

Upper Souris National Wildlife Refuge, Dam 83
Along the Souris River
Ward County ↗
North Dakota ↗ Foxholm Vicinity

HAER No. ND-3-A

HAER
ND,
51-FOX.V,
1-A

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
Rocky Mountain Regional Office
National Park Service
U.S. Department of the Interior
12795 W. Alameda Parkway
Denver, Colorado 80225

HAER
ND,
51-Fox.V,
1-A-

HISTORIC AMERICAN ENGINEERING RECORD

Upper Souris National Wildlife Refuge, Dam 83

HAER No. ND-3-A

Location: Along the Souris River, Ward County, North Dakota
UTM: Zone 14, N. 5370190 m, E. 309000 m
Quad: Carpio NE

^ Fort Belknap Vicinity

Date of Construction: 1935-1936

Present Owner: U.S. Fish and Wildlife Service

Present Use: Damming Souris River

Significance: The dams within the Upper Souris National Wildlife Refuge represent a historical movement to preserve wildlife and wildlife habitat in the United States, which began in the mid-19th century and continues today. The refuge dams are significant for their association with the development of the national wildlife refuge system during the New Deal Era. At the time of its creation, the J. Clark Salyer Wildlife Refuge was considered the most important project in the Federal Government's program of migratory waterfowl habitat restoration. The dams also are representative examples of dams designed by the Federal Government during the New Deal Era for conservation projects.

Historians: Frederick L. Quivik, RTI, Inc., August 1989
Mary E. McCormick, RTI, Inc., August 1989
Jane L. Carroll, St. Paul District Corps of Engineers, March 1990

For more historical information, see Upper Souris National Wildlife Refuge Dams, HAER No. ND-3

DAM 83

Dam 83, or Lake Darling Dam, is the farthest upstream, of the major dams at the Upper Souris refuge and situated at the north end of Ward County (NW 1/4 Sec. 6, T157N, R84W and NE 1/4 Sec. 1, R157N, R85W; Figure 3). The dam impounds the Souris River to Lake Darling Reservoir, which primarily serves to maintain water for distribution to restored wildlife habitat situated immediately downstream within the Upper Souris as well as at the J. Clark Salyer Refuge, located about 110 miles (240 river miles) downstream.

Dam 83 is a zoned earthfill embankment with a service spillway, an emergency spillway, and outlet works. The dam lies along a east/west axis, and is 39 feet and about 3,300 feet long. The crest of the dam is 39 feet and carries a paved county highway its entire length. Construction of the dam began in 1935, with the removal of the top 18 inches of soil from an area covering the entire length of the dam site and averaging about 225 feet in width. A cutoff trench was excavated under and along the length of the upstream zone of the embankment. The trench had a standard bottom width of 6 feet, but its depth varied from about 5 to 10 feet. Installed in the trench was Wakefield sheet piling, which consists of 3-inch by 8-inch, tongue-and-groove timbers (1) Clay puddling around the sheet piling was completed, providing the dam with an impervious core. [2]

The earthfill embankment is comprised of two zones of material, with each zone being about equal in volume. The upstream zone is impervious and consists of an earth, sand, and gravel mixture laid in 6-inch layers that were each sprinkled with water and compacted by a rollers. The downstream zone is semi-impervious and consists of 1-foot layers in "bank-run" rock, gravel, and sand that were also each sprinkled with water and compacted by a roller. [3] The upstream face of the embankment has a 3:1 slope. A layer of whole field stones originally covered this surface above elevation 1,585 feet. In April 1976, the upstream face was resurfaced with fractured-rock riprap. [4] The slope of the downstream face of the embankment varies from 3:1, near the base, to 2:1, near the crest. The segment above water is covered by sod. The crest of the embankment is at an elevation of 1,606 feet.

The service spillway is an uncontrolled structure located along the east end of the embankment. At the upstream end of the spillway, there is a 320-foot-long concrete cutoff wall, or weir, which is 15 inches thick and has a crest elevation of 1,598 feet. The cutoff wall originally held collapsible flashboards, but these have long since been removed. Along the downstream-edge of the cutoff wall, the spillway has an apron consisting of a 115-foot-long slab of reinforced concrete that also serves as a segment of the county highway. When originally built the apron was just nine inches thick, but, in 1970, it was entirely resurfaced with a 6-inch concrete slab affixed to the original with dowels. The downstream end of the apron feeds into an earthen discharge channel is flanked on either side by low, stone-masonry walls. [5]

about 4,200 feet southwest from the right dam abutment. When it was originally constructed, the spillway consisted of a 700-foot-long stone masonry wall with flared stone masonry wing walls and a stone masonry apron below its downstream side. Since then, most likely in the late 1940s, the spillway wall was modified by the addition of new concrete wing walls, a concrete cap, and concrete buttresses that are spaced 12 feet on center along its downstream face. [6] The current crest elevation of the weir is 1425.8 feet.

The emergency spillway is an uncontrolled channel located at the right abutment. This unlined earthen structure has a crest width of 250 feet and a crest elevation of 1,602 feet. Near its downstream end is an unlined discharge channel.

The outlet works extend through the earthfill embankment about 60 feet east of the right abutment. Components of the outlet works include a reinforced concrete intake structure with trashracks, roller-bearing gates, two outlet tunnels, and a stilling basin. The intake structure is situated on the upstream side of the embankment and consists of two identical chambers. The chambers each measure 25 feet high by 12 feet wide and are separated by a 2-foot-thick concrete wall. Extending upstream from the intake chambers is a reinforced concrete apron with flared wing walls, 12 inches wide each. Laid across the top of the intake structures are five steel I-beams, 4 feet on center, from which the trashracks are suspended. The trashracks are each about 12 feet wide by 16 feet high and are composed of vertical, 1-inch square bars, 11-1/2 inches on center, affixed to horizontal, 3/4-inch by 7-1/2-inch steel plates, 6 inches on center. A crane mounted on a pivot structure atop the intake is used for lifting and cleaning the trashracks. The existing trashracks and supporting I-beams were installed in 1976 after ice carried in flood waters damaged the original trashracks. [7]

On the downstream side of the intake structure are two parallel 10-foot by 12-foot roller gates, each having a structural steel frame with a sheet metal skin on the upstream face. These gates were installed in 1981 and replaced the two originally manually-controlled gates, which were each 12-foot by 10-foot, breast-wall, bronze-bushed, roller-bearing gates manufactured by the Hardesty Company. [8] The present gates have slide gate operators on stands located on the deck of the intake structure. The operators for the gates are driven by electric motors and can be controlled manually on-site, or remotely from the maintenance shop near the east abutment.

The two outlet tunnels extend through the dam about 90 feet from the roller gates to the dam's downstream side. Both of the tunnels are rectangular structures (10 feet by 14 feet) and each is constructed of reinforced concrete, 18 inches thick. The outlet tunnels empty into the stilling basin, which now is a concrete-lined structure extending 300 feet downstream from the outlet. When it was originally constructed, the stilling basin was lined with concrete for a length of only 40 feet, with the remaining downstream section lined by stone masonry and riprap. In April 1943, the stilling basin experienced considerable erosion from large discharges of water from the reservoir. Later that year, a cutoff wall of Wakefield sheet piling was installed along the downstream edge of the basin's original concrete lining and the entire basin was relined with concrete for a total length of about 275 feet. Between 1944 and 1948, further erosion occurred downstream from the stilling basin and, as a result, in 1949 the concrete lining was extended an additional 26 feet downstream and Wakefield sheet piling was installed along the new downstream edge of the basin floor. These walls, which are spaced about 60 feet apart, act to dissipate the energy of the water as it is released from the outlet tunnels. [9]

The downstream end of the stilling basin discharges into one of the ponds (Pond A) developed at the refuge for waterfowl habitat. Water is further channeled from Pond A to Ponds B and C. All three ponds lie several feet above the river channel and their level may be altered by a series of dikes, control works, and channels that the Civilian Conservation Corps (CCC) constructed in the mid-1930s, at the same time the dams were built. The control structures associated with ponds A, B, and C are not evaluated in this report. Along the east side of the stilling basin, and about 240 feet downstream from the outlet tunnel portals, there is a stop-log structure that allows discharged water from the dam to be diverted out of the stilling basin and into the main river channel.

Since its original construction, Dam 83 has sustained alterations to all of its major components. Modification to the embankment and service spillway, however, are minor and have had an insignificant effect on their overall appearance or function. The outlet works have been more seriously altered by replacement of the

original trash gates, and roller gates, as well as reconstruction of the stilling basin. Nevertheless, the outlet works still retains many aspects of their original form and design, as well as their basic function within the operation of the dam. The overall integrity of the dam remains good.

FOOTNOTES

- 1 Minot Daily News, September 24, 1935, p. 1.
- 2 Bureau of Agricultural Engineering, drawing no. 3a-G, "Upper Souris... Plan, Profile...Structure No. 83;" Minot Daily News, September 21, 1935, p. 1.
- 3 Elliot and Cheney, "Memorandum Serving as the Preliminary SEED Report for Dam 83," p. 7.
- 4 Alterations to the service spillway are cited from Elliot and Cheney, p. 13.
- 5 Ibid., p. 25.
- 6 Ibid.
- 7 Ibid., p. 28.

NOTE: See also Upper Souris National Wildlife Refuge Dams, HAER No. ND-3.