Frenchman-Cambridge Division
Pick-Sloan Missouri Basin Program

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Frenchman-Cambridge Division

The Frenchman-Cambridge Division is part of the Missouri River Basin Project. It has four storage facilities: Harry Strunk, Swanson, and Hugh Butler Lakes, and Enders Reservoir for irrigation water for 66,090 acres of project lands. They also provide flood control, recreational opportunities, and fish and wildlife conservation along the Republican River and its tributaries, Medicine Creek, Red Willow Creek, and the Frenchman River.

Project Location

The Frenchman-Cambridge Division is located in southwestern Nebraska. Project lands range from Palisade, Nebraska in a southeastwardly direction following the Frenchman River, and east from Trenton along the Republican River to Orleans and Alma. The project area contains land from Chase, Frontier, Furnas, Hayes, Harlan, Hitchcock, and Red Willow Counties in a strip of land, about 110 miles long and varying in width from one to three miles.[i]

The weather in the region is typical of Midwest plains states. The area experiences extreme temperature variations, and problems with wind and unpredictable levels of rainfall. The average rainfall for the project lands is twenty-two inches, the average temperature equals fifty degrees, and the frost-free season normally lasts around 160 days.[ii]

Historic Setting

Much archeological evidence exists which points to very early habitation of the present-day Frenchman-Cambridge project lands, especially those in the Red Willow Valley. Medicine Creek, Red Willow Creek, along with the Frenchman River and its tributaries provided potential travel routes for prehistoric and later Indians who moved from the Platte to the Republican drainages.[iii] Evidence shows occupation of the Red Willow Valley by prehistoric peoples as

much as 10,000 years ago. In the fifteenth century, the occupants of the Valley are thought to have been driven from the area by severe drought conditions. The people of later occupations, such as the Plains Apache in the seventeenth to mid-eighteenth centuries, and the Sioux and Pawnee of the nineteenth century also faced these dry conditions.[iv]

Prior to 1870, the main inhabitants of the Republican River Basin consisted of Pawnee, Sioux and Cheyenne Indians: however, Spaniards from Nuevo Mexico, buffalo hunters, traders, small wagon trains, and small detachments of United States soldiers occasionally visited the region. Although the Homestead Act opened the area to settlement in 1863, settlement in the area did not expand until after the removal of the area's remaining Indian tribes in 1873. However, once the settlers deemed it safe, they quickly moved into the area because of the availability of fuel and water along the Republican River and its tributaries.[v] Most of the homesteaders migrated to the Frenchman-Cambridge area from eastern states. Cattle ranchers came to the area at the same time, but soon moved further west to lands less suitable for farming.

The homesteaders faced many problems with farming here, including, recurring droughts, plagues of grasshoppers, low crop market prices, and poor crop yields due to lack of knowledge of proper agricultural methods for the sub-humid environment. Despite the fact that many of the areas original settlers relocated to area's with more stable farming conditions, most all of the area's tillable land has remained in cultivation since the late 1800s.[vi] Due to this cultivation, and the frequent dry growing seasons, irrigation began in the Frenchman-Cambridge area in the 1890s when farmers constructed several canal systems. The irrigation systems still in use near McCook and Culbertson are survivors of these early attempts at irrigation.[vii]

Historically, corn has been the most important crop grown in the Frenchman-Cambridge project area. This is due to the fact that corn can grow in both dry-land and irrigated conditions. Adverse climatic conditions prevented farmers from producing a large amount of high-value crops such as market vegetables, and vine and tree fruits.[viii] However, all of the crops grown in the region faced threats from the Valley's disastrous floods.[ix]

Project Authorization

Two unpublished reports, the "Frenchman Project Report", and the "Cambridge Project," written by the Bureau of Reclamation in October 1941, along with the unpublished, "Survey Report on Republican River Basin, Colorado, Kansas and Nebraska," prepared by Reclamation in April 1943, and the "Definite Plan Reports" were the main basis for project authorization. The various sub-units of the projects were authorized under the Flood Control Act of 1944, Public Law 534, 78th Congress, 2nd Session, as a unit within the larger plan for development of the Missouri Basin, the Pick-Sloan Missouri River Basin Program. Senate Document 191 outlined the plan, which was later revised through Senate Document 247, the latter combined and coordinated Reclamation's development plans for the region with those of the U.S. Army Corps of Engineers. This revision produced the area now known as the Frenchman-Cambridge Division.[x]

Construction History

In the October 1941, Bureau of Reclamation report on their proposed Cambridge Project, Reclamation laid out a plan which included 13,600 acres of land in the Republican Valley

between Cambridge and Oxford, Nebraska. The plan called for diversion of water from the Republican River below the mouth of Medicine Creek. They proposed a Medicine Creek site to provide 18,000 acre-feet of storage for irrigation and flood control. The project was approved under the Case-Wheeler Act, but the outbreak of World War II curtailed construction.[xi]

Reclamation attempted construction of the project during the war under the Food for War program. If successful, 9,000 acres of land would have been irrigated under the Cambridge Canal by diverting the Republican River's natural flows. However, the War Production Board turned down the plan because of shortages of steel and lumber.[xii]

In 1944 the Bureau of Reclamation, in Senate Document 191, presented their plan for water delivery for the Missouri River Basin, which included an irrigation plan for the lands now known as the Frenchman-Cambridge Division. This part of the plan included the construction of three reservoirs and irrigation of the project lands through a series of five units. These units consisted of: the Frenchman Unit of 14,475 acres, the Meeker Unit of 8,000 acres, the Red Willow Unit of 13,870 acres, the Cambridge Unit of 16,800 acres, and the Oxford Unit of 4,780 acres. The three proposed reservoirs included the Culbertson Reservoir on the Republican River, Medicine Creek Reservoir on Medicine Creek, and Harvey Reservoir on Frenchman Creek. The plan called for Harvey Reservoir as the only means of water storage for the Frenchman Unit. Together, Harvey Reservoir and Culbertson Reservoir were to supply the water for all Republican Valley development downstream to Harlan County Dam, except Meeker Canal, for which the plan provided service from Culbertson Reservoir alone. The proposal designed Medicine Creek Reservoir for flood control only.[xiii]

Then Senate Document 247 reconciled the Army Corps of Engineers and the Bureau of Reclamation's plans for development of the Missouri River Basin. In doing so, it substituted the Corps of Engineer's Enders Reservoir site for Reclamation's Harvey Reservoir Site on Frenchman Creek. The reconciled plan became known as the Frenchman-Cambridge Unit on August 25, 1945. The newly combined plan provided for the irrigation of a total of 53,140 acres of land. It presented Enders Reservoir as the only supply of stored water for all irrigation development above Cambridge, Nebraska. Cambridge Canal's supply came from Medicine Creek Reservoir, which was assigned irrigation storage capacity.[xiv]

In 1945, Reclamation began preliminary surveys of the proposed project areas. Completion of many of these surveys occurred in 1946. Prior to this irrigation project, the region contained only one irrigation district. The Frenchman Valley Irrigation District first organized in 1912, and included lands in the Frenchman Unit. Initially, one other irrigation district organized in order to aid with the distribution of repayment by the water users. The Frenchman-Cambridge Irrigation District organized in 1946 and included a large portion of the Frenchman-Cambridge Division lands not included in the Frenchman Valley Irrigation District. However, in 1955, in order to further distribute repayment costs, a third irrigation district also formed. The new district's lands covered area in Hitchcock and Red Willow Counties, and they chose the name, the H&RW Irrigation District. The District included most of the lands in the Frenchman Unit not already in an organized Irrigation District.[xv]

Reclamation's final project plan for the Division included provisions for Enders Dam and Reservoir, Culbertson Diversion Dam and Canal system, Trenton Dam and Swanson Lake, the Meeker Canal system, Red Willow Dam and Hugh Butler Lake, Red Willow Creek Diversion

Dam and Canal system, Bartley Diversion Dam and Canal system, Medicine Creek Dam and Harry Strunk Lake, and the Cambridge Diversion Dam and Canal system. The purpose for these facilities was to supply water to over 66,000 acres of land long the Republican River and its tributaries. The plan determined that the irrigation releases be made from all reservoirs to the streams for diversion into downstream canal systems for distribution, however, direct releases could be made from Swanson Lake to the canal. The systems were designed to provide the Frenchman-Cambridge Division with reliable irrigation water, much needed flood control, recreational opportunities, and wildlife preservation. The plan aimed at increasing crop production, and providing better balance between crop and livestock production[xvi]

After project approval, but before construction of structures, two events occurred which reminded the inhabitants of the project area about their vulnerability to floods. On June 21, 1947, a raging storm caused much damage. Flood waters tore out roads and washed out all bridges on Medicine Creek between Maywood and Cambridge, Nebraska. Water rose twenty-seven feet above normal level at the Medicine Creek damsite. Runoff from Medicine Creek reached 44,000 cubic feet per second. The torrent from the storm then took out every bridge crossing the Republican River from Cambridge, Nebraska, to Clay Center, Kansas, and cut new channels across good agricultural fields. In the end, the storm killed thirteen people and caused almost sixteen million dollars in property damage.[xvii] Exactly one year later, on June 21, 1948, another devastating storm caused extensive property damage in Bartley, Cambridge, and Indianola, Nebraska. However, these disasters resulted in later appropriations for the Division to aid in flood control efforts.[xviii]

Bids for construction of Enders Dam, Dike, and the relocation of State Highway 61, opened September 4, 1946. Reclamation received seven bids ranging from $4,109,927 to $5,178,755. The low bid came from Wunderlich Contracting Corporation from Jefferson City, Missouri, which received the construction contract in November, 1946. Although they did not receive notice to proceed that year because of a Presidential Moratorium on construction work, an order limiting Federal spending on Reclamation projects for the fiscal year.[xix] However, construction began in March, 1947 after issuance of notice to proceed in January. Although the contract allowed 1,150 days for construction, the contractor's construction program set completion within 672 days, or by December, 1949.[xx]

Embankment placing operations began on May 3, 1947. Construction went smoothly for the rest of 1947 and 1948. By summer of 1948, the contractors completed all but the finishing details of the relocation of the specified portion of State Highway 61. However, 1949 presented the contractor with difficulties. When attempting to install the radial gates for the spillway in October, 1949, the contractor complained that the fabricator had not properly cleaned several parts of the gates prior to shipping them. The company made a formal claim for compensation for the time and effort spent properly cleaning the parts. Excessive cleaning and delays in shipping of additional parts helped put the contractor behind schedule.[xxi]

Circumstances make it impossible for Wunderlich Contracting Corporation to complete construction by the date specified. The contractor arranged with the operators of several small reservoirs upstream from the dam to reduce flow in the river on December 13, 1949, so that the concrete closure plug could be placed in the base of the trashrack. This action, however, caused water rights infringement for area power users, and the plan became delayed until spring of

1950. Continued struggles over water rights infringements caused further delays. This trouble led to the Government's decision to terminate their contract with Wunderlich Contracting Corporation, and to advertise the rest of the work for bids in order to complete the project during the 1950 construction season.[xxii]

On June 18, and again on June 20, 1950, front page newspaper articles, very critical of Reclamation in regards to the design and construction of Enders Dam, appeared in the *Omaha World-Herald*. Written by a *World-Herald* feature writer, and seemingly based upon an interview with Mr. R. E. Leech, General Superintendent for Wunderlich Contracting Corporation, the articles appeared at the same time prospective bidders were inspecting the project site and preparing their bids. Certain individuals associated with the Enders project felt that the adverse publicity caused some of the bidders to greatly increase their bids.[xxiii]

However, Claussen-Olson-Benner, Incorporated, of Hedrege, Nebraska, received the contract for completion of Enders Dam on June 30, 1950. They received notice to proceed July 10, 1950. Thus, this fixed their completion date as December 19, 1950. This contractor, however, also missed the construction deadline because the company failed to make adequate arrangements with its subcontractors. Therefore, dam completion occurred eighteen days after the date specified.[xxiv]

The structure which resulted is an earthfill dam, with a structural height of 134 feet, one and one-half miles south of Enders, Nebraska. The concrete spillway contains six, fifty-by-thirty foot radial gates, and is located in the right abutment. The center of the spillway has a ten-foot-wide uncontrolled overflow section. About 4,000 feet north of the dam's left abutment, there is also a twenty-six foot high earthfill dike.[xxv]

The contract for clearing the area for Enders Reservoir went to Burks and Company of Denver, Colorado on August 17, 1948. Work began the middle of September. Unlike construction of the dam, work on the reservoir clearing occurred without problems. The contractor completed the project on January 1, 1949.[xxvi]

The Cambridge Diversion Dam, located two miles east of Cambridge, Nebraska on the Republican River, is a 900 foot long concrete and earthfill dam that has a 350 foot weir length.[xxvii] Bids for construction of the Cambridge Diversion Dam opened September 23, 1947. The Government granted the contract to J.A. Terteling and Sons, Incorporated, from Boise, Idaho, on October 15, 1947. The original contract granted the J.A. Terteling and Sons, Incorporated, 480 days in which to complete construction, which placed the completion date at March 11, 1949. However, the contractor proposed completing the work by May 20, 1948. Construction began November 5, 1947. Despite the contractor's desire to finish work in 1948, the Dam was not completed until January 5, 1949.[xxviii]

The completed Cambridge Unit consists of just over forty-nine miles of main canal with an initial capacity of 325 cfs, forty-four miles of laterals, and just under fifty-three and one-half miles of surface and subsurface drains.[xxix] The canal extends from the Cambridge Diversion Dam to the Harlan County Lake. Construction of the irrigation system enabled the service of 17,053 acres within the Cambridge Unit.[xxx]

The construction of the Cambridge Canal system occurred in several phases. Reclamation divided construction of the canal into four schedules in order to give small contractors a fair chance to bid on the project. Schedule I consisted of the first twelve and one-half miles of the canal. J. A. Terteling and Sons, Incorporated, received the contract for schedule

I on May 7, 1948. However, the Government did not issue notice to proceed until September 23, 1948, because of difficulty with gaining continuous right-of-ways. Once construction began, the contractor used precast concrete pipe in all culvert and turnout installations in an effort to expedite concrete operations before the winter.[xxxi] The contractor completed work on schedule I of the canal on December 15, 1949.[xxxii]

In the process of locating Cambridge Canal's third schedule, because of grade, the necessity arose to carry the canal's alignment through the city of Oxford, Nebraska. The city refused construction of an open ditch; therefore, Reclamation designed a 2,464 foot long siphon, sixty inches in diameter, to receive water from the canal at the western end of the city, carry it entirely below street grade to the eastern edge of town. Rentlor Company of Grand Island, Nebraska received the contract to construct the siphon on April 30, 1948. The contract called for work completion within 120 days, or by August 11, 1948. However, completion of the Oxford Siphon did not occur until October 9, 1948.[xxxiii]

The Government granted Bushman Construction Company of Saint Joseph, Missouri, the construction contract for schedule II of the Cambridge Canal. They began work on December 16, 1949. By May 10, 1950 the contractor placed the first concrete in the second unit of the Canal. The contractor faced no difficulty while constructing this section of the canal, and completed construction on December 16, 1950.[xxxiv]

Bids for schedule III of the canal, which was ten miles long and extended the canal to Oxford, opened October 18, 1951. Reclamation divided the specifications for schedule III into five sub-schedules to allow small contractors to bid on individual schedules. Claussen-Olson-Benner, Incorporated, was the only contractor who submitted bids on all schedules. Their bid of

$774,088.40 was lower than the engineer's estimate by almost six percent. They received the contract on November 2, 1951, which set job completion for June 19, 1953. Initial construction of the canal's third section started December 3, 1951; and concrete operations began the end of April, 1952. The contractor made the final concrete placement May 15,1953, and finished construction August 1, 1953.[xxxv]

Schedule IV of the Cambridge Canal extended twenty miles from the Oxford Siphon outlet to the northwestern city limit of Alma, Nebraska.[xxxvi] Bids for the canal's forth section opened June 16, 1953. The Government granted Bushman Construction Company the contract for the section. The contractor began work August 21, and made the first concrete placements by October 2, 1953. They completed concrete placement October 29, 1954, and completed construction work in February, 1955.[xxxvii]

Although the bidding process for the various schedules for the main Cambridge Canal went smoothly, the same cannot be said for granting the construction contract for the Canal's lateral system. The first time Reclamation opened bids for construction of Cambridge Canal's lateral system, it found all bids received greatly exceeded the engineer's estimate. Therefore, the Government rejected all bids. In September, 1951, Reclamation made a second attempt at accepting bids and granting the contract. However, before awarding the contract, Reclamation discovered that the lateral system design did not completely conform with the requirements of the repayment contract. Once again the Government rejected all bids.[xxxviii] On March 2, 1952, Reclamation attempted a third time to fill the contract for construction of the Cambridge lateral system. They only received three bids, all of which again exceeded the engineer's estimate. However, this time Claussen-Olson, Benner, Incorporated, as the lowest bidder, received the

contract on April 23, 1952. The notice to proceed of May 15, 1952, set the completion date for laterals 34 to 10.6 at April 12, 1954 and for laterals 13.4 to 27.8 at July 11, 1953. Aided by four subcontractors, the main contractor completed work by the scheduled completion dates.[xxxix]

Medicine Creek Dam and Harry Strunk Lake are located two miles west and seven miles north of Cambridge, on Medicine Creek. The dam is an earthfill embankment. It has a crest length of 5,665 feet, and a volume of 2,730,000 cubic yards of material. The Lake has a total capacity of 90,900 acre-feet. Of this, 33,900 acre-feet is designated for irrigation, and 51,700 acre-feet is used for flood control.[xl]

Medicine Creek's destructive flood of in June, 1947 prompted the earmarking of $1,000,000 from the Department of Interior's regular budget in fiscal year 1948 for appropriation to aid the District with flood control. The money went towards the construction of Medicine Creek Dam and Harry Strunk Lake. Bids opened for the project, December 23, 1947.[xli]

While conducting surveys of the dam and reservoir sites, workers discovered evidence of archeological sites. The Smithsonian Institution wished to recover archeological data before its destruction by construction work on the dam. Therefore, Reclamation provided the Institution with a bulldozer, a motor patrol blade, and a twenty person labor force to aid in their work.[xlii] The Smithsonian centered its studies on points of interest in the Republican River Basin. They confined most of their surveys to dam and reservoir sites where specimens where most endangered by construction. During the summer of 1948, the University of Nebraska also sent a field group to the area. They recovered many paleontological specimens at the damsite and at

several sites within the area. The Director of the Museum at the University of Nebraska throughly explored the important discoveries made in the reservoir area.[xliii]

C.F. Lytle Company, and Amis Construction Company received the contract for construction of the Medicine Creek Dam. They received notice to proceed on March 21, 1948, and began construction within two days. The contractor proposed to comple the work within 668 calendar days; in much less time than the 1,200 days requested in contract specifications.[xliv]

In April and May of 1948, the dam's original plans and specifications were modified. The Chief Engineer's office announced that the radial gates in the spillway would be replaced by an uncontrolled ogee crest, with a subsequent increase of thirteen feet in the height of the dam to provide the needed freeboard. Thus, the dam's height became 115 feet, the length became 5,665 feet with a spillway 229 feet wide. The plans called for the normal outflow from the reservoir to be discharged through a forty-four inch pipe, placed inside an eight foot wide horseshoe shaped conduit and controlled by high pressure gates. The specification changes altered the maximum high water surface elevation from 2,394.8 to 2,408.9. The dam was designed to control runoff from a 656 square mile drainage area. The total 150,000 acre-foot capacity contained designations for 15,000 acre-feet for silt retention; 25,000 acre-feet for irrigation storage; 57,000 acre-feet for temporary flood super-storage; and 53,000 acre-feet for normal flood control storage.[xlv]

Because of the change in specifications, Reclamation gave the contractor an additional 150 days to complete the contract. However, despite these changes, the contractor finished construction in just 645 days. Thus, the completion of Medicine Creek Dam occurred December 9, 1949.[xlvi]

In July of 1947, following floods which devastated areas throughout the Midwest, Congress passed a supplemental flood control appropriation bill. This bill provided $300,000 for fiscal year 1948 for construction of a new dam and reservoir. These features were then integrated into the Frenchman-Cambridge Unit. The original names for the features were Culbertson Dam and Culbertson Reservoir, because construction plans placed their location very near Culbertson, Nebraska. However, a revised plan moved the project location closer to Trenton, Nebraska; and in 1947, Congress enacted Public Law 61, which officially changed the names to Trenton Dam and Swanson Lake.[xlvii]

Trenton Dam sits on the Republican River with a structural height of 144 feet. It is an earthfill structure with a concrete gated spillway at its left abutment. Two sluiceways with gates permit river releases. The dam has a concrete pipe, inside the horseshoe shaped conduit, through its base which provides for releases through the stilling well to the Upper Meeker Canal. These releases serve lands of the Meeker-Driftwood Unit, along the south side of the Republican River. Release regulation through the conduit is achieved through a high-pressure gate in the control house next to the stilling basin. Initially, Swanson Lake has an total capacity of 254,000 acre-feet. As part of this capacity, 116,100 acre-feet is designated for irrigation only, and 133,800 acre-feet is designated for flood control only.[xlviii] Foundation construction took place from August 1, 1949, through July 18, 1950. The contract for this work went to Marshall, Haas, and Royce, of Belmont, California. The contractors reported no problems or delays during construction.[xlix]

Bids opened for completion of Trenton Dam June 23, 1950. The specifications required not only construction of the dam itself, but an extensive relocation of the Chicago, Burlington,

and Quincy Railroad, relocation of State Highway 34, and construction of bridge superstructures for these relocations. Reclamation received twelve bids on this work. The lowest bid came from Vinnel Company, Incorporated, United Concrete Pipe Corporation, and Ralph A. Bell, who pooled their resources to place their bid. They received the contract, and acknowledged notice to proceed on August 7, 1950. The contract set a completion date of August 11, 1953.[1]

Contractors completed most earthwork on Trenton Dam by late January, 1951. On July 19, 1951, they poured the first concrete for the dam; and two days later, began concrete operations on the spillway. The dam's contract specifications provided that relocation of the railroad be completed by December 1, 1951, however, this proved impossible. The shortage of steel due to a steel strike delayed construction. Additionally, the contractors experienced a two month delay in the erection of bridge structures because of a C.I.O. strike. However, the contractors did complete relocation of State Highway 34 by April 30, 1952, and finished the bridge superstructures for the relocation of the railroad in late October, 1952. They eventually completed the railroad's relocation in December, 1952. Because of these delays, and the late delivery of the dam's radial gates, the contractors did not meet their August 11, 1953, deadline. The dam's completion took place November 30, 1953, two and one-half months behind schedule.[li]

The Meeker-Driftwood Unit consists of Trenton Dam and Swanson Lake, and the Meeker and Driftwood Canal systems. In actuality, the Upper Meeker, the Meeker Extension Canal, and the Driftwood Canal are one continuous canal. The original plans for the system had these features as distinct entities. However, these distinctions disappeared as the final project plan developed. Since the canals had been identified separately in all previous program and

budget documents, Reclamation decided to retain the individual names in an effort to prevent confusion. The Meeker-Driftwood Unit includes close to sixty-three miles of main canal with the initial capacity of the Upper Meeker totaling 284 cfs. There are just over forty-three miles of laterals, and fifty-one miles of surface and subsurface drains. The Unit was constructed to serve 16,400 acres.[lii]

Construction of the original Meeker Canal took place in the late 1800s. Between the time of its construction and it rehabilitation in the late 1940s, the canal's works deteriorated significantly. As early as 1941, Reclamation considered acquiring this canal and including it in preliminary project planning. In the 1940s the canal belonged to the McCook Ditch Company, which, in turn, belonged to the Ferguson Investment Company of Lincoln, Nebraska. In 1943, Robert Ferguson, of the Ferguson Investment Company, entered into active consultation with Reclamation officials in regard to sale of the canal to the Government. However, negotiations did not yield the desired results. In 1947, twenty-four water users petitioned Reclamation to acquire and rehabilitate the Meeker Canal. They wanted the canal to come under the control of the Frenchman-Cambridge Irrigation District.[liii]

The refusal of the canal's deed holders to allow direct purchase of the canal, the uncertainty of the title, and the questionable value of the water rights helped the Government conclude that the best means to obtain the canal during the 1948 season included condemnation proceedings. As specified by the proceedings, an appointed board of appraisers appraised the value of the McCook Ditch Company's property. The resulting figure of $53,207.30, represented a number much larger than prior estimates by either party. However, the Secretary formally approved the appraisal report as a basis for condemnation proceedings, on January 20,

1948. Condemnation commenced February 25, 1948, and the title to the Meeker Canal went to the United States on that same date.[liv]

Government forces began rehabilitation work on the original Meeker Canal on St. Patrick's Day in 1948. They cleaned out the Canal during April and May. They then contracted out the remainder of the rehabilitation work to William A. McNeil. He received the contract on April 22, 1948, and concluded his work by July 30 of the same year.[lv]

The Government issued contracts for the rest of the Meeker-Driftwood Unit based upon the original divisions of the canal, but divided the Upper Meeker into smaller sections. April 10, 1956, the Government awarded Ace Construction Company the contract for the first section of the Upper Meeker Canal. The contract called for earthwork for approximately ten miles of canal, just under two miles of relocated road, and almost three miles of surface drains and structures.[lvi] The contractor began construction on May 6, 1956, and finished section one of the Upper Meeker on August 19, 1957.[lvii]

The Government granted the construction contract for section two of the Upper Meeker Canal, the Upper Meeker Sub-canal, and adjacent lateral systems to Bushman Construction Company on June 29, 1956. The contract called for earthwork for eleven miles of canal, one-half mile of adjacent drains, and nine miles of laterals and earthwork for, and construction of, canal and lateral structures. They began construction in September, 1956. The contractor completed all work on section two of the Upper Meeker Canal by December 3, 1957.[lviii]

Reclamation granted both the contracts for the two sections of the Driftwood Canal, Driftwood Sub-canal, and Driftwood Sub-canal lateral system and drains to Bushman

Construction Company. They began work on both sections on August 29, 1957. They completed their construction on April 3, 1959.[lix]

On December 12, 1957, M&A Construction Company received notice to proceed. Their contract pertained to the construction of the Meeker Extension canal and its associated laterals and drains. They completed the contract June 5, 1959.[lx]

The completed unit consists of the following: The Upper Meeker Canal begins at Trenton Dam and extends approximately fifteen miles along the south side of the Republican River, and ends just past Culbertson, Nebraska. The Upper Meeker Subcanal has a length of slightly less than six and one-half miles. Its capacity totals 30 cfs, and supplies the original Meeker Canal. The Driftwood Canal extends south, southeasterly, and northeast from the end of the Upper Meeker Canal on the south side of the Republican River Valley to a point eight miles east of McCook, Nebraska. It extends almost fourteen miles, and has a capacity of 225 cfs. Combined, the Driftwood, Driftwood Subcanal, and the Meeker Extension Canal, have a total length of approximately twenty-seven miles. Their capacities range from 30 to 90 cfs, and they serve lands on the far east side of the unit, south of McCook. As a unit, the Meeker-Driftwood Canal system serves 16,476 irrigable acres.[lxi]

The Bartley Unit includes the Bartley Diversion Dam, the Bartley Canal, and the canal's corresponding laterals and drains. The Bartley Diversion Dam is a concrete slab structure built on steel sheet piling. It extends across the Republican River two miles southeast of Indianola, Nebraska, to divert water for irrigation into the Bartley Canal. The diversion dam is a concrete weir and is 3,100 feet long. It has a 700 foot overflow crest with a sluiceway and canal intake structure. Additionally, a 900 foot earthfill dike extends from the dam's north abutment. The

Bartley Unit consists of almost nineteen and one-half miles of main canal with an initial capacity totaling 130 cfs. It has thirteen miles of laterals and twenty-nine miles of surface and subsurface drains. The canal originates at the dam and serves 6,539 acres on the south side of the River.[lxii]

Bids opened for the Bartley Diversion Dam on February 4, 1953. Out of eleven bidders, the Government awarded Foley Brothers, Incorporated, of St. Paul, Minnesota, the contract, May 29, 1953. The contractor began work as of June 27, 1953, and placed the first concrete less than a month later, on August 21. Although the specifications granted the contractor until July 26, 1954, to finish construction, the dam was completed by April 28, 1954.[lxiii]

Bids for Bartley Canal, laterals, and drains opened February 20, 1953. Again eleven bids arrived in response to the bidding announcement. Bushman Construction Company received the construction contract May 29, 1953. The contract divided work for the canal and laterals into two schedules. It set the first completion date on July 7, 1954, and placed the end of the second schedule on December 4, 1954. The contractor began work on the canal, July 6, 1953; and placed the first concrete the last day of September, 1953. Although the contractor only completed the laterals by the first specified deadline, they concluded all concrete work on the canal by early November, 1954, and completed all construction by the scheduled deadline.[lxiv]

The Culbertson Unit consists of the existing Culbertson Diversion Dam, the enlarged Culbertson Canal, and the Culbertson Extension Canal. The Culbertson Diversion Dam is a concrete structure, and contains two fourteen by nine and one-half foot radial-type spillway gates. It has a thirty inch diameter bypass conduit. This conduit is necessary to meet downstream water needs. It also assists in sluicing deposits through the dam. The canal system is slightly less than twenty-seven and one-half miles in length. The canal headworks is a

concrete structure with two, 10 by 6 foot, radial gates, and a spillway stilling basin. The diversion capacity needed is 400 cfs at water surface elevation 2740.2.[lxv] In 1958, Bushman Construction Company received a contract to rehabilitate the Culbertson Diversion Dam. They finished the rehabilitation work on June 12, 1959.[lxvi]

Doolittle Construction Company received notice to proceed for construction of the Canal's spillways and wasteways. They subcontracted the work to Acme General Contractors, who, in turn, subcontracted portions of the work to Claussen-Olsen-Benner, Incorporated. The contract was divided the work into three schedules. The contractors finished schedule I June 23, 1959, and completed schedule three by July first of the same year. They completed schedule II on June 7, 1960.[lxvii]

Bids opened on March 12, 1959, for construction of Culbertson Canal, Station 300+60 to Station 1126+00, and laterals. On September 3, 1959, bids opened for construction of Culbertson Extension Canal to Station 1719+00, and laterals. Bushman Construction Company received the contracts for both projects on May 1, 1959 and October 5, 1959, respectively. They completed their contract on the Culbertson Canal by March 30, 1961. Although their contract called for completion of work on the extension canal by May 7, 1961, repair work on the wasteway extended the timetable. The contractor completed all work on November 13, 1961.[lxviii]

Bids opened for the remainder of the Culbertson Extension Canal on February 25, 1960. The Government awarded the contract to Fortner and Heide - Chris Tolear. They received notice to proceed March 24, 1960. The contractor completed all work by November, 1961.[lxix]

The Red Willow Unit is located in southwest Nebraska along Red Willow Creek and the Republican River in Frontier, Red Willow and Furnas Counties. The Unit consists of the multiple-purpose Red Willow Dam and Hugh Butler Lake,[lxx] the Red Willow Creek Diversion Dam, and associated lateral and drainage systems. The Red Willow Dam is an earthfill embankment structure, with a height of 126 feet. It has a concrete spillway in the right abutment. The dam provides for river and irrigation releases for downstream diversions through an outlet works in its base. The dam forms the 86,630 acre-foot Hugh Butler Lake. Initially, its capacity has 31,500 acre-feet for irrigation, and 48,800 acre-feet designated for flood control.[lxxi] Construction on Red Willow Dam began in June, 1960, and concluded February 13, 1962.[lxxii]

Red Willow Creek Diversion Dam is located six miles northwest of Indianola, Nebraska, on Red Willow Creek. The structure is a concrete baffled apron weir with earth embankments at both ends. This dam diverts water to the twenty-four mile long Red Willow Canal. The canal serves 4,932 acres of land lying north of the Republican River.[lxxiii]

Bids opened November 11, 1961 for the Red Willow Creek Diversion Dam. The Government awarded Bushman Construction Company the contract. They received notice to proceed December 20, 1961. The contractor completed construction on March 15, 1961, the date named in the construction contract.[lxxiv]

Construction of the canal was divided into two sections. The first section was completed by May 31, 1963. Bushman Construction Company received the contract for the canal's second section. They completed work on July 17, 1964.[lxxv]

Post-Construction History

For the most part, the project works in the Frenchman-Cambridge Division remained in good condition after construction. From 1952 to 1961 the Irrigation Districts performed general maintenance tasks on canal systems. Minor seepage problems occurred. The Districts made repairs due to damage from bad weather which caused erosion, washouts, and small structural breaks. In general most repairs and improvements consisted of spraying, burning, and mowing weeds, repainting operations, cleaning canals, removing silt, and installing cattle guards, gates, and gauges. However, during this period, modifications were made to spillway chutes at Enders and Trenton Dams by tying the upstream edge of the spillway floor to the downstream edge of the spillway gate with a series of embedded anchor bars.[lxxvi]

Between 1961 and 1965 the Reclamation performed slightly larger maintenance tasks. Spillway gate controls were modified; and several of the spillway floors needed repairing due to crumbling concrete. Many spalled expansion joints were also repaired, using epoxy resin and concrete, rip rap was replaced in several areas, and the processes of general clean-up, such as silt removal, weed control, and repainting continued. However, during this period great effort was put into reshaping and flattening many of the canals. To reduce maintenance, save water and reduce the large amounts of silt filling a number a canals, plans were developed to begin covering laterals.[lxxvii]

Nineteen-hundred and sixty-five through the 1980s, saw much larger-scale improvements than in prior years. The most prevalent problems included sediment removal, bridge repair, cattle damage to canals and laterals, weed control, and replacing cracked, broken, and spalled areas of concrete. However one of the biggest problems came from the erosion of the fifty-two miles of Frenchman Creek from Enders Reservoir to Culbertson Diversion Dam. In 1965, a construction

program began in order to protect private and public improvements, and to stabilize several reaches of the Creek's banks. The program ran from 1965 to 1976. The construction operations included installing mudjacks, adding riprap, cleaning out canals, and removing logs and trees. This program successfully accomplished the desired results, and greatly reduced the erosion problem along Frenchman Creek.[lxxviii] As of 1998, a reduced maintenance program continued with staff from McCook Field Office.

The other major improvement which occurred during the same period, involved converting the open-ditch laterals in the Frenchman-Cambridge Irrigation District to closed conduits. In 1969, the District requested that Reclamation make a survey of the District's distribution facilities to determine the feasibility of converting fifty miles of open-ditch laterals into closed conduits. Reclamation concluded that the conversion would reduce operation and maintenance costs, lateral seepage, drainage costs, save water, permit irrigated farming of existing right-of-ways, help control noxious weeds, reduce farm operation costs, and improve water service. However, before approving the project, Reclamation needed to conduct further surveys and investigations. Thus, on its own, the District continued a practice they began in 1968. Through a system of having the landowner pay part or all of the material cost, and the District performing the work, the District converted a total of five and one-half miles of open laterals to buried-pipe laterals by the time Reclamation issued its final report. Reclamation's report on the Rehabilitation and Betterment Program for the Frenchman-Cambridge Irrigation District, went through revisions in 1976, and was issued at the end of the year. The program outlined a plan for converting 109 laterals and sublaterals with capacities ranging from two to twelve cfs, at a cost of $4,400,000. The plan called for the District to provide for construction

by their own personnel during the off-season over a five year period. However, the final cost totaled $5,500,000, and work extended into the mid-1980s.[lxxix]

Beginning in 1970, the Districts began facing water shortages. A combination of less than average precipitation, and extensive development of irrigation wells upstream on Frenchman Creek left the Districts with reservoirs at their lowest points since they were first filled. With these conditions continually worsening, water users were notified to practice water conservation. Reclamation, the Districts, and the State of Nebraska, explored various ways to supplement and conserve the water supply. In 1975, a number of bills were introduced into the State Congress calling for action to protect the Frenchman-Cambridge Division and other District water users from the effects of rapid development of irrigation wells upstream from Enders Dam. However, the only legislation passed by the State was Legislative Bill - 577. This bill outlined a compromise which assigned administration of various control areas to the Natural Resource Districts, in Frenchman-Cambridge's case, the Upper Republican and Middle National Resources District. The bill did restrict groundwater use under certain conditions, but did not place controls on preventing the depletion of surface water flows by groundwater development. A water appraisal report finished in January of 1977 stated that, indeed, intensive groundwater development upstream of Enders Reservoir depleted the surface flows of Frenchman Creek at a much swifter rate than what was expected when the Frenchman Unit was built. A preliminary report predicted that water shortages in the Frenchman Unit would grow progressively worse over time. They recommended that water users should use every means possible to conserve the existing available water supply.[lxxx] However, several years of above average rainfall in the 1980s relieved some concerns about water shortages.[lxxxi]

Settlement of Project Lands

Most all the project lands were privately owned prior to construction of the irrigation works. They remained so during and after construction.[lxxxii]

Project Benefits and Uses of Project Water

Higher yields in crop production and protection from floods were two of the main benefits expected from the irrigation and storage works within the Frenchman-Cambridge Division. In these respects, the project was successful. Not only did crop yields increase when average weather occurred during growing seasons, but irrigation helped stave off damage during low precipitation seasons. At times when temperature and moisture conditions wreaked havoc on non-irrigated crops, irrigated fields stayed fairly healthy. Irrigation even helped hail-damaged crops restore growth. Additionally, the Division's storage reservoirs prevented hundreds of thousands of dollars in flood damages, by completely storing flood waters, or reducing the rate at which flood waters reached downstream areas. Up until 1965, Reclamation provided reports which listed the amount of flood damage prevented by the Division's storage reservoirs. According to the 1965 report, Trenton Dam prevented $1,786,000 in flood damages between 1953 and 1965. Enders Dam stopped $910,000 in flood damage between 1950 and 1965; and Medicine Creek Dam and Harry Strunk Lake prevented $246,000 in flood damage between 1949 and 1965.[lxxxiii]

Although crop production increased, the types of crops grown did not change dramatically. Although farmers began growing some vine and tree fruits after the start of irrigation water deliveries, it was not a large percentage of the total crops. Acreage of alfalfa and

sorghums did increase. However, as before irrigation, corn remained the number one crop grown in the Frenchman-Cambridge Division.[lxxxiv]

The two other greatest benefits of the irrigation project come in the forms of recreation, and wildlife havens. Every year hundreds of thousands of tourists visit Swanson, Hugh Butler, and Harry Strunk Lakes, and Enders Reservoir. The Nebraska Game and Parks Commission administers the areas and monitors tourist activities and fish and wildlife populations. The lands surrounding the reservoirs provide a place for wildlife to thrive. Visitors spend their time swimming, boating, water skiing, fishing, camping, and hunting. Additionally, tourist money brings income to the parks and to the surrounding communities.[lxxxv]

Conclusion

The Frenchman-Cambridge Division farmers lived in an area prone to floods and unpredictable weather. The irrigation project works are of great benefit to these farmers by stabilizing crops against sometimes harsh Nebraska environment. Additionally, farmers and townspeople alike, reap the benefits from the reservoirs' flood control features, through greater safety and the prevention of millions of dollars in property damage. Likewise, economically, the Division and surrounding areas profit from the recreational facilities, and wildlife havens provided by the Division's lakes and reservoirs. The irrigation project works are a valuable asset to the area.

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