9 million in crops grown on 40,129 acres. Recently, sugar beets have fallen behind corn in acres planted. The necessity of more grain and silage to met the demands of the profitable local cattle industry

52. Cassai, *Denver Post Empire*, p. 61.
53. *Accomplishments of Irrigation Weld County, Colorado*, iii.

has reduced the importance of beets. Other crops on the project include corn, alfalfa, barley, beans, potatoes, and a variety of vegetables. Pinto beans have become a valuable commodity thanks to irrigation -- farmers grew $34.3 million worth of beans on 53,759 acres in 1990.[54]

The greatest beneficiaries of CBT are the counties closest to the Rocky Mountains. Agriculture continues to dominate the life and business of the northern Front Range, but corporate America continues to plant "Business Parks" in Weld, Larimer and Boulder counties' previously lush farmland. A new crop, suburban housing, has followed. Many residents in towns like Greeley, Loveland, and Longmont fear the individuality of their communities will disappear as communities merge into one another along the corridor bordered by U.S. Highway 34 on the west and Interstate 25 on the east.

Conclusion

Unwanted by some in the 1930s, and lamented by few at the close of the century, time helped the Colorado-Big Thompson project outgrow the controversy surrounding its early days. In its life, CBT provided a model for irrigated development, hydropower, municipal, and industrial water use and a political football for environmentalists and war-time bureaucrats. Its role now is to serve as an economic and social stabilizer for the state of Colorado. In 1993, *Denver Post* columnist Bill Hornby ridiculed modern ignorance of the CBT's achievements, "New generations take an ample water supply for granted, and political clout has passed to environmental lobbies that have made water providers the goats instead of heroes."[55]

The CBT energized the economies of Colorado and built a network of communities up and down the Front Range. In 1956, at its completion, lay and professional opinion hailed CBT as "a commendable engineering feat that provided northern Colorado with water and hydroelectric power at a time when Front Range growth was spectacular."[56] After the Central Valley Project in California, CBT is the most productive undertaking launched by

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54. U.S., Department of Interior, Bureau of Reclamation, *1990 Summary Statistics*, 254.
55. Bill Hornby, "Water Policy Has Changed – Attitudes will Follow," *Denver Post*, 11 July 1993, sec. D, p. 5.
56. Tyler, *The Last Water Hole in the West*, 242.

Reclamation. Grand endeavors inspire expansive emotions, and some fifty years later, the circumstances surrounding CBT's birth and the exploits central to its construction, still result in a sense of wonder.

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