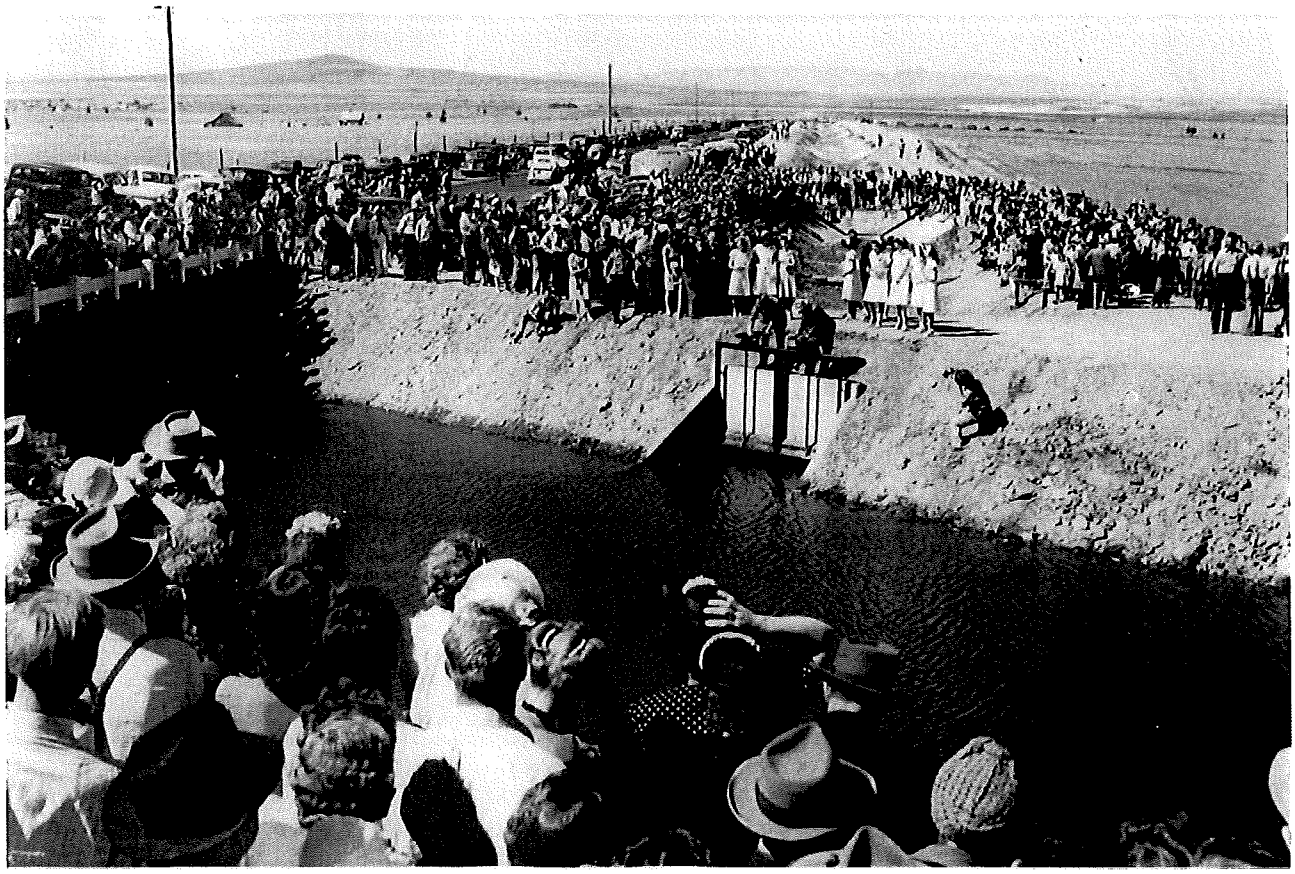
Sagebrush to Clover

THE U.S. BUREAU OF RECLAMATION'S NORTH UNIT OF THE DESCHUTES PROJECT

NORTH UNIT IRRIGATION DISTRICT
DESCHUTES AND JEFFERSON COUNTIES, OREGON

VOLUME 1: HISTORY



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Introduction

In September 2003, the U.S. Department of the Interior, U.S. Bureau of Reclamation (Reclamation), Pacific Northwest Region contracted with Renewable Technologies, Inc., (RTI) of Butte, Montana, to conduct an inventory and National Register of Historic Places (National Register) evaluation of select historic resources of the North Unit Irrigation District (NUID) in the Upper Deschutes River Basin of central Oregon (see Figure 1). The NUID is an irrigation system serving nearly 59,000 acres of irrigable farmland in Jefferson County. The irrigation works are a component of the Deschutes Project, a water storage facility and irrigation project constructed by Reclamation between 1938 and 1957. Areas covered include the NUID buildings, conveyance and distribution system elements, along with brief general descriptions of the Deschutes Project major facilities, both historic and modern.[1]

RTI provided Reclamation with a rough draft report in 2004, but the contract expired before Reclamation was able to comment on this draft and for RTI to finalize it. Without dedicated funding to complete the document, the draft report languished until 2012, when NUID received a WaterSMART Grant from Reclamation to pipe five miles of the Main Canal. The undertaking resulted in an Adverse Effect to the National Register-eligible historic resource, and a Memorandum of Agreement, signed by NUID, Reclamation, the Bureau of Land Management, the Deschutes River Conservancy, and the Oregon State Historic Preservation Office, detailed steps to mitigate the Adverse Effect by completing the draft report started by RTI. From 2010-2013 Kelsey Doncaster, Historian from Reclamation's Columbia-Cascades Area Office and Chris Horting-Jones, Archeologist from Reclamation's Bend Field Office, revisited the NUID and conducted additional research to verify, edit, and correct details or errors in the draft report. Kelsey Doncaster added additional areas not covered in the original draft along with the photographs, drawings, final editing and revising of the report into two volumes.

This report is presented in the following principal sections:

Volume 1:

- Methodology: records research efforts and methods used for the field inventory;
- Environmental Setting: general description of the geography and climate of the Upper Deschutes River Basin;
- Historic Context: origins and growth of irrigated agriculture in the Upper Deschutes River Basin, providing the context within which Reclamation's Deschutes Project was developed. It also discusses the impact of the NUID early operations on Jefferson County's farm economy and outlines the significant changes made to the irrigation system as of June 2013.

[1] Title of this document comes from the 1947 winning slogan of the Culver High School publicity contest to pick an appropriate name for the area. Buzz Griffin a freshman and son of Walter Griffin a North Unit settler was the person who came up with the slogan of Sagebrush to Clover. "Deschutes Slogan Winner" *The Reclamation Era.* (Washington D.C.: U.S. Department of the Interior, U.S. Bureau of Reclamation, Vol. 33, April 1947), 96.

Volume 2:

- Site and Feature Descriptions: design characteristics and physical attributes of the Main Canal and its principal associated structures with general descriptions of laterals and the types of minor structures on the irrigation system. This section also provides descriptions of the buildings and structures in the NUID.

- National Registration Evaluation of the NUID irrigation system: recommendation for consideration of the system as an historic district with an assessment of those facilities lacking sufficient historic integrity (as of 2013) to be non-contributing to that historic district.

Methodology

Historic Background Research

The primary focus of RTI's research effort was to collect information on the construction and early operational history of the Deschutes Project and the NUID. Additionally, they sought to determine the original design characteristics of the Main Canal, its major canal structures and lateral system, as well as modifications to those works over time. Kelsey Doncaster collected additional information, and along with Chris Horting-Jones, verified changes to the system since RTI's document was drafted in 2003. The research phase involved standard techniques of locating primary and secondary documents. Deschutes Project records were researched at three principal repositories: the NUID Office at Madras, Oregon; the National Archives and Records Administration, Rocky Mountain Region, Broomfield, Colorado; and the Reclamation's Pacific Northwest Regional Office in Boise, Idaho. Primary sources consisted of papers, Reclamation Deschutes Project Histories, drawings, studies, reports and other historic material.[2]

Invaluable information on the condition of the NUID irrigation system and its operations came from Chuck Schonneker and Kirk Holcomb, who at the time of RTI's research served, respectively, as the NUID Project Manager and the Water Master. Chuck Schonneker retired in 2005 and today Kirk Holcomb is now Assistant Manager.[3]

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[2] An Annual History was a report prepared by U.S. Reclamation Service (USRS)/Reclamation for each authorized Project until 1986. It summarized significant construction, operations, developments, accomplishments and administrative actions on that specific irrigation Project for the year. The reports were intended to inform Congress and the public of agency accomplishments. More detailed information was incorporated by reference to studies and reports prepared by USRS/Reclamation or others.

[3] Chuck Schonneker died on February 25, 2011. See *Madras Pioneer* March 2, 2011 for obituary.

The Deschutes River collects water from various tributaries as it descends ever deeper into canyons cut below the surrounding terrain (see Figure 1). The first two of its major tributaries downstream of Bend are Tumalo and Wychus Creeks, both draining from the west. Crooked River, a major eastern tributary, leaves the Ochoco Mountains more than 50 miles east of Bend and then makes a wide loop to the north and west before emptying into the Deschutes River in south-central Jefferson County. At that point, the Deschutes River is entrenched at the bottom of a nearly 1,000-foot-deep gorge. The two major tributaries below the confluence with the Crooked River are the Metolius River on the basin's west side and Willow Creek on the east.

In common with other regions of central Oregon, the Upper Deschutes River Basin has a semi-arid climate characterized by moderate winters and a short growing season.[9] Rainfall averages slightly over 12 inches per year at Bend and about 8.6 inches at Redmond, while Madras receives around 9 to 10 inches of precipitation in a typical year. Winter temperatures rarely drop below 0 degrees Fahrenheit, but cold snaps in excess of 20 to 30 degrees below zero have occurred. Summertime highs typically range in the 90s. The growing season in the Redmond and Madras areas lasts about 120 days in a typical year, while farmers in the Bend area only have about a 90-day period each year to cultivate and harvest crops. Soils in the upper basin are primarily light sandy loams, and generally richer and deeper in its northern than its southern reaches. Where the terrain is amenable and the soils fertile, irrigated agriculture yields bountiful crops.

Historic Context

Rise of Irrigated Agriculture in the Upper Deschutes Basin: Early Euro-American Settlement and Irrigated Agriculture

In comparison to those of the well-watered coastal plains and valleys west of the Cascade Mountains, Euro-American settlement activities in the plains and basins of eastern and central Oregon came late and were slow to progress. This situation was in large part due to the area's dry and sometimes harsh climate which, like elsewhere in the American West, was generally perceived to be unsuitable for agricultural production. As a result, most settlers who arrived in Oregon during the mid- to late 19th century bypassed the eastern plains and central basin regions of the state on their way to the Willamette Valley.

The first sustained Euro-American use of the Upper Deschutes River Basin hinged on the growth of eastern Oregon's cattle industry. In the late 1860s, stockmen in search of new grazing lands began moving herds of cattle into the basin, attracted by its grassy plains and plateaus. A few hardy farmers followed the stockman and began settling fertile lands along the Deschutes River

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city in India synonymous with madras plaid fabric. "Origin of Names of Projects and Project Features in Reclamation Territory." *The Reclamation Era.* (Washington D.C.: U.S. Department of the Interior, U.S. Bureau of Reclamation, Vol. 31, April 1940), 103.

[9] The Upper Deschutes River Basin is considered the area from Redmond south near to Chemult on the Deschutes River. The upper basin is where the watershed for the Deschutes River begins in a series of lakes, creeks and two large man-made reservoirs (Wickiup and Crane Prairie) and flows north (downstream) to Bend.

These first attempts at irrigation in the upper basin probably consisted of little more than a farmer diverting the spring run-off from the river or a creek directly onto an adjacent hay field or subsistence garden. As farmers began to cultivate lands at a greater distance from the river or a stream, shallow ditches were dug to convey irrigation water to the fields. Some neighboring farmers worked together to build irrigation systems for their common use. Such early cooperative workings, however, likely consisted of little more than simple diversion structures and a small network of ditches. In common with most other early settlers elsewhere in the American West, Deschutes Basin farmers lacked both the funds and technical expertise to develop large irrigation systems.

Carey Act Projects

By the late 19th century, many boosters for development of the arid American West believed that irrigation was the key to the region's large-scale settlement and prosperity. While the practice of diverting river water to croplands to enhance growing conditions was not new to the region, attempts by private parties to develop large irrigation systems typically met with little success. Consequently, the need for the Federal government to assume a role in controlling and developing water resources was increasingly viewed as essential.[13]

Work by advocates and proponents of Federal involvement in western irrigated agriculture persuaded the United States Congress to attach a reclamation provision to its appropriations bill of October 2, 1888. This legislation directed the USGS to conduct a survey of irrigable lands of the arid West. In 1890, Congress published the USGS Report of Findings and began to consider various bills that would support Western irrigation development. Concurrently, western railroads, especially the Great Northern Railway, began sponsoring Irrigation Congresses where participants could meet and discuss means by which the Federal government could take a more comprehensive approach to developing or supporting development of large-scale irrigation projects.[14]

Irrigation proponents hoped that the Federal government would take an active role in western irrigation development. However, Congress initially would not approve direct Federal involvement. As a compromise, Congress passed the Carey Act in 1894. Under this piece of legislation, the U.S. would grant up to one million acres of lands under the public domain to each western state agreeing to its provisions. The states would issue contracts under the Carey Act to private developers who were expected to design and build irrigation works to serve lands "segregated" by the state from the Federal grant for that contracted development project. The state would also issue a water right to the Carey Act contractor. The segregated Carey Act lands would be available to settlers under the Homestead Act. The contractors were expected to recoup their construction costs, and commercial enterprises also to turn a profit, by selling irrigation water to the settlers. Some Carey Act contracts also allowed for the developer to charge a fee for

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[13] Golze, Alfred R. *Reclamation in the United States* (Caldwell, Idaho: The Caxton Printers, Ltd., 1961), 6.

[14] Gates, Paul W. *History of Public Land Law Development* (Washington, D.C.: Zinger Publishing Company, Inc., 1968), 645-46; American Public Works Association. *History of Public Works in the United States* (Chicago: American Public Works Association, Chicago): 310; Robinson, Michael C. *Water for the West: The Bureau of Reclamation, 1902-1977* (Chicago: American Public Works Association, 1979), 12-13.

Bend. The ODC planned to irrigate its Carey Act lands with water from Crescent Creek and Crescent Lake high in the Cascades.[21]

The Deschutes River was the proposed water source for each of the upper basin's other five Carey Act projects. None of these projects made provision for storage, expecting that the river's natural flows would amply meet the needs of their respective water users. The Deschutes Reclamation & Irrigation Company (also known as the Swalley) project was the smallest of the five, with the acreage approved by the State covering 1,200 acres just northeast of Bend, followed by the Arnold Reclamation & Irrigation Company's approximately 5,000 acre project several miles south of the city.

Segregations for the other three Carey Act projects were substantial, totaling nearly 215,000 acres of unsettled land east of Bend and extending northeast to the deep gorge of the Crooked River. Although initially conceived by and contracted as three separate commercial enterprises, by the spring of 1907, all three of these enterprises had been consolidated under the control of the Deschutes Irrigation and Development Company (DIDC).[22]

Of the Deschutes Basin's various Carey Act projects, none compared in size and scope to that of the DIDC. By early 1905, the company had completed the main distribution artery for its Carey Act lands, the Pilot Butte Canal. This canal took in water at a diversion about four miles upstream of Bend and thereafter extended north-northeast some 34 miles to its discharge at the Crooked River. Almost immediately, excavation started on another main canal to serve water users on the company's segregated lands due east of Bend. The Central Oregon Canal, as the latter canal became known, was to also receive its river-diverted water supply above Bend.[23]

Before much construction on the Central Oregon Canal got underway, however, the company faced strong opposition to its development from Bend officials and residents. Of greatest concern was the company's plan to divert additional water from the Deschutes River above Bend. The opponents claimed this would leave their community high and dry during the irrigation season as well as derail a proposal by a local power company to build a hydroelectric plant just downstream of the town. Deferring to the opponents, the company quickly revised its plans so that the Pilot Butte system would receive its water supply downstream instead of upstream of Bend. The revised plan called for construction of a diversion dam about 1.5 miles north of Bend and a short 1.5 miles of canal from the dam's east abutment to the Pilot Butte Canal.[24]

Construction of the North Canal Dam and North Canal began in May 1909 and was completed within the next three years (see Figure 3). During this time DIDC reorganized and renamed itself

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[21] Hall, 12-14, 17-18; Winch, Martin T. *Tumalo, Thirsty Land: History of Tumalo Irrigation District.* (Portland, Oregon: Oregon Historical Society, 1985), 383. Starting in 1920 the State of Oregon worked with the newly formed Tumalo Irrigation District to do the O&M of the Tumalo Project irrigation works, but a permanent turnover of the project to the irrigation district did not occur until 1922.

[22] Ibid., 12-13, 19-21, 25.

[23] Ibid., 20-21, 25.

[24] Hall, 25-26; Central Oregon Irrigation Company, "Plan of North Canal Dam and Headworks," April 20, 1912, drawing No. 313, Chief Engineer's Office, Deschutes, Oregon, on file, North Unit Irrigation District Office, Madras, Oregon; U.S. Department of the Interior, Water and Power Resources Service, *Project Data* (Denver, Colorado: Government Printing Office, 1981), 425.

originally served by the SCIC are now operated today by the Three Sisters Irrigation District and serves 7,500 acres. While the original TSIC project had it shares of false starts and mismanagement it was finally completed by the State and today those lands are served by the Tumalo Irrigation District, which provides irrigation water to 8,215 acres.[27]

Developments under the Carey Act ultimately never came close to fulfilling the promise of transforming the arid American West into an Eden of irrigated farms. The lack of up-front capital to fund construction of adequate water storage and distribution systems plagued many developments, and in some cases, resulted in a project's complete failure. Many such enterprises discovered that although they were successful in building irrigation systems, there was insufficient water to serve these lands. Later studies often concluded that lands segregated for a project were unsuitable for agriculture. Some projects were plagued by poor, sometimes even fraudulent, management. Any one of or a combination of these factors could result in a project's complete failure. Even the most successful of Carey Act projects typically fell short of expectations in terms of the amount of land settled and brought under irrigation. Carey Act developments in the Upper Deschutes Basin were perhaps more successful than those in many other states in that, ultimately, irrigation systems were completed to serve at least a portion of the proposed lands for all but one of the contracted projects.

The Early 20th Century Homesteading Boom

Carey Act irrigation project development started in the Upper Deschutes Basin at a time when the region was entering a period of unprecedented land settlement activities. Not all of this growth, however, could be attributed to the increased availability of water through irrigation. Rather, the upper basin, similar to other arid areas of Oregon and elsewhere in the American West, saw a boom in homestead applications by settlers planning to grow wheat by dry land farming techniques. The belief that dry land farming was locally sustainable in part grew out of the then popular theory that "rain follows the plow."[28]

In Oregon, the railroad companies helped propagate the homestead boom, conducting aggressive promotional campaigns designed to lure hopeful farmers to the State's agricultural hinterlands. In addition to developing and widely distributing brochures and other advertisements hailing Oregon's eastern plains and central basins as a farming paradise, the railroads greatly expanded their reach by building thousands of miles of branch lines into previously underserved areas. In 1909, the Union Pacific Railroad (UP) and Great Northern Railway (GN) launched a highly competitive and tumultuous race to be the first to bring railroad service directly to the Deschutes. Subsidiaries of the two firms, the GN's Oregon Trunk Railroad and the UP's DesChutes Railroad Company, each began building secondary lines from their respective railroad lines (Spokane, Portland & Seattle Railway and the OR& N) in the Columbia River Gorge south toward Bend. The DesChutes Railroad Company soon conceded the race, agreeing to end its line at the Oregon Trunk Railroad's newly platted townsite of Metolius in the upper basin's north

[27] Ibid., 17, 27.

[28] Wilber, C.D., *The Great Valleys and Prairies of Nebraska and the Northwest,* (Omaha, Nebraska: Daily Republican Print, 1881), 68. Wilber was a noted author, journalist, booster and land speculator of the agricultural development of the American West who coined this phrase and helped to promote this theory.

Figure 4: Homestead, Powell Butte Area, "after the water came in" (1908). Photograph 1984.031.0350.1109 courtesy of the Deschutes County Historical Society.

U.S. Reclamation Service and the Origins of the Deschutes Project

At the time that the State of Oregon adopted the Carey Act in 1901, Congress was embroiled in debates over whether the Federal government should assume a more direct role in the development of reclamation projects. Many politicians in eastern states objected to funneling more Federal dollars out west, while ranchers in western states felt that public lands should remain open for cattle and sheep grazing. With the support of newly elected President Theodore Roosevelt, Congress passed the Reclamation Act of 1902, which created the U.S. Reclamation Service (USRS) as a new branch of the USGS. The USRS was charged specifically with development of irrigation projects in the arid west serving the small family farmer. This included construction of dams and extensive canal systems typically beyond the capability of the Carey Act project developers. USRS initiated the process by conducting surveys to identify irrigation development opportunities, and then recommended further study for those that initially appeared feasible. When further study indicated a project could be built at a cost that could reasonably be repaid by water users, USRS would then recommend project construction to the Secretary of the Interior. If the Secretary concurred, the project would then be recommended to Congress. Congress could pass a legislative act that approved expenditure of funds for construction and defined the purposes of the approved USRS Project. Local irrigation project boosters expressed their support to their Congressmen and the Secretary, which often played a significant role in selecting areas for irrigation surveys and project feasibility studies, and could also influence priority for ultimate selection for construction. As originally envisioned, farmers that utilized project irrigation water were to repay the Federal government the cost of construction within ten years, in addition to paying a fee to fund ongoing operation and maintenance (O&M) expenses.

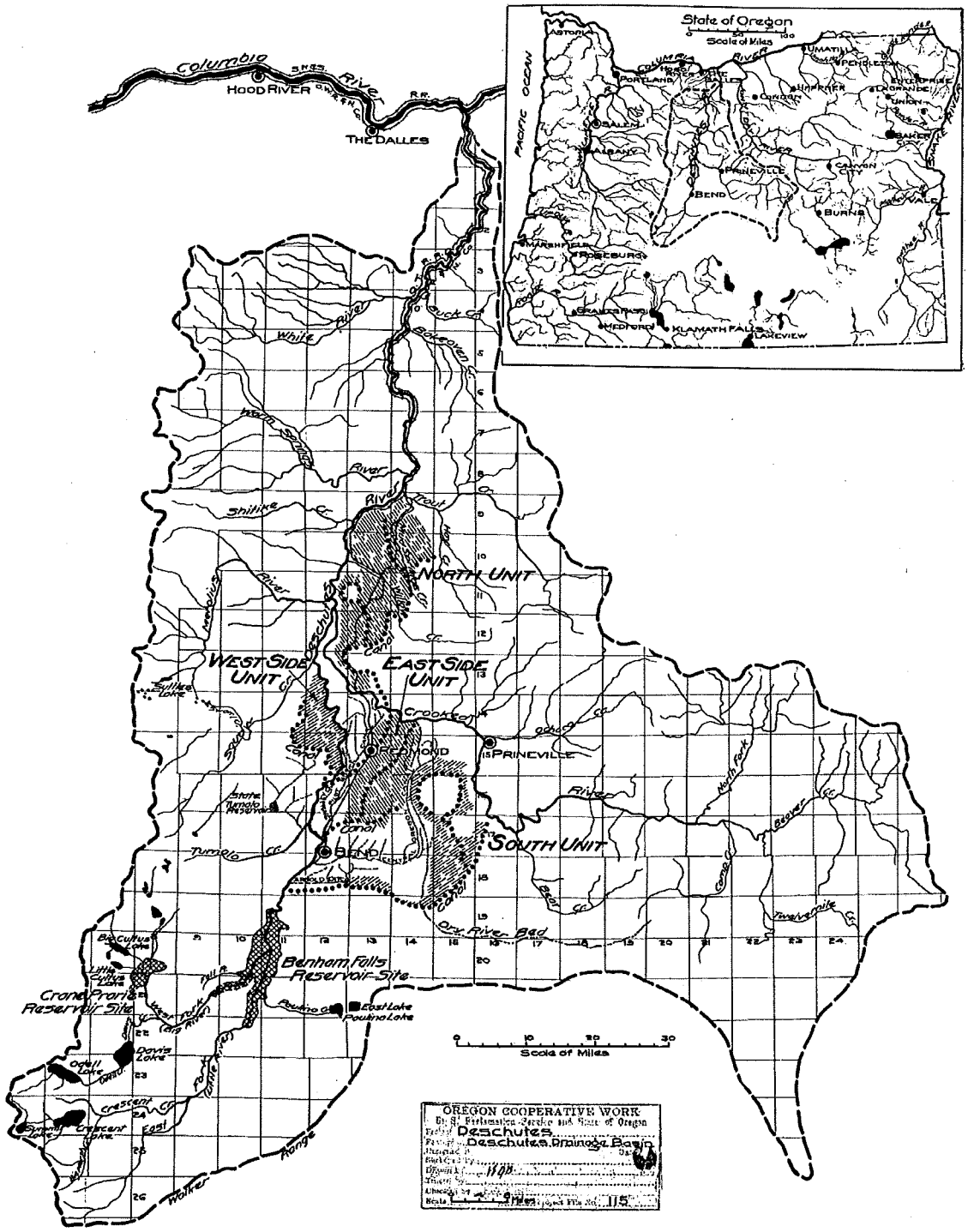

Figure 5: 1914 map showing layout and location of the four planned units of the Deschutes Project.

Of the four irrigation units identified in the 1914 Cooperative Study, USRS officials and others viewed the North Unit as the most feasible of the four for development. Studies had determined that soils in the North Unit were superior to those at the other locations. Additionally, the North Unit already possessed a good base of potential water users, having experienced considerable

time for the land owners and the USRS to work out the details of the contract for construction, the planned Federal Reclamation Project was rejected due to three issues. The first issue being that land owners to be served by this new project had to limit their holdings to only 160 acres. Since many of these land owners had over 160 acres they would be required to "dispose of their excess holdings over 160 acres of irrigable land, at an appraised value set by a Government board". [48] Second, Ralph Schneeloch & Company stated it would finance the planned irrigation project with private funds if the USRS offer was rejected.[49] Third, abundant rains and strong wheat prices, bolstered by the United States' recent entry into World War I (WWI), led many local farmers to question the need for irrigation, especially considering the financial burden they would bear in paying off construction costs.[50] Therefore, landowners in the NUID voted against entering into a repayment contract with the USRS. These farmers threw their weight behind Ralph Schneeloch & Company instead, who would construct and operate the project without imposing any acreage restriction. Nonetheless, the farmers' hopes were dashed when, due to financial problems, Ralph Schneeloch & Company withdrew their offer to finance the project.[51]

The loss of both Federal and private support for the North Unit Irrigation Project came on the verge of dramatic change in the climactic and economic conditions in central and eastern Oregon and other arid regions of the West. In the late 1910s, the wet cycle of the previous several years ended and normal dry conditions returned. At the same time, grain prices that had been inflated by WWI plummeted to all-time lows with the conclusion of the war. By the early 1920s, dry land farmers throughout the west were suffering the ill effects of depression and drought. In Jefferson County, wheat yields dropped to slightly less than 10 bushels per acre, or below the production level needed to sustain a dry land farming operation.[52] Bankruptcy and delinquent taxes forced many farmers to abandon their land and leave the county. On January 11, 1921 the NUID changed its name to the Jefferson Water Conservancy District (JWCD) under the impression that a new name would help the irrigation district sell their bonds without the stigma of the failed NUID scheme.[53] This cycle of farm failure and abandonment accelerated in the late 1920s and early 1930s as drought conditions in the west grew even more extreme and the Great Depression spread worldwide.[54]

For a while at least, the Upper Deschutes Basin irrigators weathered the drought better than their dry land farming neighbors. In 1922, COID constructed a dam with a 50,000 acre-foot reservoir at Crane Prairie. Crane Prairie was aptly named for the birds found there, as cranes are numerous in the vicinity of this location in the Cascades.[55] Crane Prairie was one of the two water storage

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[48] U.S. Department of the Interior, *Deschutes Investigations*, North Unit: 8-9; U.S. Department of the Interior, *Economic Report and Repayment Plan,* 4; *The North Unit Story*, The Long Dry Wait: 6.
[49] Hands, 341.
[50] U.S. Department of the Interior, *Deschutes Investigations*, North Unit: 8-9; U.S. Department of the Interior, *Economic Report and Repayment Plan,* 4; *The North Unit Story*, The Long Dry Wait: 6.
[51] Hands, 341.
[52] U.S. Bureau of Reclamation, *Annual Project History, Volume I, Deschutes Project, Calendar Year 1938* (Bend, Oregon: Author, 1938), 38.
[53] Hands, 342-343.
[54] U.S. Department of the Interior, *Annual Project History 1938*, 38-39; U.S. Department of the Interior, *Deschutes Investigations*, North Unit: 6-7 & 45; *The North Unit Story,* The Long Dry Wait: 6.
[55] "Origin of Names of Projects and Project Features in Reclamation Territory." *The Reclamation Era.* (Washington D.C.: U.S. Department of the Interior, U.S. Bureau of Reclamation, Vol. 31, April 1940), 103.

ranks of the Nation's workforce left unemployed by the Great Depression.[62] In 1934, Reclamation received its first New Deal support for reclamation work in the Upper Deschutes Basin, an appropriation of $50,000 from the Public Works Administration for a water storage investigation. One year later, another New Deal agency, the Emergency Relief Administration, allotted Reclamation $30,000 to re-examine the feasibility of the North Unit project. The man assigned to supervise the new investigations was C.C. Fisher, a Reclamation engineer with experience on previous irrigation studies in the basin.[63]

As one of their initial tasks, Fisher and his engineering team identified an alternative water storage site - the Wickiup basin. The Wickiup Basin, where the Deschutes River flows through a shallow but broad depression in the foothills of the Cascades is located some 28 miles upstream of Benham Falls and 12 miles downstream of Crane Prairie (see Figure 6). Stockmen who traveled through this part of the Upper Deschutes Basin found a Native American campsite with many wickiups, which gave the basin its name.[64] After extensive subsurface testing, Fisher and his team had determined that the bedrock deposits in the Wickiup basin appeared far less conducive to leakage than those at Benham Falls. Other favorable conditions for development of a reservoir at Wickiup were found to exist, most notably that the basin had the capacity to easily accommodate the some 200,000 acre-feet of the river's winter flows calculated to be available for storage.[65] Fisher's studies indicated that the 200,000 acre-feet of water supply that would be available could adequately serve approximately 50,000 irrigable acres, not the 160,000 acres anticipated under earlier studies. He and his team faced the formidable task, then, of determining which portions of the previously anticipated 160,000 acre area would actually be incorporated into the North Unit. An extensive program of soils testing and land classification of areas in wheat production at the time followed. The total acreage ultimately included within the service area boundary of the North Unit was about 62,000 acres, around 7,000 of which consisted of rights-of-way and non-irrigable high, rocky, or, canyon land.[66] Plans previously proposed for the North Unit's diversion and distribution systems were subject to re-examination and revision by Fisher as well. In regard to the point and means of diversion, he advised that a significant reduction in cost would be realized if plans to construct an all-new diversion dam were discarded in favor of diverting the North Unit's water supply at the COID's North Canal Dam. It was proposed that North Unit waters would initially flow through existing COID canals, using the North Canal for 1.5 miles, and then the Pilot Butte Canal for nearly 2 miles. Both of these sections of canal were to be enlarged to handle the additional water. Thereafter the North Unit water would flow through a new canal, referred to as the North Unit Main Canal (Main Canal).[67]

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[62] Ibid., 138-141; Salmond, John A. *The Civilian Conservation Corps, 1933-1942: A New Deal Case Study* (Durham, North Carolina: Duke University Press, 1967), 4-12.
[63] U.S. Department of the Interior, *Deschutes Investigations*, North Unit: 9.
[64] "Origin of Names of Projects and Project Features in Reclamation Territory." *The Reclamation Era.* (Washington D.C.: U.S. Department of the Interior, U.S. Bureau of Reclamation, Vol. 31, April 1940), 103. A wickiup is a loosely constructed hut made of boughs of trees interlaced, used for the time being by some tribes and left standing when abandoned.
[65] Ibid., 15.
[66] Ibid., 34-36.
[67] Ibid., 16-17.

The Main Canal was to commence at mile 3.3 (e.g., 3.3 miles from the intake structure at the North Canal Dam). The proposed canal would run north-northeast for about 29 miles to a site on Crooked River, 8 to10 miles south of Smith Rocks. The prior study had proposed a canal crossing at Smith Rocks, but Fisher and his team relocated the crossing to avoid Smith Rocks' difficult terrain. It was suggested that all 26 miles or so of new canal south of Crooked River be lined with concrete as a means to minimize water losses from seepage into the area's porous miles before finally reaching Project lands. Thereafter, it would continue north through the center of the Project service area, bypassing Metolius and crossing Willow Creek Canyon just west of Madras before entering Agency Plains, a near-level plateau with some 23,000 acres of irrigable lands.[68] The canal would terminate eight miles into Agency Plains.[69] The total length of the canal from intake to terminus would total about 65 miles, and would operate by gravity flow.

To carry canal water across the Crooked River and Willow Creek canyons, Fisher recommended the use of inverted siphons.[70] Siphons, at that time typically made of wooden-stave materials, were commonly used for water transportation purposes, and Reclamation had used siphons in canal building since the Agency's inception. In its early years Reclamation had pioneered the use of reinforced concrete for siphon construction. However, it came to favor steel siphons after some of the first concrete-constructed components showed almost immediate signs of deterioration. Fisher proposed using steel for the North Unit siphons. [71]

Fisher's report of findings for his North Unit investigations was completed in mid-1936. It provided a cost estimate of just over $9.2 million for Project construction. In addition to the cost to build the Project's storage and irrigations works, that projection included compensation to the Pacific Power and Light Company (PP&L) for the loss of its rights to the Deschutes River winter flows. In 1910, the Bend Water Power and Light Company built and operated a hydroelectric generating plant on the Deschutes at Bend – one of several that would follow downstream. In 1926, this company merged with other electrical developments in Redmond, Madras and Prineville to become the Deschutes Power and Light Company. By the time of PP&L's purchase of the Deschutes Power and Light Company and the Des Chutes Power Company in 1928, power plants had been constructed in Bend, Cline Falls and Steelhead Falls the Deschutes, and at the

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[68] U.S. Department of the Interior, U.S. Bureau of Reclamation, *Annual Project History, Volume III, Deschutes Project, Calendar Year 1940. (*Bend, Oregon: Author, 1940), 8.

[69] Agency Plains received its name because it is a large plain near the agency of the Warm Springs Indian Reservation. "Origin of Names of Projects and Project Features in Reclamation Territory." *The Reclamation Era.* (Washington D.C.: U.S. Department of the Interior, U.S. Bureau of Reclamation, Vol. 31, April 1940), 103.

[70] Siphons are used when water that is being conveyed by gravity must flow uphill, such as when crossing a stream channel. It is more economical to use a siphon than to build a bridge that keeps the flow at a level plain or downhill slope when the volume of water being transported is to be less than 100 cubic feet per second (c.f.s.) of flow. An inverted siphon is simply an enclosed pipe that transports water under the force of high pressure; the pressure of water flowing through the enclosed pipe can force water uphill. U.S. Department of the Interior, *Deschutes Investigations*, North Unit: 17-18, 24-26.

[71] For a discussion of Reclamation's early use of reinforced concrete for construction of irrigation structures see: McCormick, Mary & Kordecki, Cynthia , *Belle Fourche Irrigation Project, 1999-2001 Cultural Resource Inventory and Evaluation, Butte and Mead Counties, South Dakota,* Anthropology Research, Department of Anthropology, University of North Dakota, Contribution No. 361 (Grand Forks: University of North Dakota, 2002), 4.7-4.8.

on Reclamation's projects focused on improving soil and water conservation "through the construction and improvement of irrigation systems [and] the provision of supplemental water supplies" and developed recreational facilities at irrigation reservoirs.[80] There also was also auxiliary work on "improvements to wildlife refuges at reservoirs, rodent control operations, and weed eradication experiments."[81]

Reclamation sent the feasibility report to the Secretary of the Interior, Harold Ickes, for approval. Ickes agreed with the finding of the Deschutes Project feasibility report. The reality of construction of the Deschutes Project was getting closer when the U.S. Congress appropriated $450,000 for construction in the Interior Department's fiscal year 1937 appropriation budget. Nonetheless, before construction work could commence on the Deschutes Project, FDR had to act on this finding of feasibility. On November 1, 1937, FDR had approved of the Department of Interior's finding which then enabled Reclamation to commence with construction of the project.[82] Also before year's end, Jefferson County landowners demonstrated strong support for the Deschutes Project, approving the terms of a repayment contract by a vote of 179 for versus 10 against.[83] The favorable vote was a clear reflection of the dramatic change in local sentiments due to the tough economic times as nearly 75 percent of the farm families that had been there in 1921 had left the area through abandonment, consolidation or government purchase.[84] Those remaining were willing to accept Reclamation's land limitation requirements for the benefits of irrigated agriculture.

After nearly two decades of investigations and debate, in early 1938, Reclamation and the JWCD finally signed a construction and repayment contract for the Deschutes Project. The contract obligated the district's water users to repay the Government $8 million (less $2 million in non-reimbursable funds for CCC labor) for the cost to construct Wickiup Dam and the North Unit canal system infrastructure, payable over a period of 40 years. Reclamation charged C. C. Fisher with supervision of all aspects of Deschutes Project construction, appointing him Chief Engineer.[85]

Strong opposition to the North Unit immediately arose from the COID and AID, who had also signed on as Deschutes Project water users. These two independent irrigation districts had signed Warren Act contracts for additional water from the Deschutes Project.[86] Nonetheless, these

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[80] Golze, Alfred R. Civilian Conservation Corps Accomplishments on Federal Reclamation Projects Fiscal Year 1938, *The Reclamation Era.* (Washington D.C.: U.S. Department of the Interior, U.S. Bureau of Reclamation, Vol. 28, September 1938), 190.

[81] Ibid.

[82] "Deschutes Project is Approved", *The Reclamation Era.* (Washington D.C.: U.S. Department of the Interior, U.S. Bureau of Reclamation, Vol. 27, December 1937), 285; North Unit is Approved by President. *The Bend Bulletin,* (Bend, Oregon: G.P. Putnam, November 6, 1937), 1.

[83] *The North Unit Story*, The Long Dry Wait & Voters Support Irrigation Plan: 6.

[84] Van Winkle, Alfred Eugene. *Capitol Used in the Development of Newly Irrigated Farms on the North Unit, Deschutes Project, Oregon.* (Unpublished master's thesis, Corvallis, Oregon: Oregon State College, 1950), 11.

[85] U.S. Department of the Interior, *Annual Project History 1938*, 1 & 13; *Madras Pioneer,* March 5, 1942, retyped article in Box 581, Folder 23, National Archives Record Group 115, Broomfield.

[86] The Warren Act was passed on February 21, 1911 "authorizing the Secretary of the Interior to contact for the impounding, storage and carriage of water that is in excess to project requirements" to private corporations and irrigation districts even though these entities were not government built or owned systems. Lentz, C. R. *Yakima*

placing erosion-control canal riprap, eradicating burrowing animals, stringing phone lines, and other simple support services. For the Deschutes Project, it had been expected that they would be used to clear brush and trees from the reservoir pool and along canal alignments, help construct camps, and other ancillary actions. However, Reclamation considered it urgent to get Deschutes Project construction activities underway, and decided to use CCC enrollees for as much work as possible on Wickiup Dam and the North Unit Canal, including potentially dangerous jobs such as operating heavy equipment and setting dynamite charges. Reclamation would, however, contract with private firms for construction of the technologically complex structures such as the outlet works at Wickiup Dam, and the Crooked River and Willow Creek siphons.[93]

On June 6, 1938, even before the Deschutes Project engineering staff had arrived, the first of a total of three CCC units assigned to the Deschutes Project reported for duty.[94] The CCC unit contained 200 men and on the Deschutes Project an enrollee was paid $30 a month, of which $22 was allotted to dependents or set aside until he left the CCC. This first unit came in from Reclamation's CCC camp BR-44 near Stanfield, Oregon. Under the direction of Army personnel, that first unit started construction of a CCC camp at Redmond that day. This camp, located 16 miles north of Bend, was located on a 40-acre tract of unimproved land leased from the city of Redmond. [95] The camp buildings would occupy 20 acres to house "the largest single group of CCC enrollees in the West".[96] Camp Redmond consisted of three sets of barracks and mess halls for 200 men, "four Army offices, a camp store, officers' quarters, quarters and office for Bureau of Reclamation supervisory personnel, a large educational building, a woodworking shop, infirmary, radio station, recreation hall, laundry, and the required garages, shops, etc."[97] (see Figure 7)

On July 18, 1938, the Army brought the remaining two CCC units to Camp Redmond "direct from Indiana and Kentucky in the Fifth Army Corps Area".[98] These units were given the numbers BR-88, BR-89, BR-90 when they were at Camp Redmond, but the numbers changed to BR-75, BR-76, and BR-77 when they were stationed at Camp Wickiup.[99] At this time the Army turned the first unit over to Reclamation. Deschutes Project engineers immediately dispatched that group of young men to Wickiup, setting them to work building a road to the dam construction site. Due to the primitive travel conditions between Redmond and Wickiup's somewhat remote location, which was located some 40 miles south of Bend, the Army decided to build a spike CCC camp at the dam site, and immediately set the enrollees to the task (see Figure 8).[100] To better access the site, an 8 mile road was reconstructed from Pringle Falls to

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[93] Quivik & Hess, 75.
[94] U.S. Department of the Interior, *Annual Project History 1938*, 1-2
[95] Fisher, 115; Pfaff, Christine. *The Bureau of Reclamation's Civilian Conservation Corps Legacy: 1933-1942.* (Denver, Colorado: U.S. Department of the Interior, U.S. Bureau of Reclamation, 2010), A-203. CCC assistant leaders were paid $36 a month and leaders were paid $45 a month.
[96] Fisher, 102.
[97] Fisher, 103.
[98] U.S. Department of the Interior, *Annual Project History 1938*, 1; Ibid., 102.
[99] Pfaff, E-5.
[100] U.S. Department of the Interior, *Annual Project History 1938*, 1-2; *The North Unit Story,* Forest Must be Cleared for the Wickiup Project: 7-8; "Extension of Canal Deschutes Project", *The Reclamation Era.* (Washington D.C.: U.S. Department of the Interior, U.S. Bureau of Reclamation, Vol. 31, March 1941), 79; Fisher, 103.

Camp Wickiup and a new telephone line was strung 8.5 miles from the U.S. Forest Service line at Pringle Falls. The spike camp was replaced with permanent buildings, which was unlike other CCC camps at this time which utilized portable buildings. At Camp Wickiup the permanent buildings were quicker to build than the portable ones. Construction on these camp buildings commenced on September 26, 1938, with a maximum of 36 carpenters to construct 34 buildings to house the men and machinery needed for this job and a large auditorium building. A testing laboratory for dam construction materials was also built in the complex.[101] Army officials considered Camp Wickiup to be "the one outstanding CCC camp of the West, if not the entire Nation" due to the "beautiful setting, the special high class of the construction and the completeness and large capacity of the camp".[102] Work at Wickiup would go on each year from April to December; when the snows were too deep to continue, the units would be transferred to Camp Redmond for work on the Main Canal (see Figure 9).[103]

Deschutes Project - North Unit Irrigation System Construction

Crane Prairie Dam

In 1938, Reclamation agreed to replace the old Crane Prairie Dam as component of the water storage plan for the Deschutes Project. The old name would still be retained, but a new, conventional 285 foot long earthfill dam with a storage capacity of 55,300 acre-feet (which was equal to about 16 billion gallons of water) would be built to replace the old wooden crib structure. This dam was to be located just below the old dam's location. Reclamation engineers designed the new dam in-house and let the construction contract to competitive basis. Vernon Brothers of Boise, Idaho won the contact for construction of the dam under Reclamation specification No. 850, Schedule No. 1 on August 9, 1939. One of the unique features to the new Crane Prairie Dam would be the 12-sided fish screen at the beginning of the outlet works and the open air jib crane used for screen removal located on top of the control works. Construction involved removing the old dam, clearing the area for the new dam, excavating for the new dam, building a concrete outlet works with fish screens along with earth fill embankments. Also on the left downstream side of the dam an 80 foot-wide by 400 foot-long open cut uncontrolled spillway built with rubble rock sides. Work began on August 24th and shut down for the winter on December 18, 1939. It started back up again on March 8, 1940, with all the work on the contact being completed by August 15, 1940. Final cost of this new dam was $104,000 (see Figures 10 & 11). [104]

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[101] U.S. Department of the Interior, *Annual Project History 1938*, 21 & 32-33; Fisher, 103.
[102] Fisher, 103.
[103] U.S. Department of the Interior, U.S. Bureau of Reclamation, *Annual Project History, Volume II, Calendar Year 1939 for Deschutes Project.* (Bend, Oregon: Author, 1939), 1 & 5.
[104] U.S. Department of the Interior, *Annual Project History, 1939,* 34; U.S. Department of the Interior, *Annual Project History 1940*, 45- 47; "Contracts Awarded, Crane Prairie Dam Deschutes Project, Oregon", *The Reclamation Era.* (Washington D.C.: U.S. Department of the Interior, U.S. Bureau of Reclamation, Vol. 29, October 1939), 268; "Crane Prairie Dam Completed", *The Reclamation Era.* (Washington D.C.: U.S. Department of the Interior, U.S. Bureau of Reclamation, Vol. 30, September 1940), 249; "A New Crane Prairie Dam", *The Reclamation Era.* (Washington D.C.: U.S. Department of the Interior, U.S. Bureau of Reclamation, Vol. 32, April 1942), 90; U.S. Department of the Interior, U.S. Bureau of Reclamation, *Project History, Deschutes Project, Oregon, Volume XX, 1967-1968.* (Bend, Oregon: Author, 1968), iv. The contract number for construction of Crane Prairie Dam was I2r-10387.

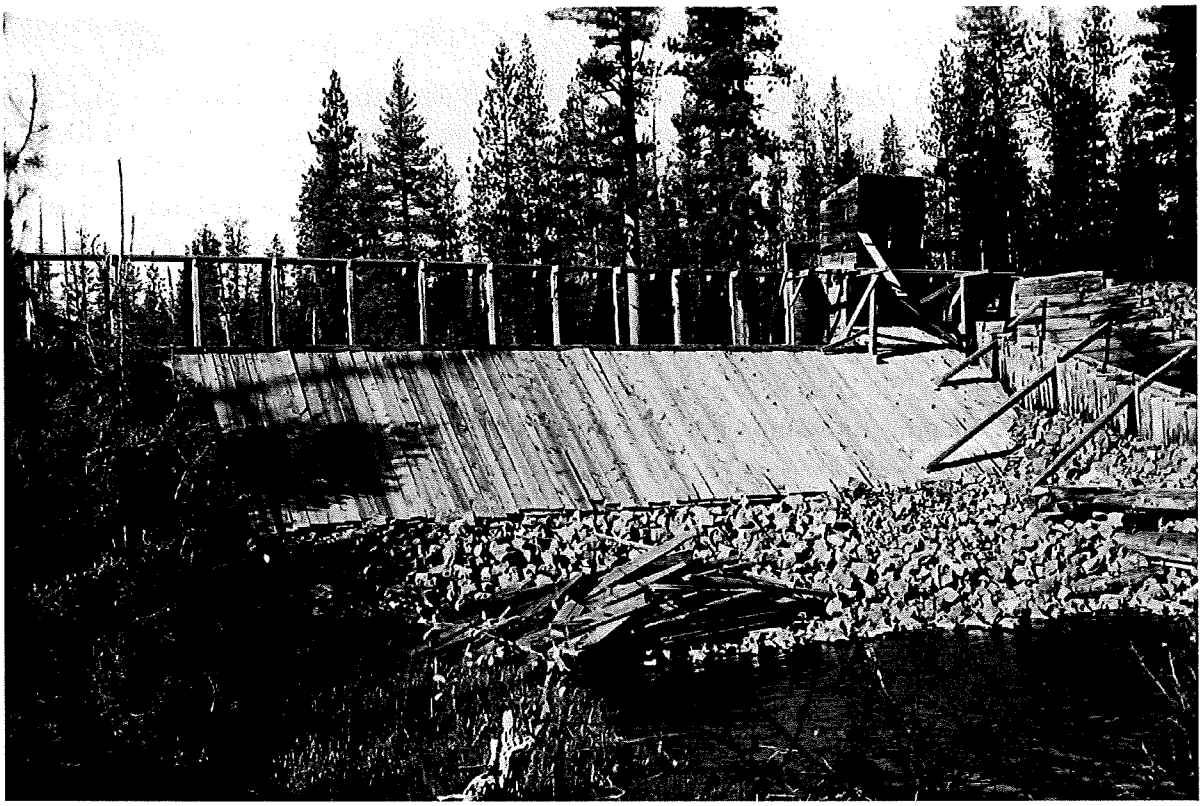

Figure 10: Old Crane Prairie Dam downstream view October 7, 1938.

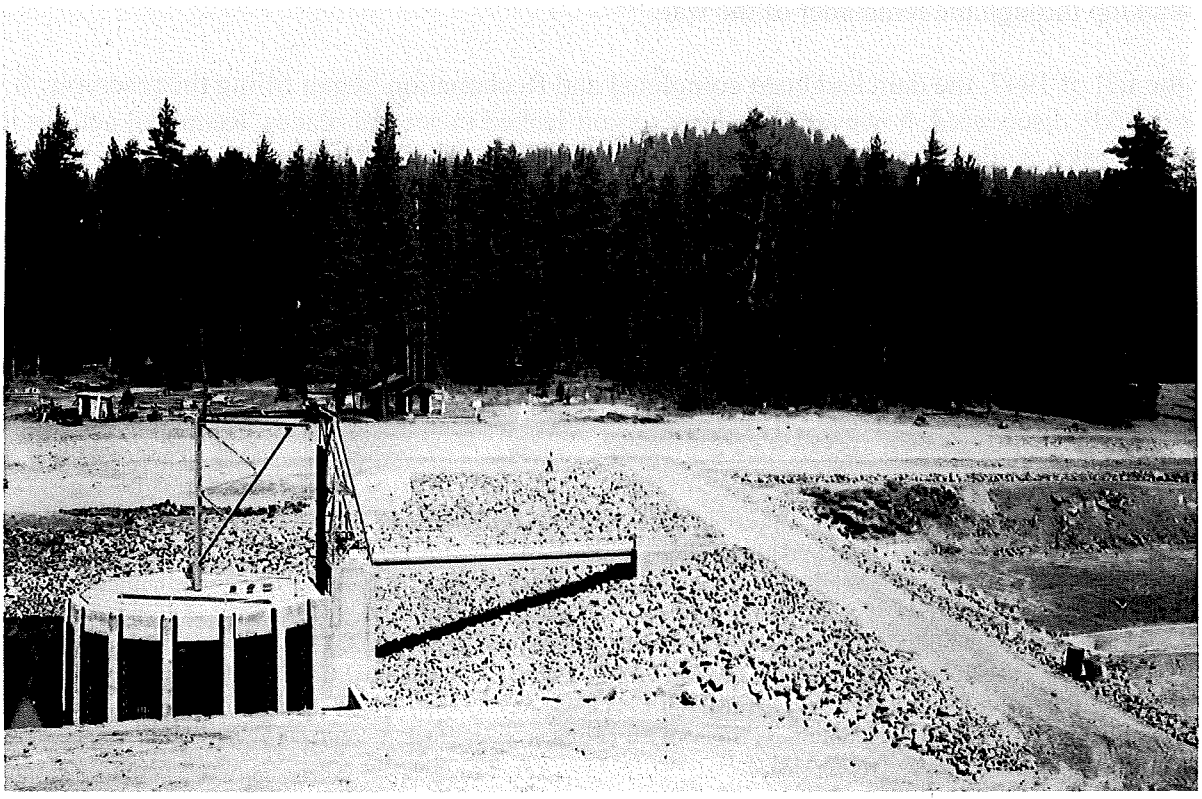

Figure 11: Completed new Crane Prairie Dam, 1940.

Figure 12: Clearing operations at Wickiup Reservoir, 1940.

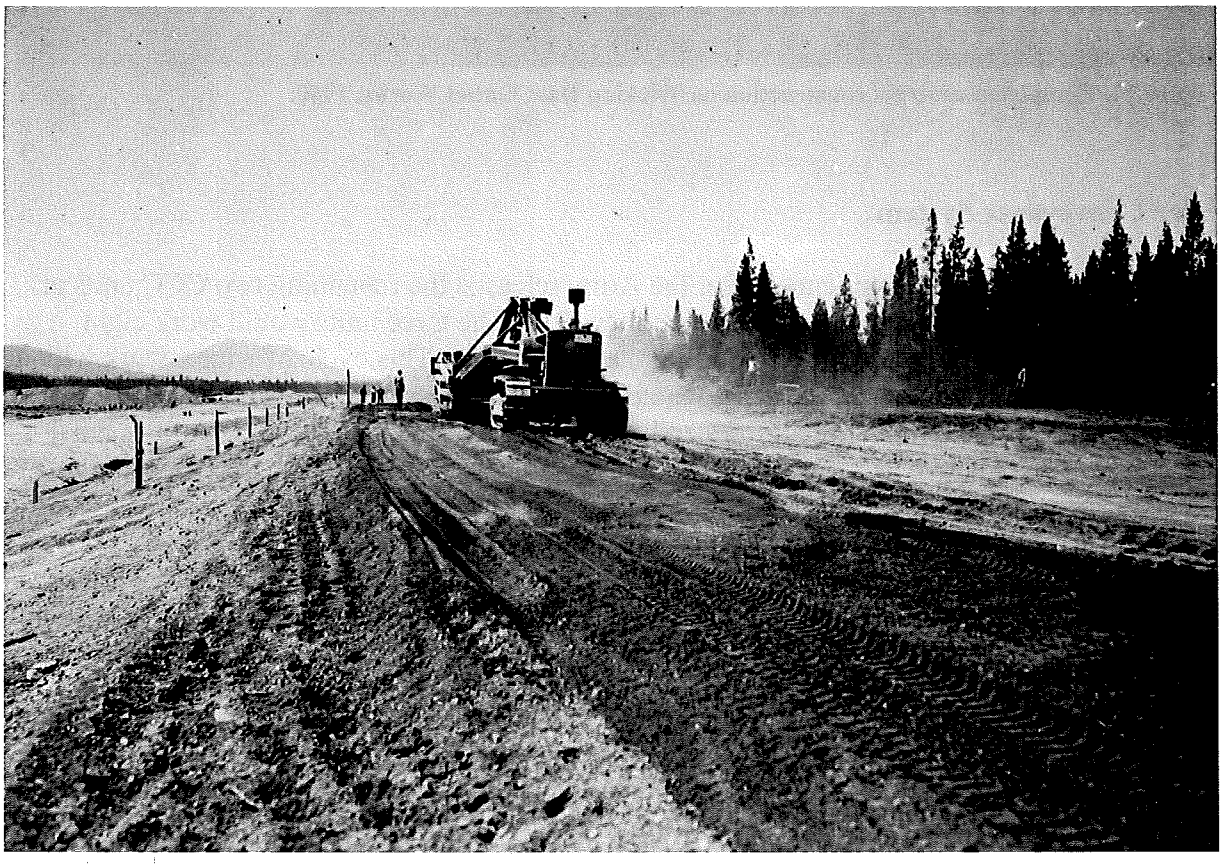

Figure 13: Wickiup Dam – View along Dike from Left Abutment, 1940.

Figure 15: Wickiup Dam, looking north from right abutment. Reclamation maintenance buildings located below the dam with Round Mountain beyond. Snow covered Cultus Mountain to left with reservoir at near maximum storage. Reclamation photograph Deschutes 640 taken in 1950.

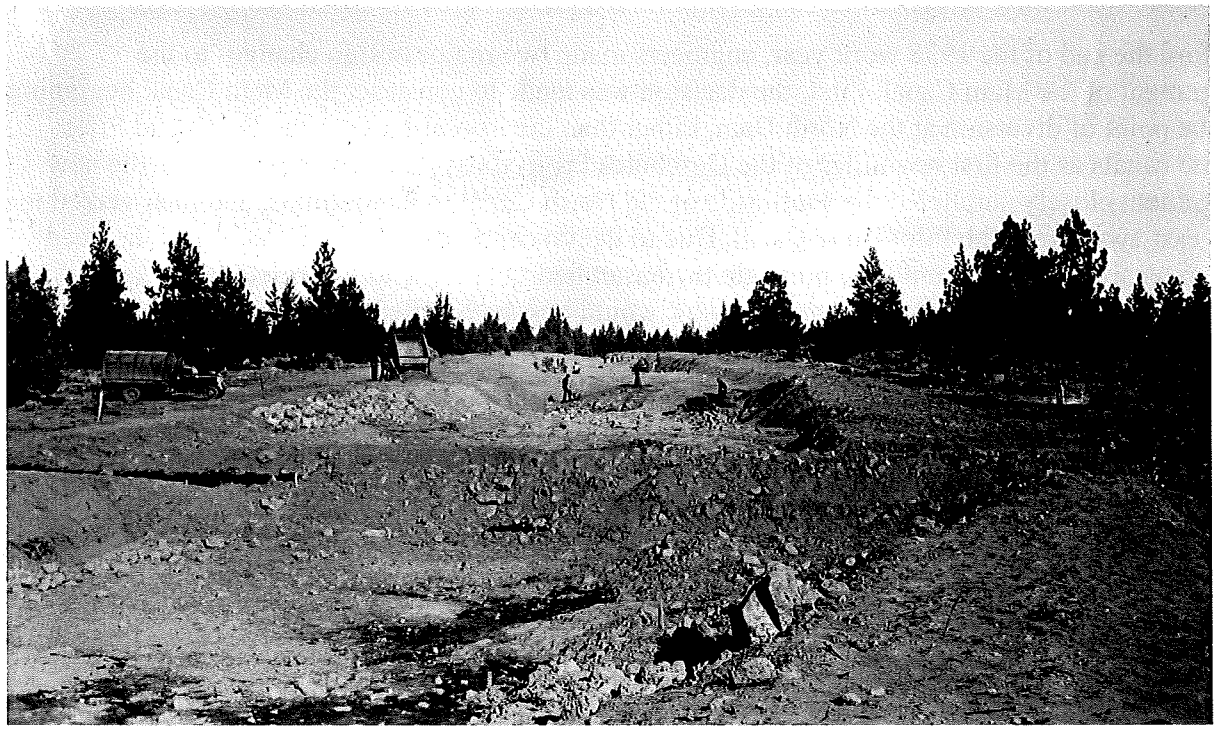

Figure 16: North Unit Main Canal – Beginning of construction Station No. 245. November 17, 1938.

siphon and bridge work apparently more than compensated for the added expense of constructing nearly five miles of canal through the Smith Rocks formation.[113]

In early 1939, Reclamation brought additional heavy equipment to the Deschutes Project, increasing the pace of construction on the Main Canal. By then, Deschutes Project engineers had formalized the work into a set sequence of tasks performed by one or more CCC crews, each under the direct supervision of Reclamation personnel. Clearing and excavation crews progressed up the canal alignment, while other crews followed behind drilling blasting holes in the exposed bedrock and setting dynamite charges. A drilling crew consisted of 30 to 40 CCC enrollees who used 14 to 18 jackhammers. Each man did not have his own jackhammer, but worked in groups of three with two jackhammers (see Figure 18). An experienced powder foreman oversaw the placing and handling of the charges by the approximately ten CCC men in this crew. There would be as many as 800 to 1,200 loaded holes in an average blast.[114] After blasting, the rock rubble was removed, initially with a 1.5 cubic-yard power shovel. In spring of 1939, two 2 cubic-yard draglines arrived on-site, and thereafter, the dragline was used for rock excavation activities (see Figure 19). However, Reclamation crews and not CCC enrollees operated the dragline.[115]

Figure 18: CCC enrollees drilling rock - North Unit Main Canal, 1940.

[113] U.S. Department of the Interior, *Annual Project History, 1938*, 5-7 &10.
[114] Beam, 91.
[115] Fisher, 115.

Figure 20: CCC enrollees hand finishing riprap - North Unit Main Canal, 1940.

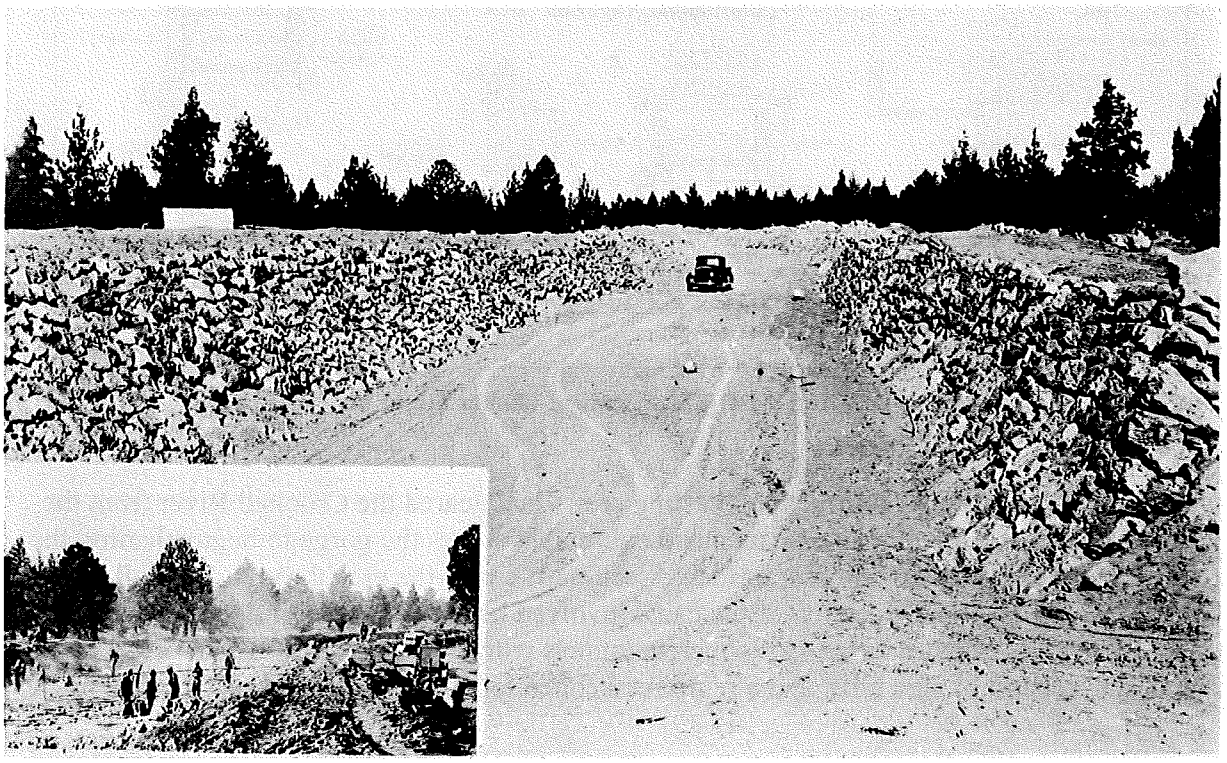

Figure 21: Completed section of North Unit Main Canal. Inset of CCC enrollees drilling rock on canal, 1939.

Figure 23: CCC enrollees constructing Farm Flume at Station No. 139+62 on North Unit Main Canal, 1941.

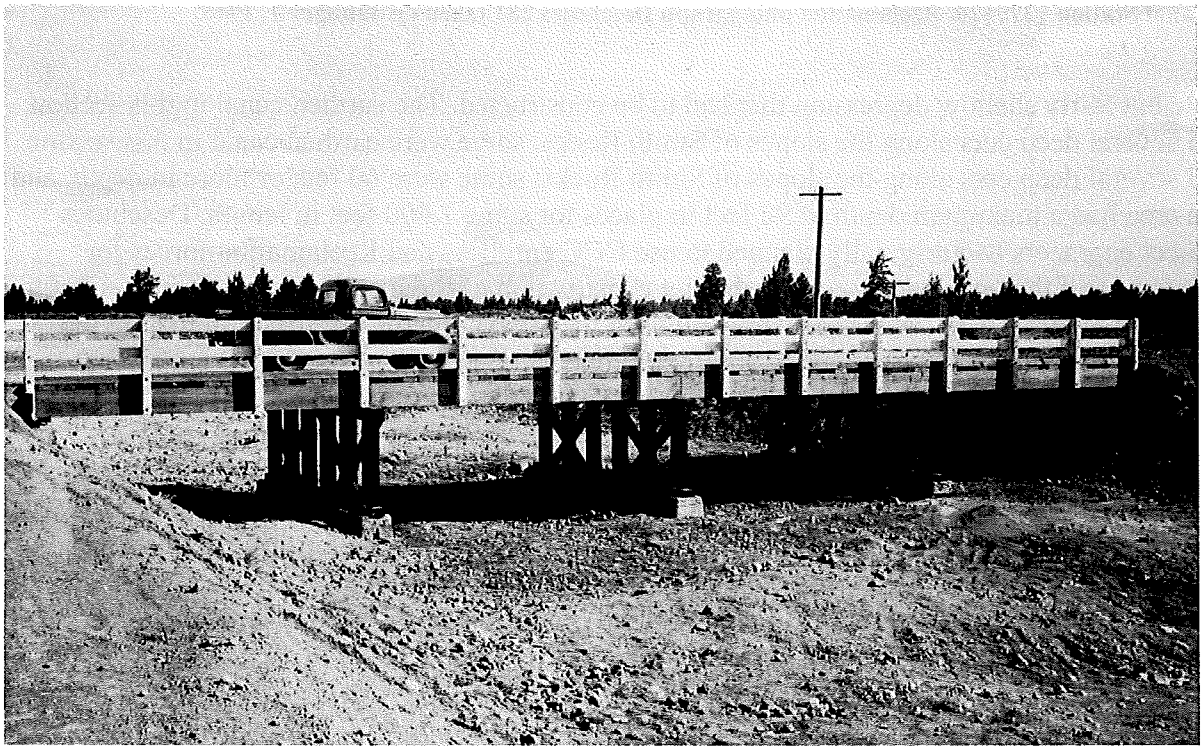

Figure 24: North Unit Main Canal completed county bridge at Station No. 1074+42 in 1941.

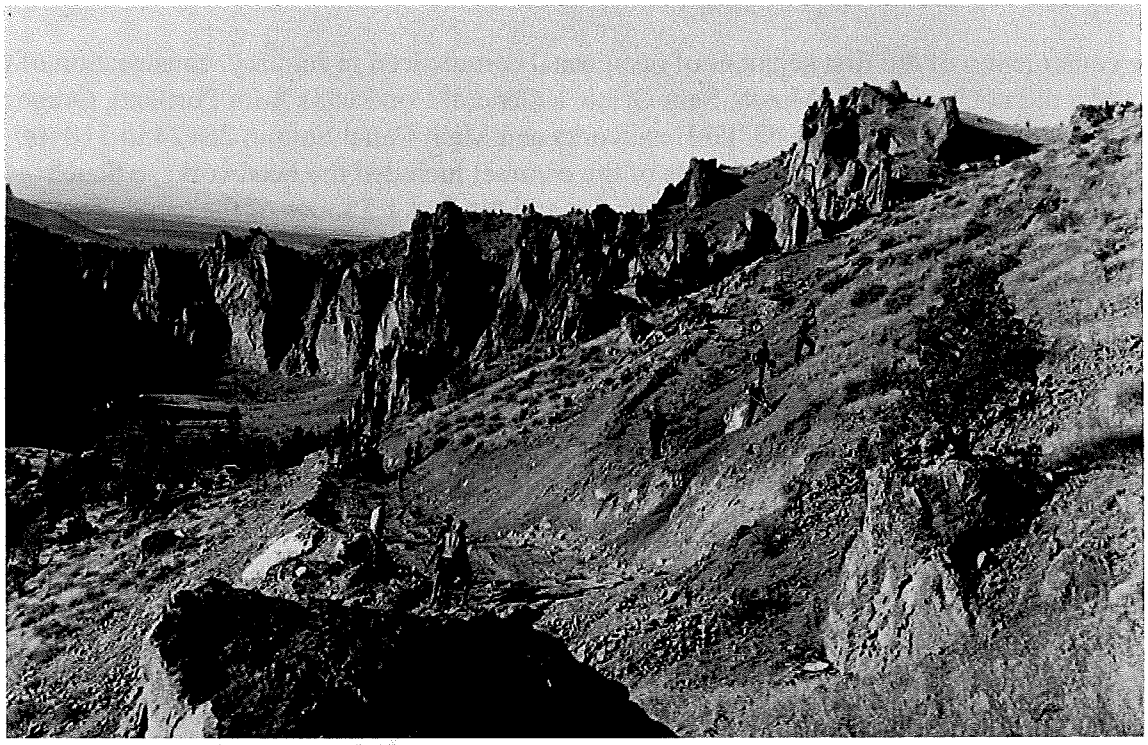

Figure 26: CCC Camp Redmond enrollees excavating construction road near Tunnel 1 "Smith Rock" section, North Unit Main Canal, taken on February 7, 1941.

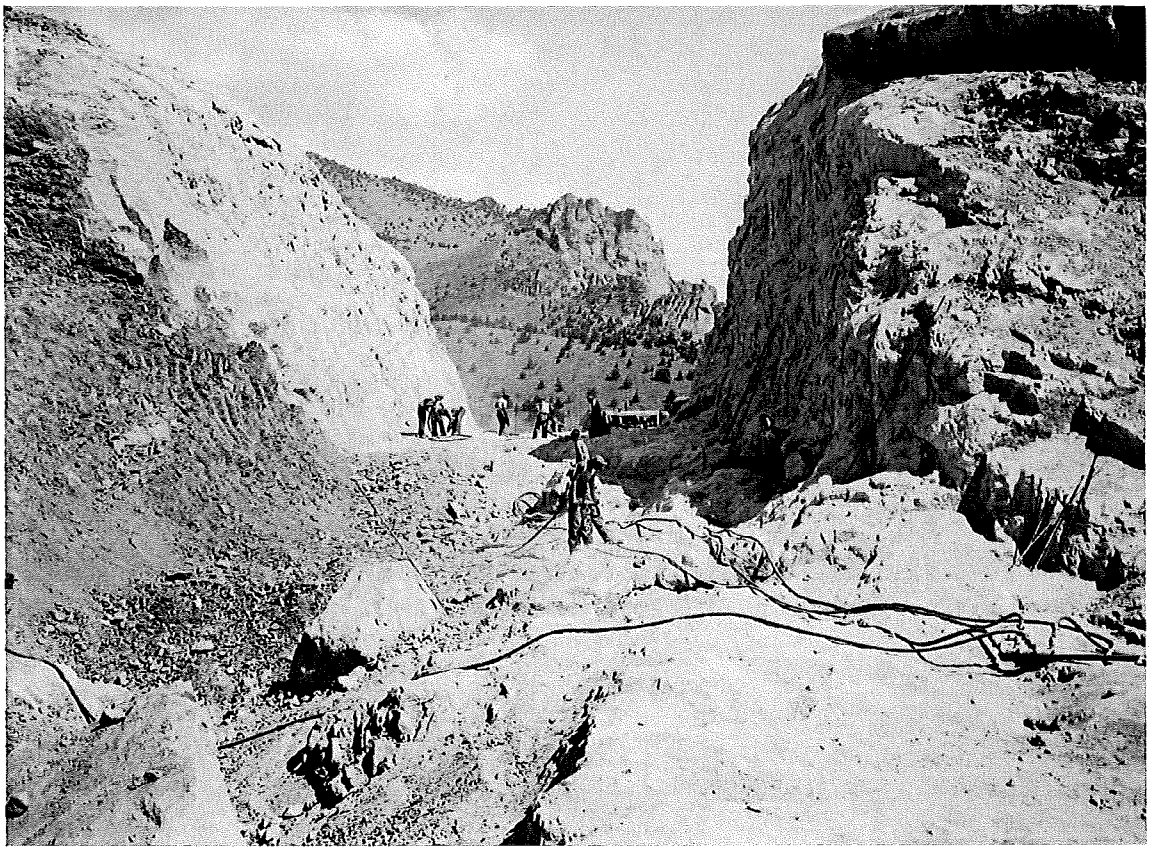

Figure 27: CCC enrollees drilling rock cut at Station No. 1552 in the North Unit Main Canal, 1941.

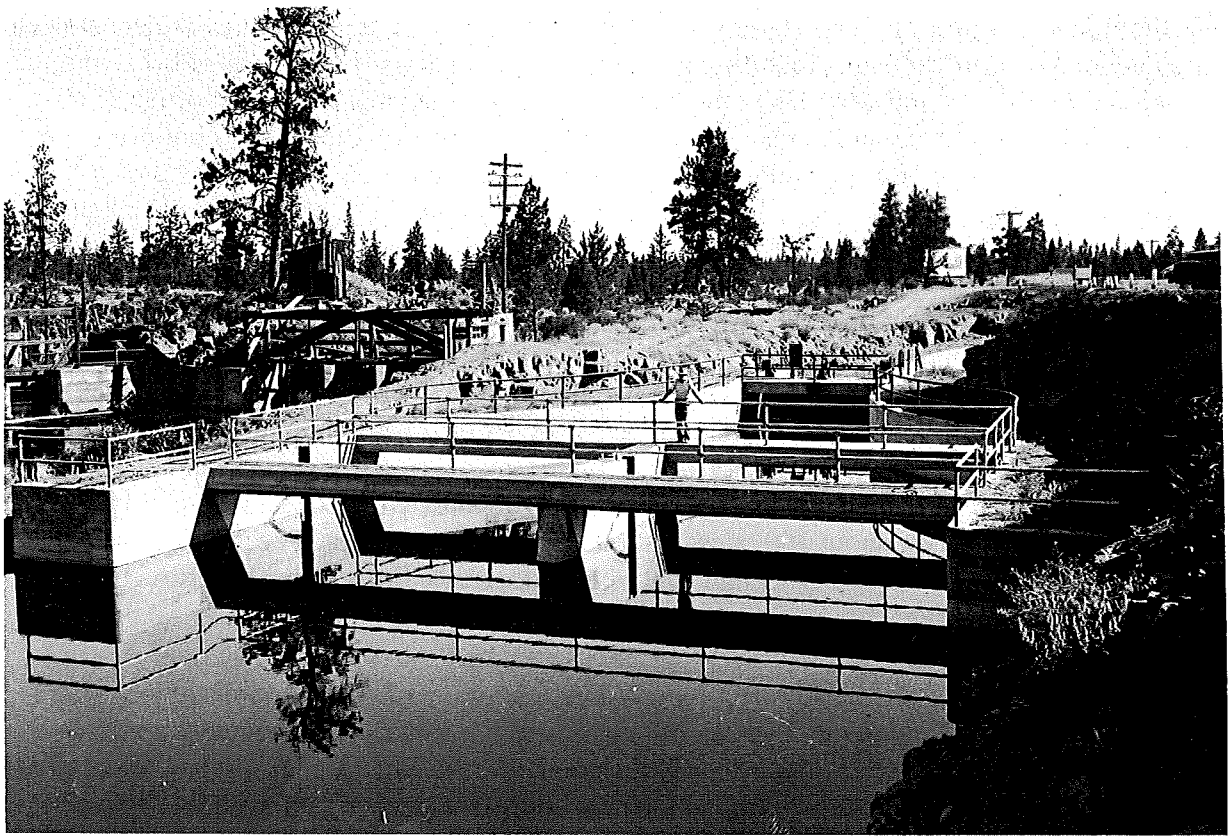

Figure 29: Completed North Unit Main Canal Headworks by Sam Orino contractor on July 9, 1942. Note fish screens have not been installed. Reclamation photograph Deschutes 189.

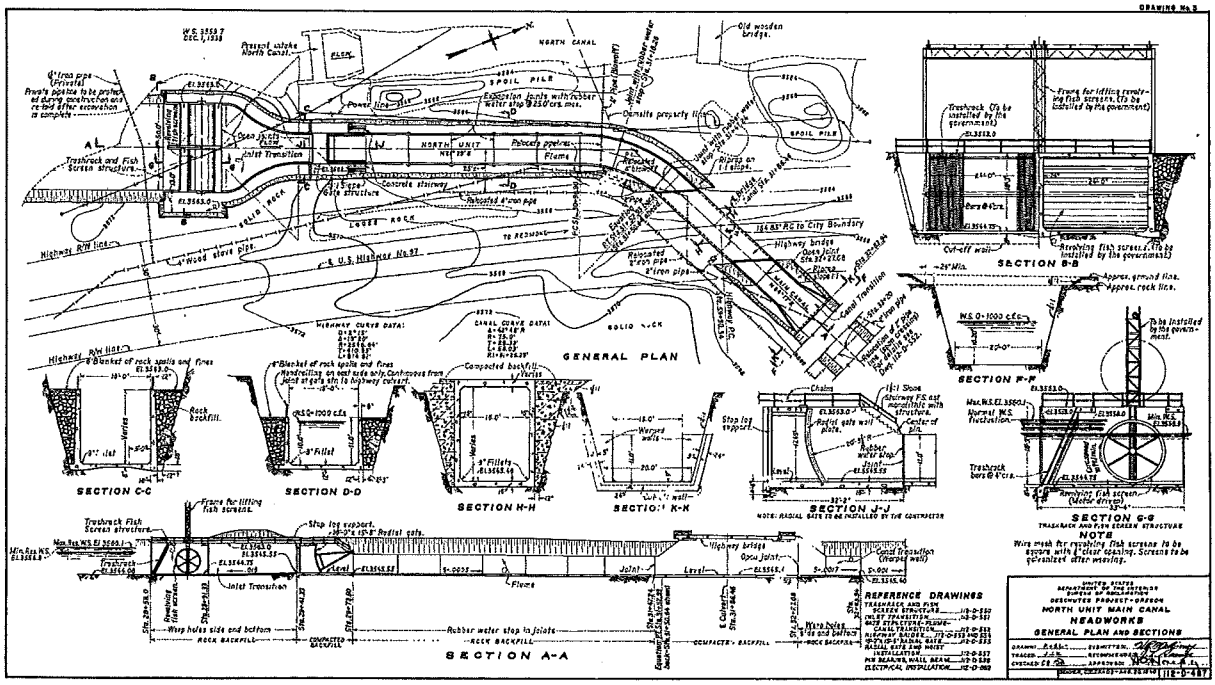

Figure 30: Reclamation Drawing 112-D-487 of North Unit Main Canal Headworks.

the two Smith Rocks tunnels that had been cancelled in 1942. They were Specification No. 1071 for the Sherwood Canyon siphon, Specification No. 1063 for the two tunnels, and Specification No. 1072 for the Crooked River Bridge. Contracts were in place for all three construction jobs by early 1944 for a total cost of $725,976.80, which included the cost of two highway bridges in Sherwood Canyon under Specification No. 1071. Those who won the contracts were McLaughlin Construction Company of Livingston, Montana for Specification No. 1071, Wixson & Crowe of Redding, California for Specification No. 1063, and David A. Richardson of Santa Cruz, California for Specification No. 1072.[131]

Due to the commandeering of steel by the war industry, Reclamation had shelved plans to build the two crossings using steel siphons. The siphon design was retained for the shallow crossing site at Sherwood Canyon; with construction materials modified from steel to reinforced concrete (see Figure 31). However, due to the width and great depth of the Crooked River gorge, construction of an all-concrete siphon across the gorge was not feasible from an engineering standpoint. Reclamation instead decided to span the Crooked River with a reinforced concrete flume. Revised plans called for a 521-foot-long concrete box flume supported by a concrete arch-like bridge (see Figures 32 & 33).[132] One Reclamation engineer was to later declare that "with its long central span and flume conduit located some 150 feet above the river, [the Crooked River Flume] is one of most unusual canal structures in the region."[133]

Construction work on the Crooked River Flume and the other major canal structures did not progress as quickly as hoped. In the 1944 Deschutes Project History, it was noted that all three contractors had fallen behind schedule due to "difficulties in securing labor, materials, repair parts, and housing facilities."[134] Labor and material shortages continued to plague construction throughout 1945. Firms awarded the contracts for the Sherwood Canyon Siphon and the two Smith Rocks Tunnels managed to complete their respective jobs by late summer of 1945. However, considerable work still remained on the Crooked River Flume at the end of the year.[135] Reclamation formally took over the project on January 15, 1946, due to the unfinished condition of the flume at the end of 1945 and the inability of Richardson to complete this project on time. Reclamation immediately issued invitations to bid on completing the structure. McLaughlin Construction Company of Livingston, Montana was the lowest bidder at $118, 801.00. Construction under the new contractor started on January 30th and was completed, including the removal of all the wood scaffolding, by April 30, 1946 (see Figure 34).[136]

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[131] U.S. Department of the Interior, U.S. Bureau of Reclamation, *Annual Project History, Volume VII, Deschutes Project, Calendar Year 1944.* (Bend, Oregon: Author, 1944), 63, 65 & 69.

[132] U.S. Department of the Interior, U.S. Bureau of Reclamation, "Crooked River Crossing: Flume and Outlet Transition," 22 March 22, 1944, Deschutes Project Drawing No. 112-D-840, prepared by Denver Office, on file at Reclamation's Pacific Northwest Regional Office, Boise, Idaho [Citations hereafter for Reclamation drawings will not include the name of the repository unless RTI found the drawing at a location other than the Pacific Northwest Regional Office.]

[133] "Inspection of Crooked River Crossing North Unit Main Canal, Deschutes Project, Oregon," October 1, 1952 in: U.S. Department of the Interior, U.S. Bureau of Reclamation. *Inspection of Major Structures and Facilities of the Bureau of Reclamation in Region 1, Field Trip Report March 13, 1953* (Boise, Idaho: Author, 1953), Appendix 4, on file at Reclamation's Pacific Northwest Regional Office, Boise.

[134] U.S. Department of the Interior, *Annual Project History 1944*, 62.

[135] U.S. Department of the Interior, *Annual Project History 1945*, 14-15.

[136] U.S. Department of the Interior, U.S. Bureau of Reclamation, *Annual Project History, Volume IX, Deschutes Project, Calendar Year 1946.* (Bend, Oregon: Author, 1946), 43.

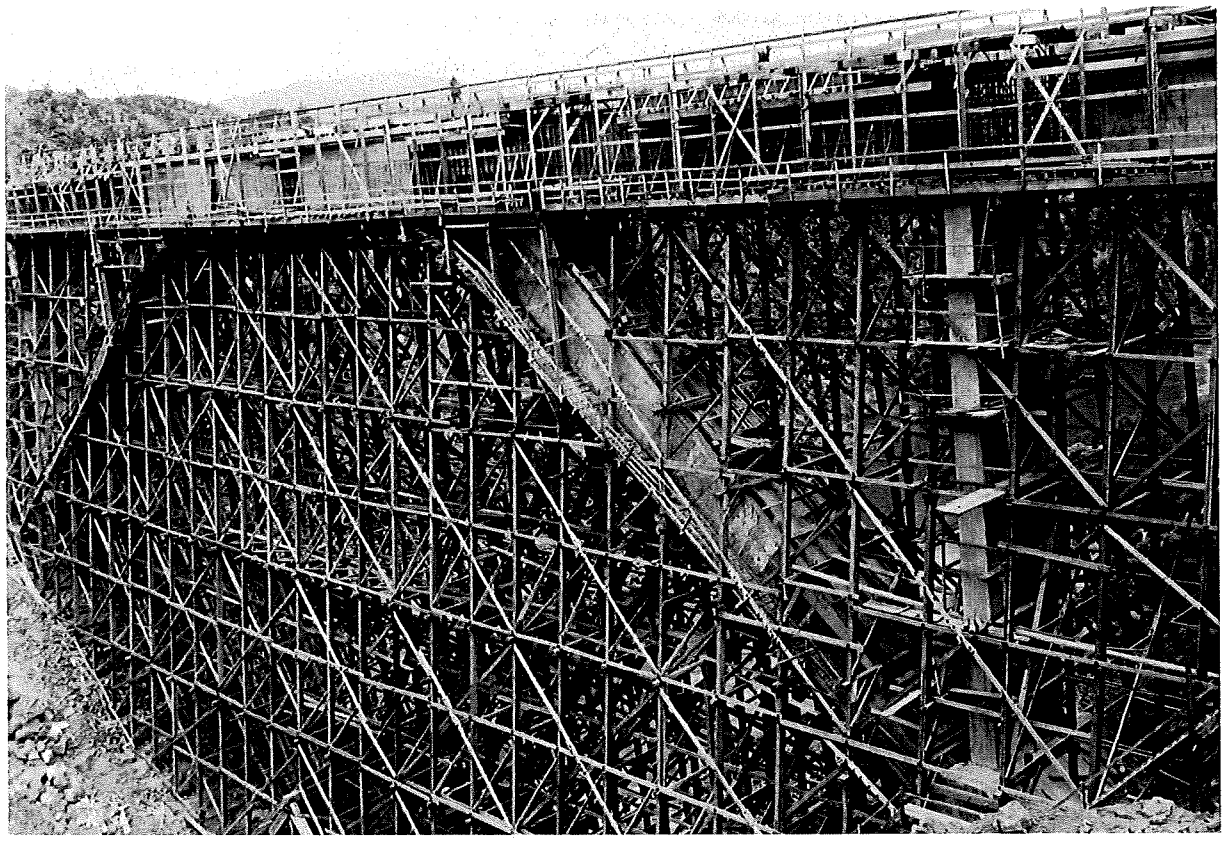

Figure 33: North Unit Main Canal Crooked River Crossing showing erection of enclosed flume and roadway on April 20, 1946. Reclamation photograph Deschutes 460.

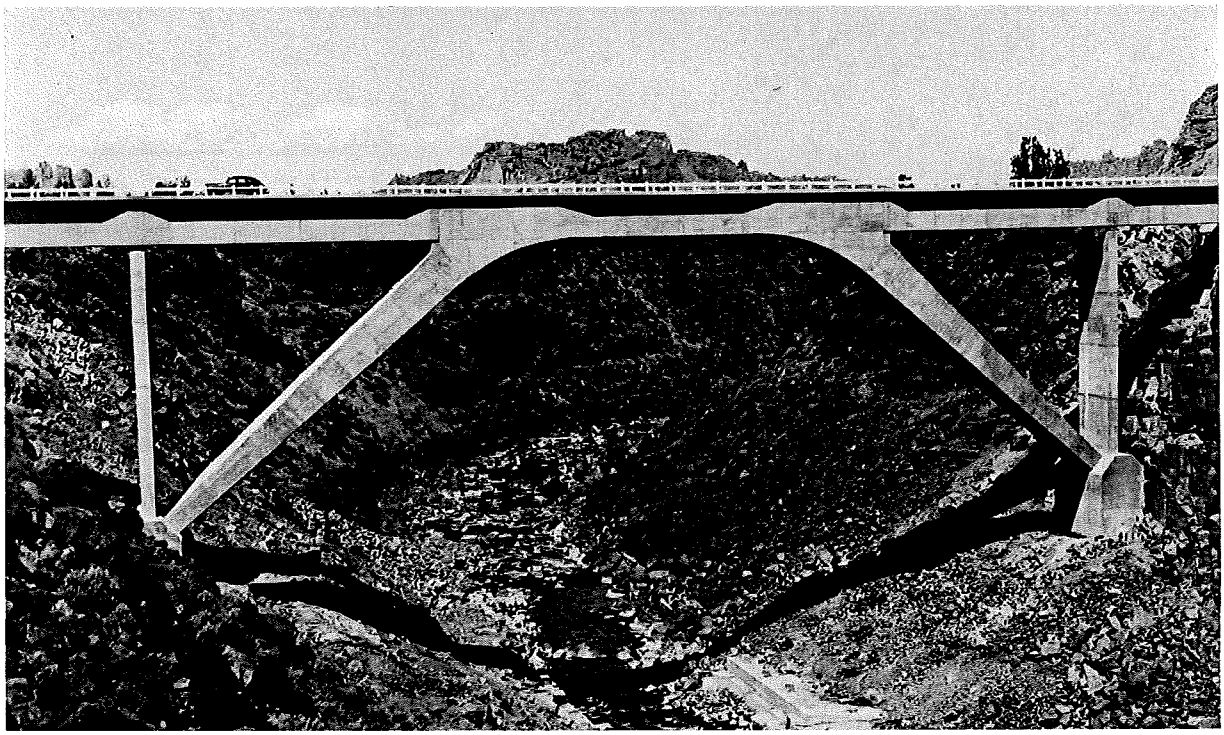

Figure 34: North Unit Main Canal Crooked River Crossing. View of completed structure looking downstream from south rim of canyon on July 13, 1946. Reclamation photograph Deschutes 470.

structures were to be constructed of reinforced concrete rather than wood, reflecting the preference to minimize maintenance or replacement costs.[139]

While the headworks had been completed in 1942, Reclamation did not have Sam Orino install the fish screens before the headworks gate.[140] This was to be completed by Reclamation and on May 3, 1945 the installation of the rotary fish screens began, so the canal would be ready for its first test (see Figure 36). In early June 1945, the headworks were complete and the gate was opened to test and prime the Main Canal. Much to the distress of engineers, however, the canal leaked excessively. In an attempt to reduce water losses, Reclamation and conscientious objector crews immediately began puddling the Main Canal from the intake to the Crooked River crossing.[141] Puddling is a process where silt-laden water is run into the canal and the silts are allowed to settle out, filling the voids and creating a thin water resistant veneer thereby reducing water loss.[142] Work crews filled the major cracks and crevices in the Main Canal with cinders prior to puddling.[143] Priming and puddling of the canal north of the Crooked River to Haystack Draw commenced in early May 1946.[144]

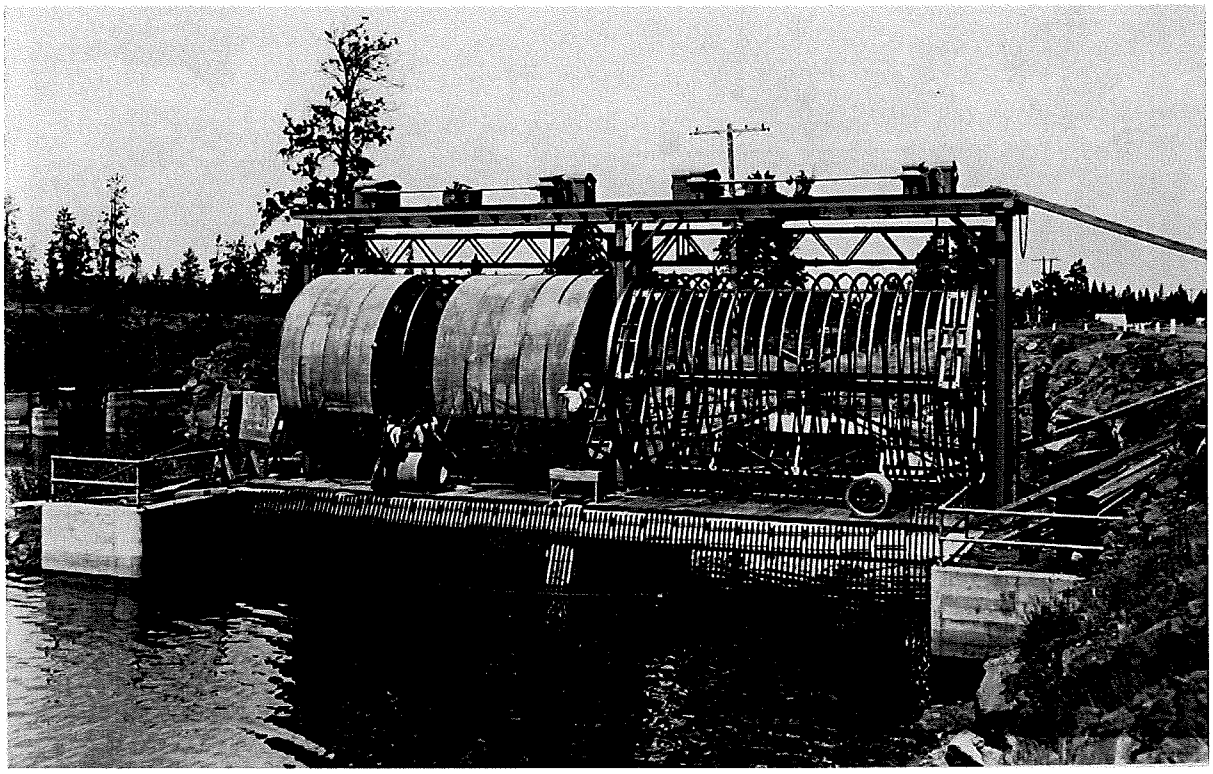

Figure 36: Placing screening on Rotary Fish Screen at headworks of North Unit Main Canal. Reclamation photograph Deschutes 317 taken on May 30, 1945.

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[139] U.S. Department of the Interior, U.S. Bureau of Reclamation, *Annual Project History, Volume X, Deschutes Project, Calendar Year 1947.* (Bend, Oregon: Author, 1947), 19.
[140] U.S. Department of the Interior, *Annual Project History 1942*, 94.
[141] U.S. Department of the Interior, *Annual Project History 1945,* 62& 65.
[142] Harding, S. T. *Operation and Maintenance of Irrigation Systems*, (New York and London: McGraw-Hill Book Company, 1917), 14.
[143] Ibid.
[144] U.S. Department of the Interior, *Annual Project History 1946,* 11.

Figure 38: First water to reach land on the 50,000 acre North Unit at George Rodman farm which received its water off Lateral M-41. May 18, 1946. Reclamation photograph Deschutes 786.

However, in 1947, a dramatic resurgence in the pace of construction on the Deschutes Project occurred. U.S. servicemen returning from the war and eager for work effectively ended the labor shortage. At the same time, the Federal government rescinded the wartime restrictions on materials, although some high-priority materials remained in short supply. Before the end of the 1947 irrigation season, the Main Canal extended from the intake to Willow Creek, a distance of slightly over 56 miles, while the lateral system was all but complete, having the capability of serving 23,500 irrigable acres. Construction was also underway on the siphon at Willow Creek as well as the last 8 miles of the canal alignment. Although short, that final section of canal served an extensive lateral system branching out to 18,500 acres of irrigable land across Agency Plains. Additionally, it was to furnish irrigation water to a much smaller network of laterals extending to North Unit lands along Mud Springs east of Agency Plains.[147]

While material shortages during the war resulted in changes to the original construction designs for the conveyance structures at the Crooked River and Sherwood Canyon crossings, Reclamation kept to the original siphon design for the Willow Creek crossing. Willow Creek siphon had a short bridge span crossing the creek at the bottom of the canyon instead of a large a level flume placed on a long bridge span above the canyon like Crooked River and Sherwood Canyon crossings. Willow Creek siphon was a high-pressure pipeline with a diameter of 96 inches. The pipeline section spanning the creek consisted of a steel siphon on steel trusses (see

[147] U.S. Department of the Interior, *Annual Project History 1947,* 12 & 35-42.

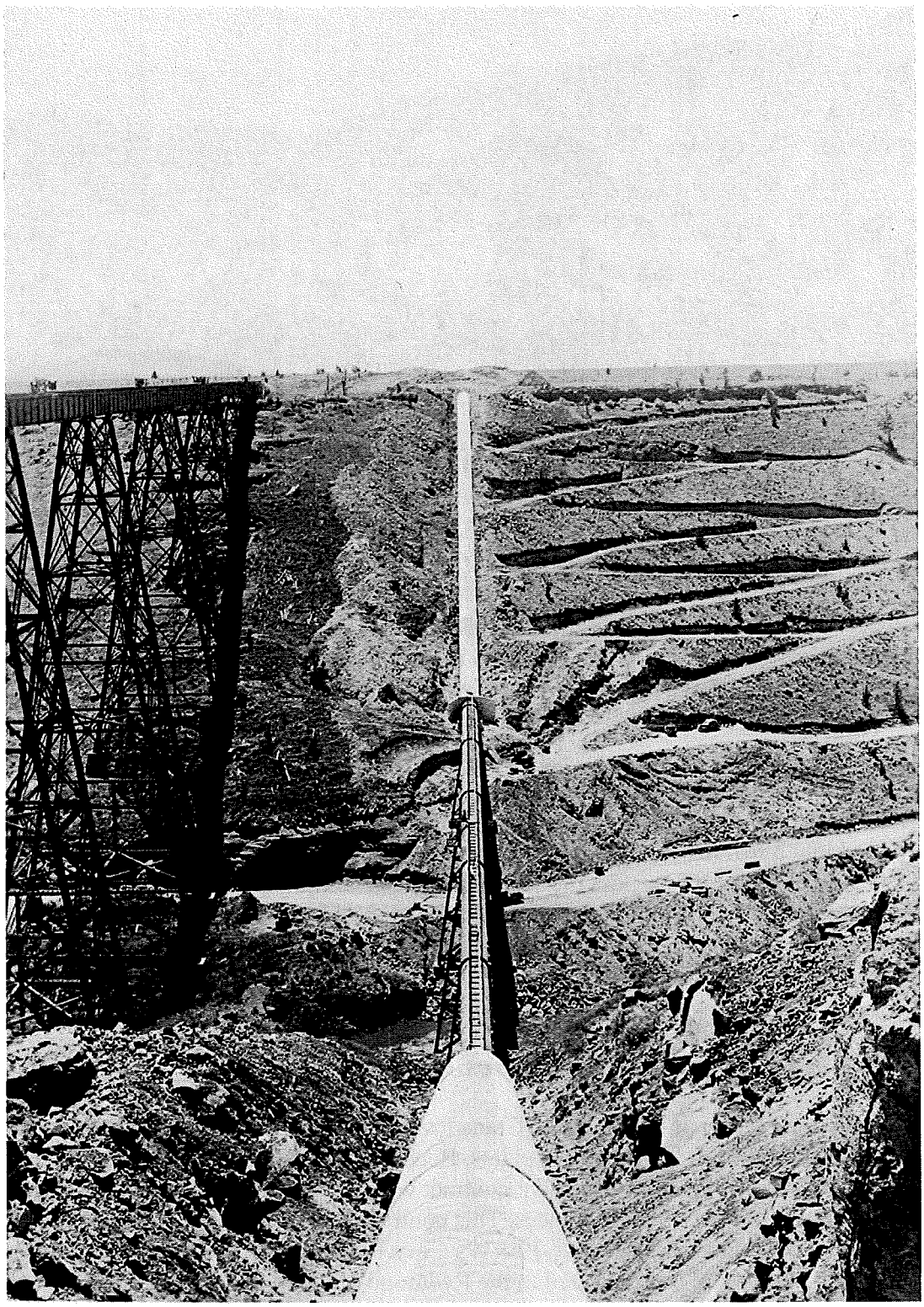

Figure 40: View along center line from outlet end of Willow Creek Crossing North Unit Main Canal. Reclamation photograph Deschutes 561 taken in 1948.

between these locations would be reinsulated or reconstructed to 66-kilovolts from 22-kilovolts and two new step-down substations would be built at Redmond and the Atomite plant. [152]

Reclamation in conjunction with PP&L designed the new transmission lines under Reclamation Specification No. 1450-D. Homer G. Johnson of Portland, Oregon won the construction contract for Schedule No. 1 and 2 under this specification with a bid of $6,298 on December 13, 1940. Work did not begin immediately because of "unexpected complications in obtaining right of way and delays in securing construction materials, particularly poles, notice to proceed did not occur until" March 5, 1941.[153] Work was finished by June 6, 1941 and they were turned over to PP&L for energizing and O&M (see Figure 42).[154] Construction of the 1,500 kilowatt hydro-electric unit at the Cove Power Plant was delayed until January 3, 1945 due to material shortages in WWII. The contract for Reclamation's Specification No. 1079 for the Cove Power Plant addition was awarded to C.J. Montang & Sons, but as with many of the projects during WWII the contractor experienced difficulties in obtaining labor which resulted in the structure being only 67 percent complete by the end of 1945 (see Figure 43). [155] It was completed by March 21, 1946, tested, and then placed into operation by PP&L in April (see Figure 44).[156]

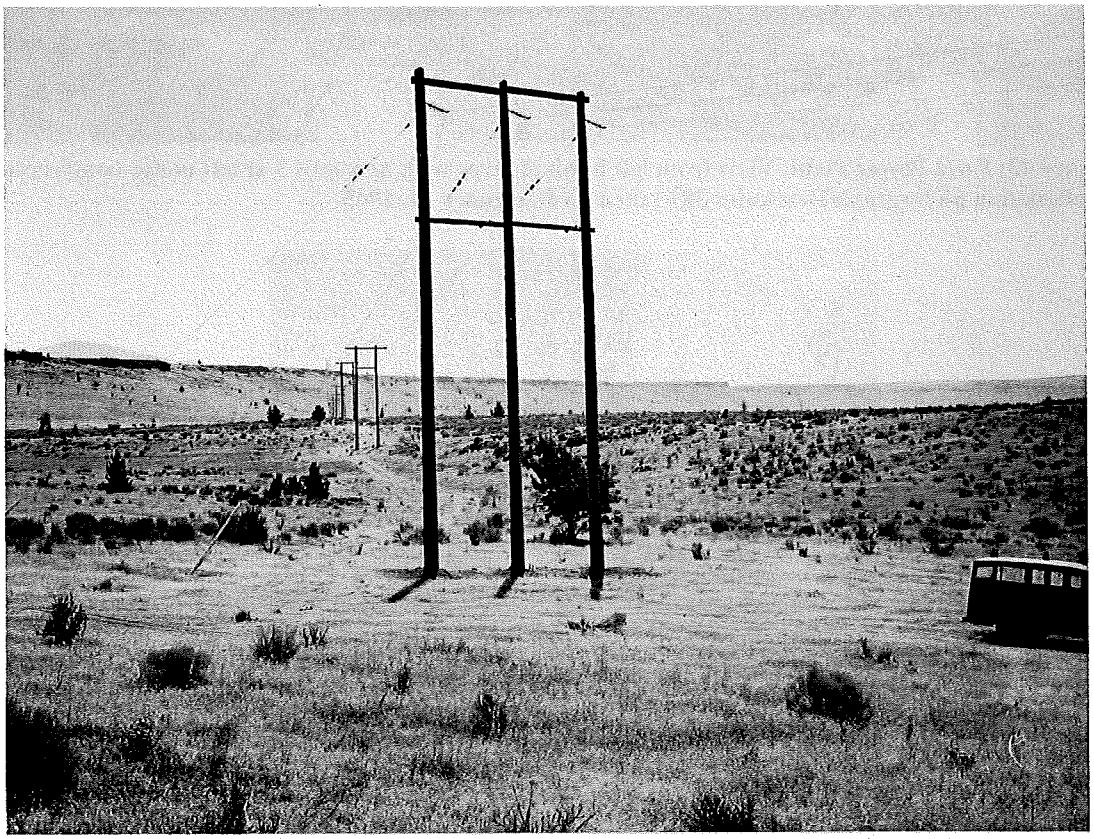

Figure 42: Culver Junction to Cove Power Plant 66 kilovolt transmission line, 1941.

[152] Ehrman, K.S. "Power Replacement on the Deschutes Project", *The Reclamation Era.* (Washington D.C.: U.S. Department of the Interior, U.S. Bureau of Reclamation, Vol. 31, November 1941), 302.
[153] Ibid., 304; U.S. Department of the Interior, *Annual Project History 1941*, 92.
[154] U.S. Department of the Interior, *Annual Project History 1941*, 95.
[155] U.S. Department of the Interior, *Annual Project History 1945*, 15-16.
[156] U.S. Department of the Interior, *Annual Project History 1947*, 47.

Settlement and Irrigated Farming on the North Unit

The War Production Board's identification of the North Unit for accelerated construction in late 1943 sparked a rush for North Unit lands. Young men from southern Idaho and eastern Oregon, who had been deferred from military service to maintain food production on the home front, were among the first of the Deschutes Project's new settlers. These new arrivals seized the opportunity to buy North Unit lands as they were unable to afford the high prices for farmland "at home," which sold for a premium as the land was already irrigated. Lands in the North Unit were selling for the comparatively low price of $25 per acre (see Figure 45). After completing their land purchases, most of these first-time landowners immediately returned to southern Idaho or eastern Oregon to await the arrival of irrigation water to their new Jefferson County farms.[157] Other individuals came to settle on the North Unit lands from such areas as the Willamette Valley in Oregon, or from many of the southern Great Plains states such as Kansas.[158] The demand for North Unit lands steadily increased over the next two years, and by late 1945, new houses stood on as many as 35 farm units and several of the new settlers had begun preparing their fields for irrigation water (see Figure 46).[159]

Figure 45: This brush-covered land will be the farm and home of a World War II veteran on the North Unit. Reclamation photograph Deschutes 402 taken on March 12, 1946.

[157] U.S. Department of the Interior, *Annual Project History 1943*, 16; *The North Unit Story,* The Idaho Migration: 20-21.
[158] Van Winkle, 21.
[159] Reclamation only built the irrigation system to the property delivery point. Each landowner was responsible for completing improvements on their lands to actually distribute the water to and over their fields. U.S. Department of the Interior, *Annual Project History 1945*, 19-20.

acre.[163] While this worked to open up more land for sale it was exactly what Reclamation tried to prevent in irrigation project development overinflated prices for land.

After the end of WWII, the Federal government began offering veterans' preference for settlement of Federal lands within the project, including old homestead lands that had reverted back to Federal ownership during the depression. The veterans drew lots for farm units from 60 to 124 acres in size, and paid $1 per acre for the property. A sizable number of veterans came to Jefferson County to take advantage of this program.[164] Between private purchase and veterans' preference, according to one contemporary report, virtually all of the farm units on the NUID were settled by 1950.[165]

Farm development progressed fairly rapidly as irrigation water became available. In 1947, irrigation water was turned onto 13,500 acres, or more than three-fourths of the 17,000 acres of North Unit lands then served by the Main Canal and lateral system. Another 6,500 acres received water at the onset of the 1948 irrigation season. One year later, when the irrigation system became fully operational, NUID farms turned out water on approximately 40,000 acres. All but about 4,000 of the total of 50,000 irrigable acres eligible to receive Deschutes Project water in the district were under irrigation in 1950.[166]

The opening of the North Unit to irrigated agriculture coincided with the Nation's entry into an unprecedented period of prosperity and economic growth following the end of WWII. Farmers, a group that had suffered greatly from the ill effects of the combined drought and Great Depression, shared in the prosperity. The Nation's farm income increased by $5 billion between 1945 and 1948,[167] sustained by an insatiable demand for foodstuffs at home and abroad, as well as Government subsidies and price controls. In the midst of this booming farm economy, the North Unit's fledgling farmers enjoyed commercial success, primarily in the production and sale of clover seed and potatoes.[168] Ladino clover seed, in particular, "solidified the district" in its formative years.[169] In 1949, several North Unit farmers won top honors for their Ladino clover seed at such prestigious agricultural fairs as Chicago's International Livestock Exposition and the Royal Winter Fair in Toronto, Canada. The gross value of the North Unit's clover seed crop reached in excess of $2 million that year. Encouraged by good yields and heavy demand for North Unit products, large seed companies soon established cleaning and warehousing facilities for clover and other seed crops in Madras.[170]

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[163] *The North Unit Story,* The Dryland Holdout: 18.
[164] *The North Unit Story,* The Idaho Migration: 21-22.
[165] U.S. Department of the Interior, *Economic Report and Repayment Plan,* 9.
[166] U.S. Department of the Interior, *Annual Project History 1949,* 8.
[167] Morison, Samuel Eliot, Commager, Henry Steele, and Leuchtenburg, William E., *The Growth of the American Republic,* Volume II (New York: Oxford University Press, 1969), 619.
[168] U.S. Department of the Interior, U.S. Bureau of Reclamation, *Annual Project History, Volume XVI, Deschutes Project, 1955-1960.* (Bend, Oregon: Author, 1960), 70.
[169] *The North Unit Story,* South District Gets Water in 1946: 10.
[170] U.S. Department of the Interior, *Annual Project History 1949,* 86; U.S. Department of the Interior, U.S. Bureau of Reclamation, *Annual Project History, Volume XIII, Deschutes Project, 1950.* (Bend, Oregon: Author, 1950), 66-67.

Figure 48: A field of netted gem potatoes under irrigation on the Symms Brothers farm located on Agency Plains, 1951. Reclamation photograph Reg. 1-5400.

Early North Unit Project Management

In anticipation of North Unit's first irrigation season in 1946, Reclamation began hiring permanent staff to supervise O&M activities necessary to keep the irrigation system in top working order. Carlos Randolph, a young Reclamation employee with practical work experience garnered on other irrigation projects, was named as the North Unit's first irrigation manager. In addition to general management of the irrigation facilities, Randolph was to serve as Reclamation's liaison in its interactions with the Jefferson County Water Conservancy District. Day-to-day oversight of operations and maintenance activities was delegated to an assistant manager.[175]

Job positions within the North Unit's operations and maintenance division were typical of Reclamation's other active irrigation projects.[176] A watermaster held responsibility for measuring and recording deliveries to farm ditches and was assisted by ditchriders in delivering water. By late 1948, nine ditchriders were on the payroll, opening and shutting the turnouts from the

[175] *The North Unit Story,* Carlos Randolph NUID's First Chief: 24.

[176] Kordecki, Cynthia, McCormick, Mary, Jackson, Carrie F.& Bales, Jennifer, *Lower Yellowstone Irrigation Project, 1996 and 1977 Cultural Resources Inventory, Dawson and Richland Counties, Montana, and McKenzie County, North Dakota* (Grand Forks: University of North Dakota, 2000), 4.5. Prepared for Reclamation's Montana Area Office.

Through the Surplus War Property Administration, the U.S. Government began disposing of equipment and buildings by transferring them from the Army to other Federal departments or by auctioning them for sale to the highest bidder.[183] In 1947, Reclamation purchased 35 buildings and land at the defunct airbase to utilize as a headquarters complex (to house functions related to administration, storage and operations and maintenance of an irrigation district as well as employee housing) for the North Unit of the Deschutes Project (see Figure 49).[184] Buildings not used by Reclamation were sold off or removed from the complex.[185] Several large warehouse-type buildings, nine barracks, and a variety of ancillary structures were already present on the parcel.[186]

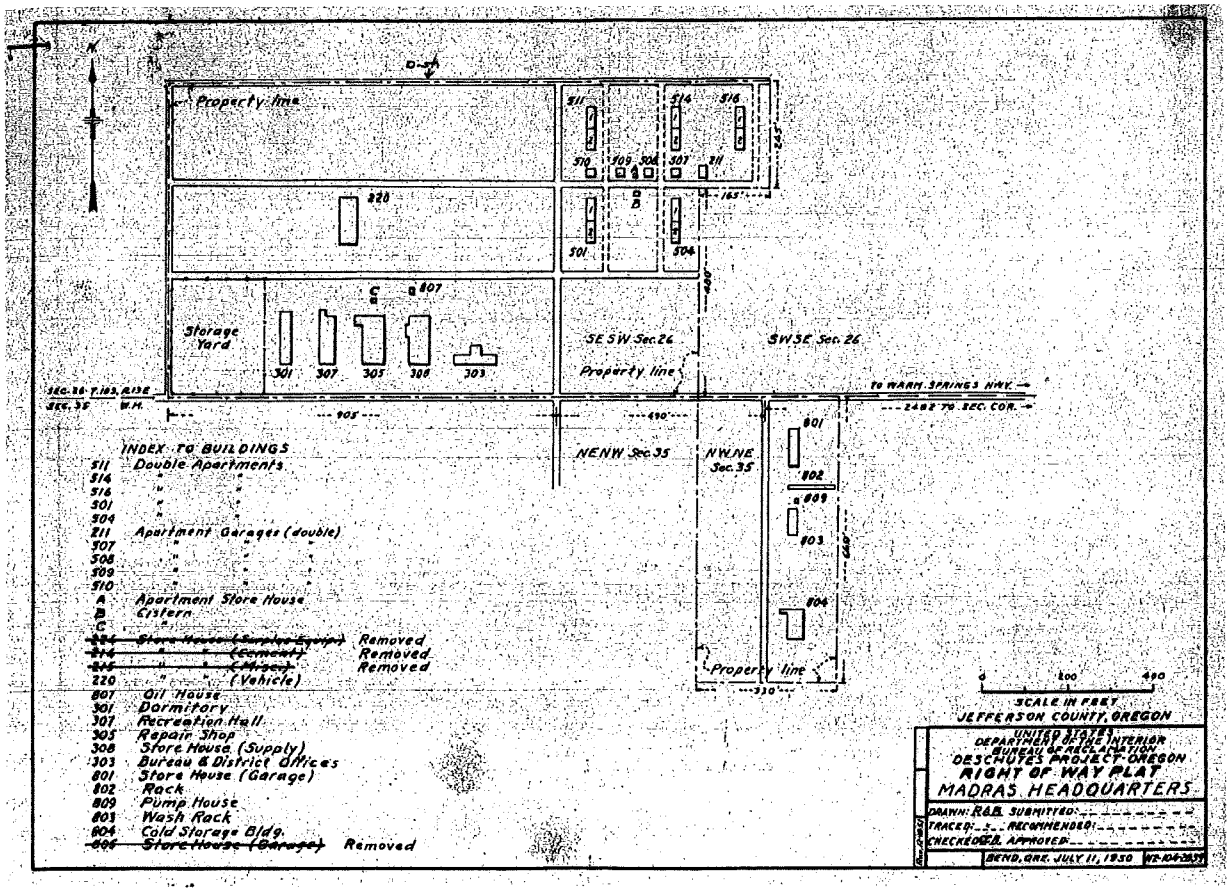

Figure 49: Reclamation Drawing 112-104-2059 of North Unit Madras Headquarters in 1950.

The warehouse buildings were repurposed as O&M buildings for storage of materials, equipment and other items needed for O&M of the North Unit (see Figures 50-53). This also included a

[183] American Public Works Association, 628; www.americanpresidency.org, text of EO 9425, accessed 9 August 2004; *Madras Pioneer*, (Madras, Oregon: Pioneer Publishing Company April 17, 1986) April 17, 1986, Sec. C, 5.
[184] U.S. Department of the Interior, *Annual Project History* 1947, 65.
[185] U.S. Department of the Interior, *Annual Project History* 1948, 32 & 36.
[186] U.S. Department of the Interior, U.S. Bureau of Reclamation, "Deschutes, Elevations at Bureau Village, Sewer Floor and Ground Elevations," 4 June 1947, [No Deschutes Project drawing number], prepared by the Bend Office; "Madras Air Base Apartments Location Map, revised July 29, 1948, " Deschutes Project Drawing No. 5-C-11; prepared by the Bend Office; "Right of Way Plat Madras Headquarters," ca. 1948, [No Deschutes Project drawing number], prepared by the Bend Office; all on file, North Unit Irrigation District Office, Madras.

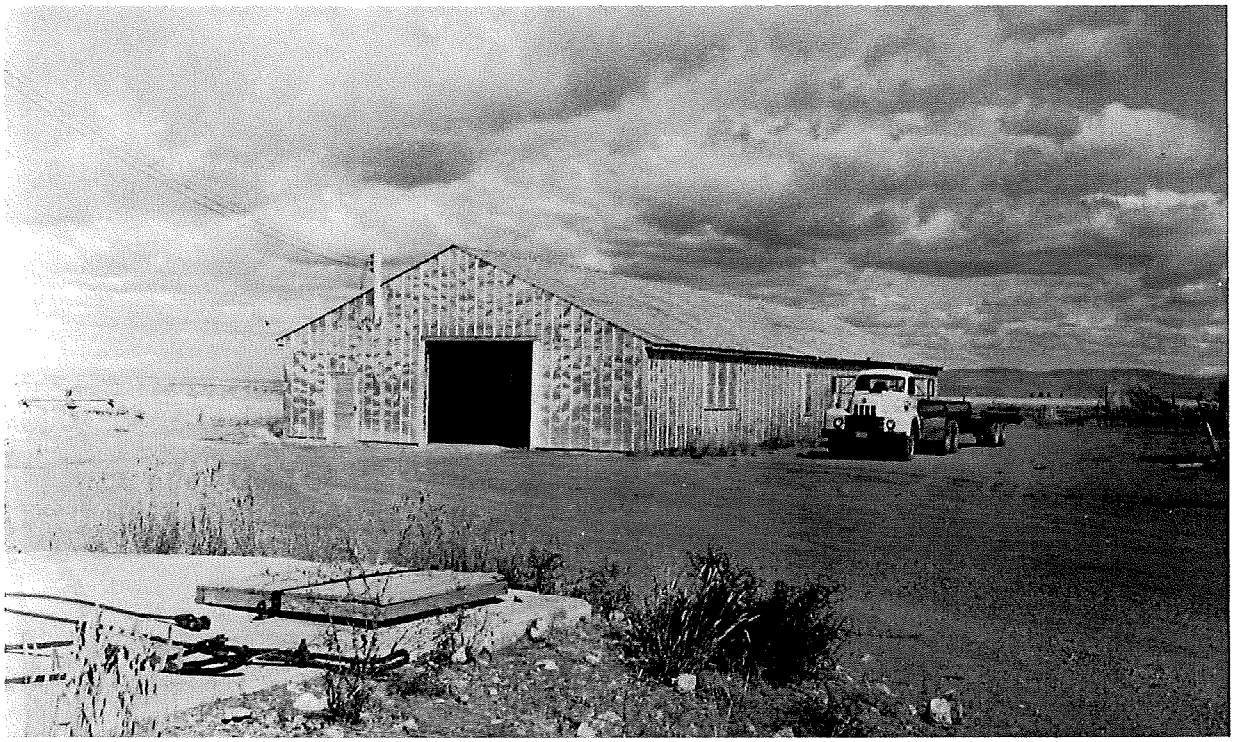

Figure 52: North Unit Headquarters Equipment Garage, September 10, 1959.

Figure 53: North Unit Headquarters Gasoline and Oil House, September 10, 1959.

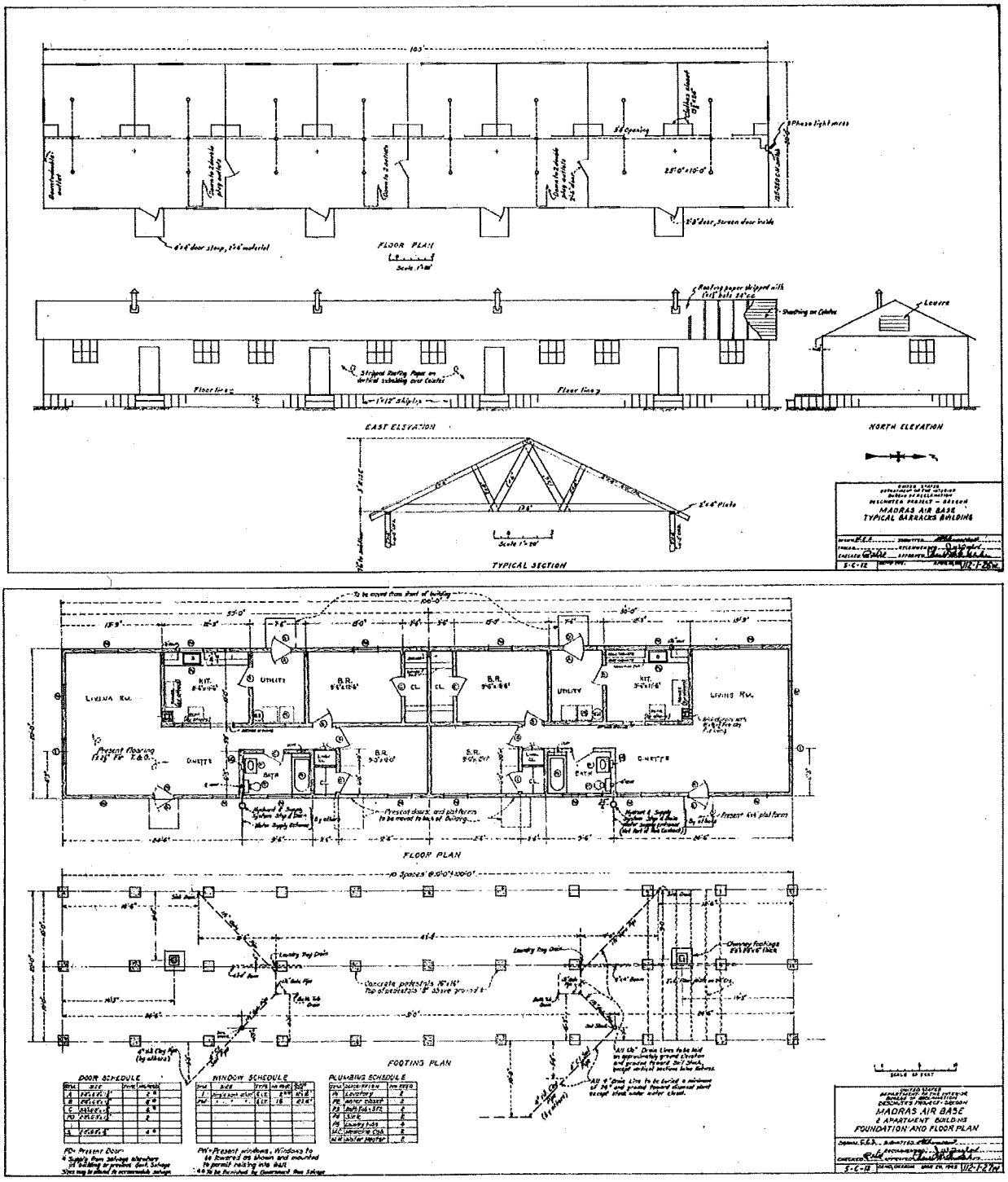

Figure 55: Reclamation Drawings from 1948 showing changes to barracks building to duplex apartments.

Reclamation also established ten small residential complexes at strategic locations along the canal line, one for each of the nine ditchriders and the tenth for the canal patrolman. Each complex had a ditchrider house, garage and barn. Reclamation used its own forces to construct the first ditchrider complex in 1947.[189] This initial complex consisted of a small two-bedroom house, double-car garage, and a small barn that occupied a small tract near the canal in the vicinity of the Lateral M-37 headgate, at the south end of the North Unit area (see Figure 58). Engineers at the Bend office prepared the design plans for each of these buildings. All three were mostly constructed with lumber and other materials salvaged from dismantled barracks at the old CCC camp at Wickiup.[190] This pattern of re-use became standard for most of the ditchrider buildings built later.

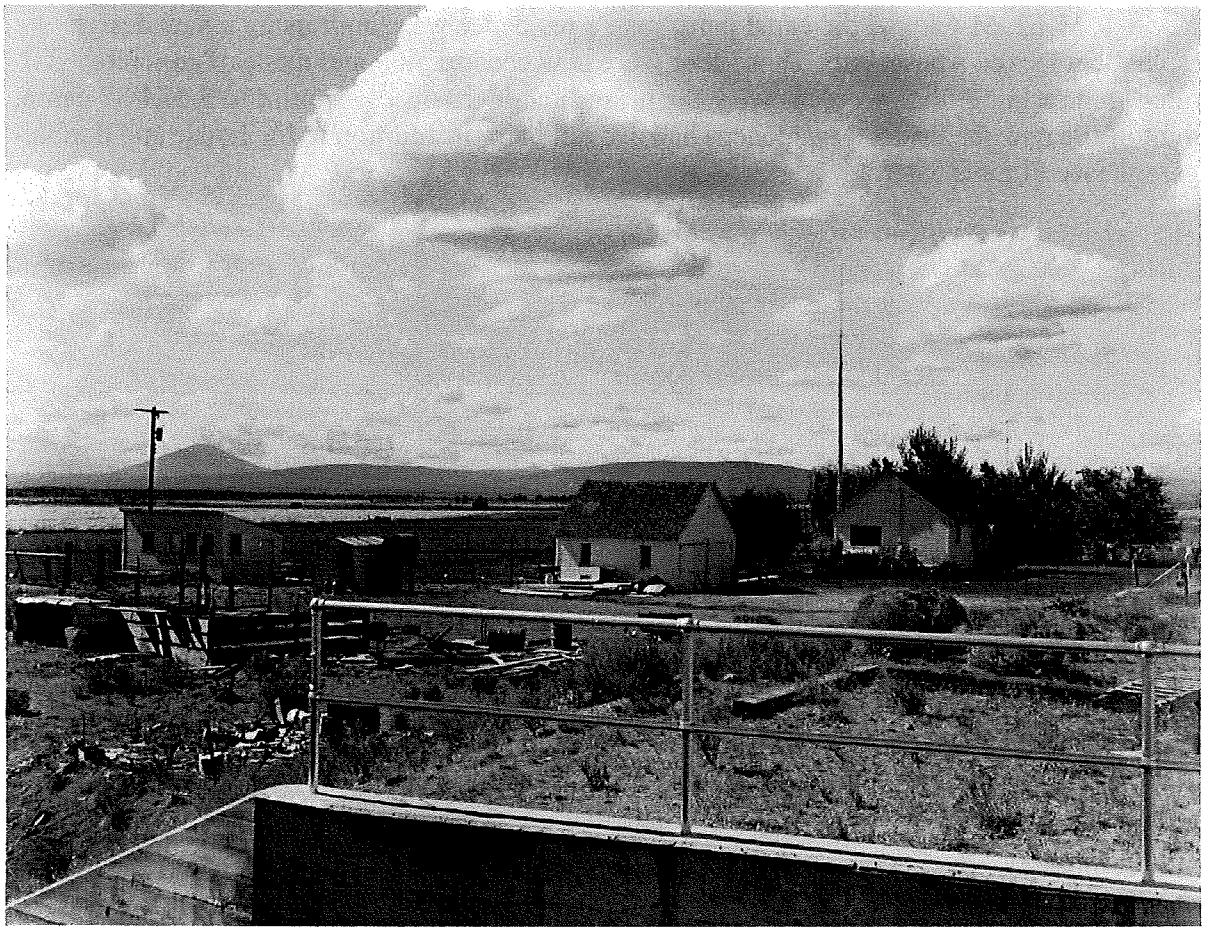

Figure 58: Ditchrider House M-37 house at right, garage in center and barn at extreme left, September 10, 1959. Reclamation photograph P112-104-945.

In 1948, Mr. Syverson was the winning bidder on Specifications No. R1-10 and No. R1-33 to build the houses and garages at the remaining eight ditchriders' residences and a residence for

[189] U.S. Department of the Interior, *Annual Project History 1947,* 10.

[190] U.S. Department of the Interior, U.S. Bureau of Reclamation, "Building and Quarter Inventory," for Ditchrider's House, Garage and Barn at M-37, 10 September 1959, on file, Reclamation's Pacific Northwest Regional Office, Boise, Idaho [The "Building and Quarter Inventory," forms for all of the current NUID buildings on the North Unit Project are filed at Reclamation's Pacific Northwest Regional Office. Consequently, subsequent citations for these forms will not mention this repository.]

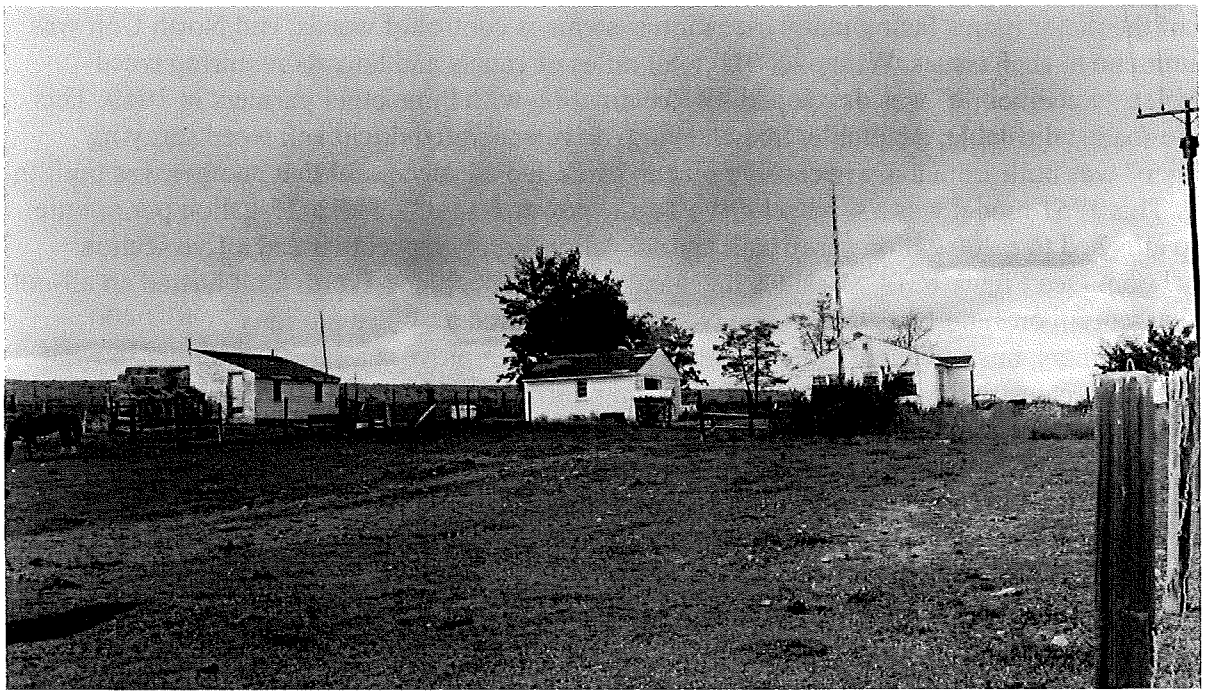

Figure 60: Ditchrider House M-53 on right, garage in center and barn on left, September 10, 1959. Reclamation photograph P112-104-946.

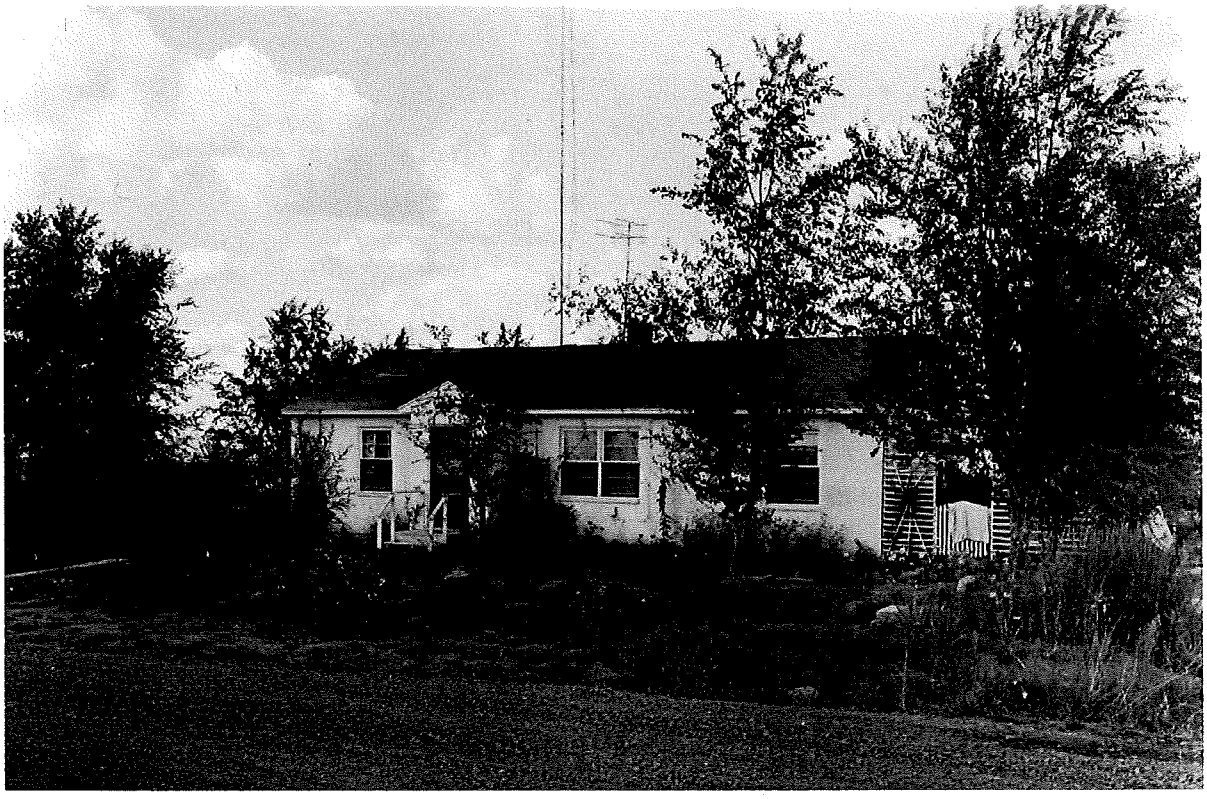

Figure 61: Ditchrider House M-64, September 10, 1959. Reclamation photograph P112-104-947.

Figure 63: Weed Holiday on the North Unit, June 17, 1952. During the morning hours farmers and businessmen dug out noxious weeds on the canal and lateral system. Reclamation photograph Region 1-5743.

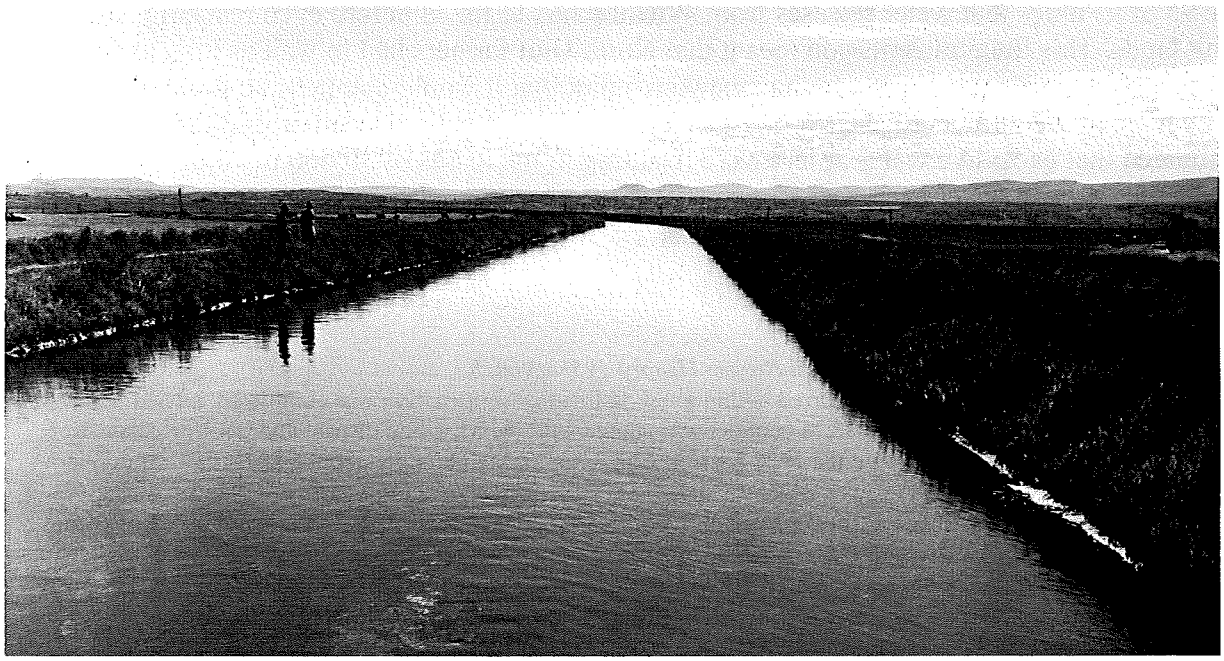

Figure 64: North Unit Main Canal at Mile 55, showing stand of Crested Wheat and Brome Grass seeded on canal banks to prevent weed infestations c. 1953. Reclamation photograph Region 1-5742.

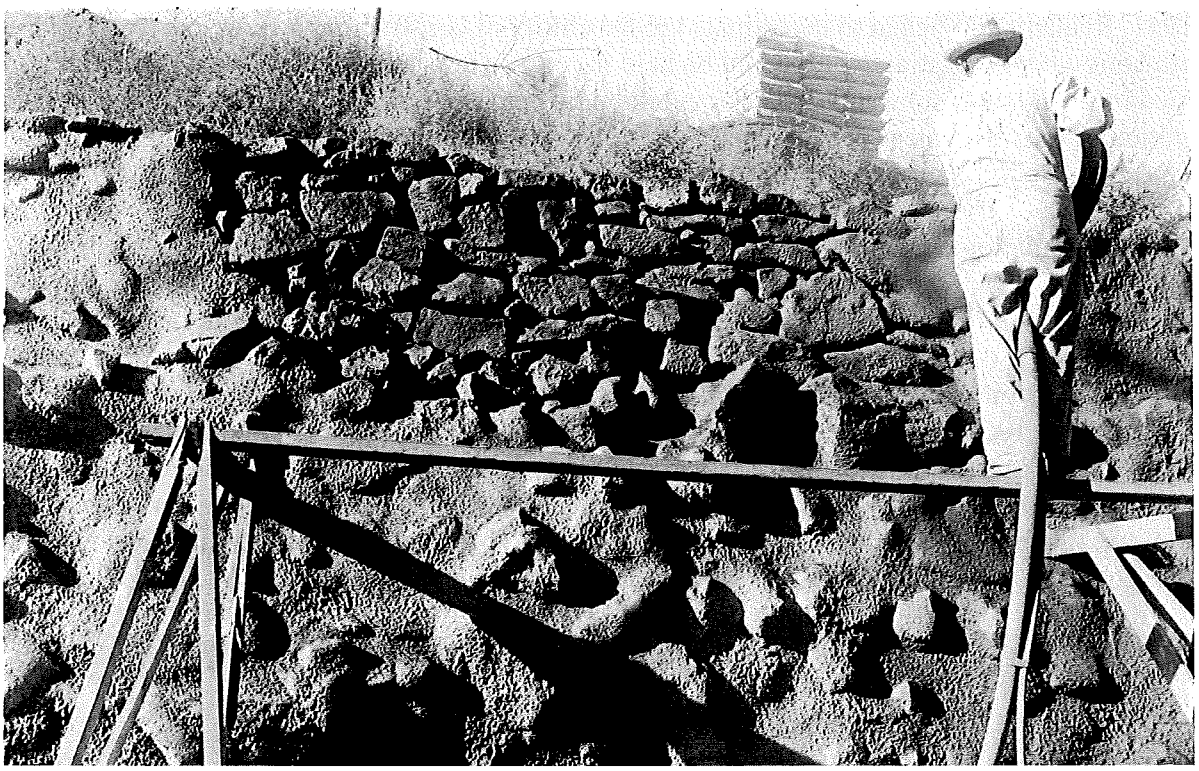

Figure 65: Applying mortar to hand placed riprap by pneumatic pressure at North Unit Main Canal, Station No. 36. American Gunite Company contractor for Specifications No. R1-25. Reclamation photograph Deschutes 579, taken in 1948.

Figure 66: Looking downstream from Station No. 35 at completed section pneumatic applied mortar on riprap and rock banks. American Gunite Company contractor for Specifications No. R1-25. Reclamation photograph Deschutes 583, taken in 1948.

According to Carlos Randolph, the NUID Secretary-Manager at the time, operations at Haystack improved the overall efficiency and control of the irrigation system beyond "all expectations." Deliveries from Haystack to some 31,000 acres of North Unit lands downstream took only a few hours rather than a few days.[209] One of the important working components of the Haystack facility was the "Little Man" automatic control device installed at the headgate to the feeder canal. The Little Man quickly responded to variations in the volume of flow by automatically raising or lowering the headgate as needed to maintain the water in the Main Canal and feeder canal at the same level. Within the next few years, NUID installed Little Man controls at the Main Canal's headgate at the North Dam as well as on four other gated structures at strategic locations along the Main Canal line (see Figure 68). This series of automatic gates effectively controlled the rate of flow through the Main Canal from inlet to outlet. [210]

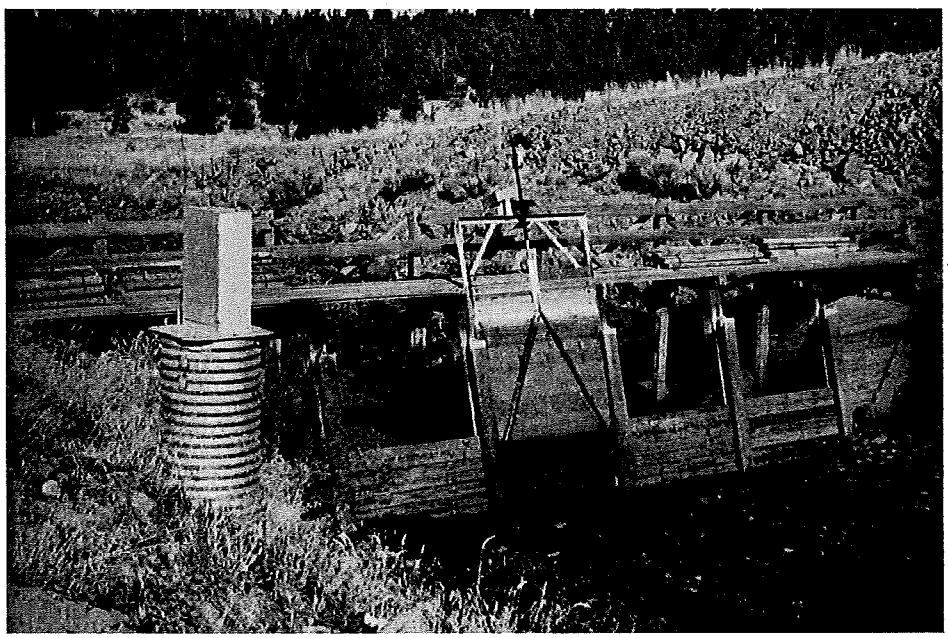

Figure 68: Mile 34 (M-34) Main Canal check structure showing "Little Man" control gate, 1963. Reclamation photograph P112-100-259.

By 1951 a 200-foot-long section at Station 1660+43 to 1663+07 (Mile 29) of the Main Canal had turned out to be a maintenance problem and a hazard in the delivery of water. This area was in the "Big Cut" in the Smith Rocks section and it was determined that a cut and cover conduit was the only solution to this problem.[211] The contract for Specification No. DC- 3630 was won by G.T. Gentile of Portland, Oregon, who started work on February 5, 1952, installing the reinforced concrete conduit by April 14 in time for the first of the season's water delivery (see Figure 69).[212]

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[209] U.S. Department of the Interior, *Annual Project History 1955-1960,* 51-52.

[210] U.S. Department of the Interior, *Annual Project History 1955-1960,* 69; U.S. Department of the Interior, U.S. Bureau of Reclamation, *Annual Project History, Volume XVII, Deschutes Project, 1961-1962.* (Bend, Oregon: Author, 1962), 100; U.S. Department of the Interior, U.S. Bureau of Reclamation, *Annual Project History, Volume XVIII, Deschutes Project, 1963-1964.* (Bend, Oregon: Author, 1964), 17.

[211] U.S. Department of the Interior, *Annual Project History 1952-1954*, 23.

[212] Ibid., iv.

housing. By 1954 these buildings were in poor condition and it was deemed necessary to build a new O&M complex. This new complex was at a different location overlooking the dam and consisted of a dam caretaker's residence with a garage and a covered three stall equipment garage with shop and a dormitory (see Figures 70 & 71). It was built by Marvin L. Johnson under Reclamation Specification No. 100C-217. While this was new construction one CCC building that had been used as a garage in the former location was moved and remodeled into this new complex for the caretaker.

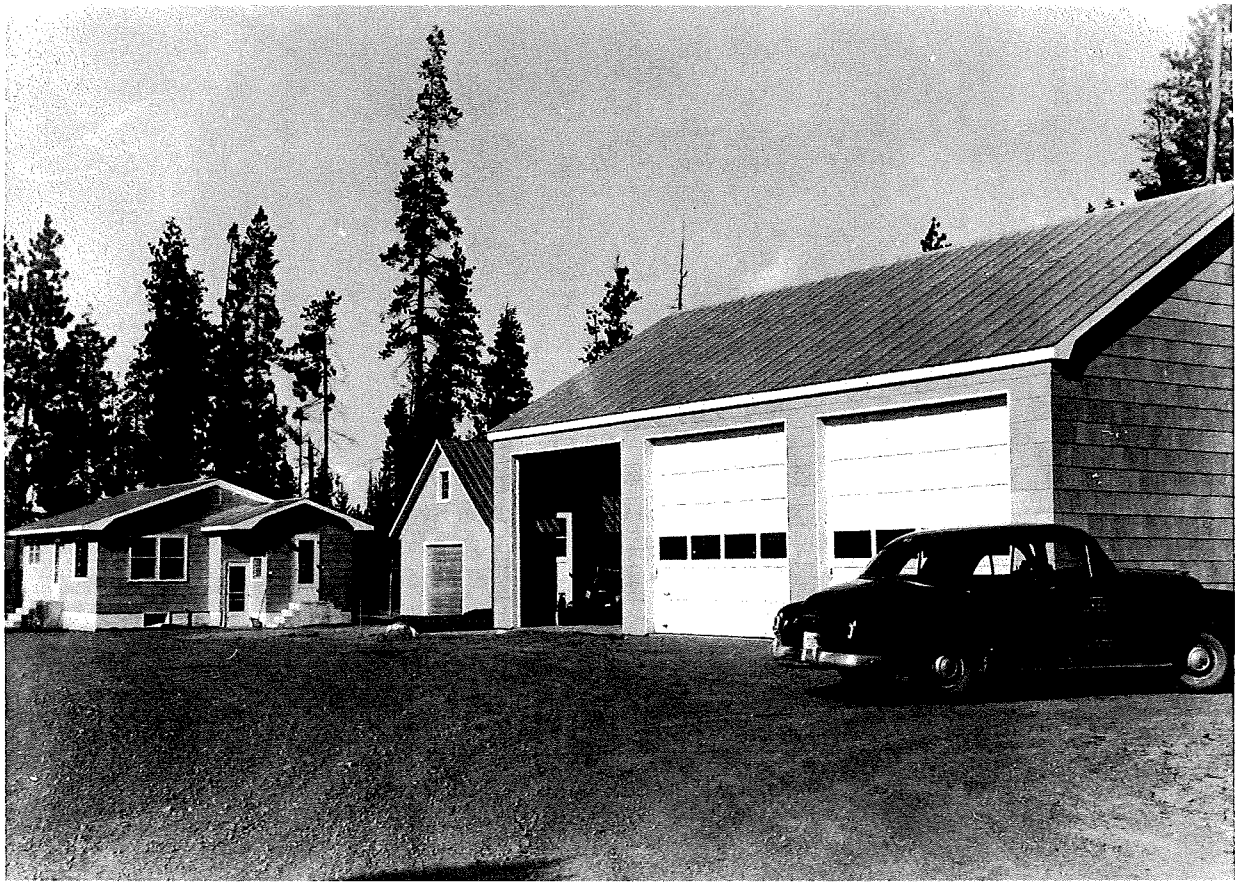

Figure 70: Wickiup Dam Caretaker's Residence, Garage, Equipment Garage and Shop Building, c. 1956. Reclamation photograph P112-104-735.

In 1958 the old wooden office for the Madras Headquarters was replaced with a new more permanent single story building. It was much larger being 38 feet by 61 feet, clad in Roman brick veneer with a tile hipped roof, interior vault, and a poured-in-place concrete floor (see Figure 72). This new building was constructed by C.P. Patterson of Redmond, Oregon under Reclamation Specification No. 100C-307. Work began on September 12, 1957, and was nearly completed by January 17, 1958, except for the installation of insulated glass in the windows which the contractor could not get from the supplier in time. Nonetheless, the district personnel moved in with plywood temporary sheets covering over the windows until the specified glass had arrived in March.

Post-Construction Modifications

Several major upgrades to the North Unit have occurred since construction was completed. After several dry years resulting in water shortages for North Unit farmers, in 1968 NUID paid for and constructed a nine-unit pumping plant on its own to supplement flows in the Main Canal with water from the Crooked River. The Crooked River Pumping Plant is situated on the river a short distance above the Crooked River Flume (see Figure 73).[214] In 1997, Reclamation and NUID took a major proactive step towards conserving its water supply by installing cement lining along the sidewalls of the first 12 miles of canal – the stretch of canal where an estimated 80 percent of the water losses occurred. The cost of the lining program totaled $8.5 million, and the cost was shared between the two entities. Other water conservation programs were also instigated, beginning in the 1990s, as part of a cost share program between Reclamation and NUID. Segments of open, unlined canals or laterals typically from a few thousand feet to about a mile in length have been replaced with high-pressure pipe. Segments typically selected are those with greatest seepage, where canal banks had proved most susceptible to erosion, or where changes in use of surrounding lands made buried pipe preferable.[215] As of the end of 2009, 43 miles of canal or lateral have been converted to pipe or replaced with pipe in new alignments.[216]

Epilogue

Since the late 1950s, the NUID has experienced cycles of agricultural prosperity and recession. For the most part, however, its irrigated farms have weathered the hard times in far better shape than their dry land counterparts in the Upper Deschutes Basin. By the early 1960s, North Unit farmers were growing peppermint introduced to the area from the Willamette Valley, and Jefferson County quickly gained recognition as the "Mint Capital of the World." [217] After peppermint yields began to decline due to disease, North Unit farmers experimented with a variety of alternative cash crops such as garlic, onions, radishes, and coriander seed. On average, about 30 percent of the North Unit's irrigable lands were devoted to raising cash crops, while most of the remaining acreage was used for raising hay and small grains or as irrigated pasture for livestock.[218] In 1991, Reclamation reported that, while the NUID was the fifth largest of the agency's 14 irrigation projects in Oregon, it was second only the Owyhee Project in the total value of its crop production for the year.[219] Many farm units in the NUID are owned and

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[214] U.S. Department of the Interior, *Project History 1967-1968*, 90a & 90b; *The North Unit Story,* North Unit in the Blood: 25.

[215] *The North Unit Story,* North Unit in the Blood: 25; Chuck Schonneker, telephone conversation with Mary McCormick, October 2004.

[216] Personal communication, Kirk Holcomb, NUID, to Chris Horting-Jones, Reclamation 1/28/2010.

[217] U.S. Department of the Interior, *Annual Project History 1955-1960*, 71; *The North Unit Story,* South District Gets Water in 1946: 11 & The Dryland Holdout: 18.

[218] *The North Unit Story,* Clover, Mint, Potatoes Have Driven District: 31; "Crop Production Report 1977," for the North Unit Irrigation District in: U.S. Department of the Interior, U.S. Bureau of Reclamation, *Project History, Deschutes Project, Oregon, Volume XXV, 1977-1978. (*Bend, Oregon: Author, 1978), 121.

[219] U.S. Department of the Interior, U.S. Bureau of Reclamation, *1991 Summary Statistics: Water, Land and Related Data.* (Denver, Colorado: Author, 1991), 134-163.

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