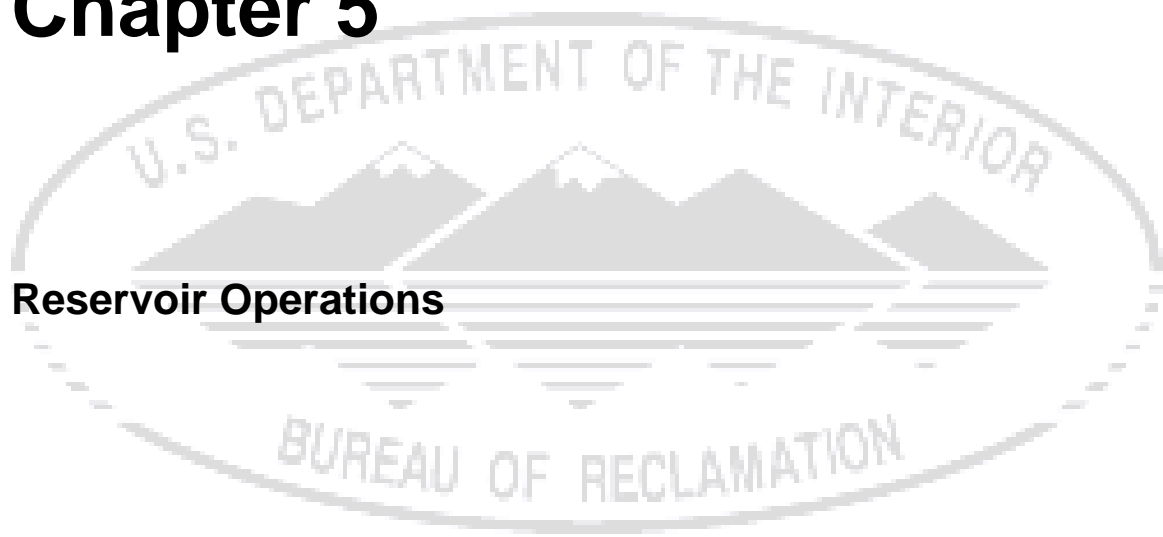


Chapter 5



Reservoir Operations

CHAPTER 5 – RESERVOIR OPERATIONS

Reservoir’s Authorized Purposes

Webster Dam impounds water from the South Fork of the Solomon River to form Webster Reservoir. The authorized purposes of Webster Dam and Reservoir are to provide storage for irrigation, flood control benefits, recreation, and fish and wildlife activities. Project facilities map for the Webster Unit is on page 62a.

Contract Between the Webster Irrigation District and the United States

The “Solomon River Basin Resource Management Assessment and Environmental Assessment/Finding of No Significant Impact” were completed in May 2002. The Federal action analyzed in this EA was the conversion of the Webster Irrigation District’s long-term water service contract to a repayment contract. The preferred alternative in the environmental assessment/finding of no significant impact was developed following contract negotiations with the irrigation district. Specifically, the alternative provides for minimum pool elevations at Webster Reservoir, which provides secondary benefits to fisheries and recreation by providing carryover irrigation storage. In addition, the alternative provides for an increased delivery efficiency of 9 percent for Webster Irrigation District and to increase collective on-farm efficiency by 5 percent. (Bureau of Reclamation, 2002a)

The Preferred Alternative provides for the inclusion of specific environmental measures in the district’s operating plans. Each district would:

Continued irrigation with specified water conservation goals and practices to be outlined in the irrigation districts water conservation plan.

There is a minimum pool elevation at Webster Reservoir of 1,863.0 feet above mean sea level (msl) (7,352 acre-feet). The annual shutoff elevation for Webster Reservoir will be established according to the Webster Irrigation District Operating Plan.

Install or create better screening devices to prevent the passage of fish, crayfish, and others into turnouts and lateral systems.

Establish policies to maintain reservoir levels.

Provide the United States, before July 1 of each year, an annual report of environmental activities/accomplishments for the prior year.

Cooperate with Reclamation and others in improving fish and wildlife habitat and recreational access. If requested, the district shall annually furnish labor for work coordinated through Reclamation during the fall of the year. In lieu of labor, the district may furnish a district-owned machine and operator

The district agrees to cooperate with the United States, if requested, in the implementation of an adaptive management plan for selenium.

The Webster Irrigation District has agreed to provide seven man-days or three machine days, with operator, per year to assist with reservoir projects such as boat ramps and shoreline protection during low lake levels.

Reservoir Operations and Flood Control

Reclamation’s area manager in Grand Island, Nebraska, is responsible for the O&M of the dam and reservoir and appurtenant features. The U.S. Army Corps of Engineers is responsible for flood control regulation of the flood space in the reservoir.

Reservoir capacity allocations (storage capacity in relation to water elevations) are shown in Table 4, followed by definitions of the various types of storage. Table 5 shows maximum/minimum reservoir levels for 1964 (when the reservoir began to fill) to 2004.

Table 4 – Webster Reservoir Capacity Allocations

Space	Net Capacity (acre-ft)	Water Elevation (feet msl)
Dead Storage ¹	1,256	1855.5
Inactive Storage ²	4,231	1860.0
Conservation Storage ³	76,157	1892.45
Flood Control Storage ⁴	259,510	1923.7
Total	400,422	

¹ Dead Storage: Capacity from which stored water cannot be evacuated by gravity.

² Inactive Storage: Capacity that can be released from the dam but is below design capacity for irrigation.

³ Conservation Storage: The pool allocated to storage of water for irrigation purposes only.

⁴ Flood Control Storage: Volume above active conservation pool reserved for flood runoff and then released as required to keep the space available for flood storage.

Reservoir Operations and Fisheries

Fisheries management within Webster Reservoir must be coordinated and planned within the constraints of annual downstream releases of irrigation water. A significant and successful fishery does currently exist, but continued low reservoir elevations may have a negative effect on overall fish populations and recruitment. Seasonal downward fluctuations of water levels result in the loss of fauna and shoreline habitat. This can lead to severe competition between certain game and non-game species for spawning sites and food.

As a result of various constraints associated with fluctuating water levels, management techniques must be used which will result in optimum utilization of the available fisheries resources.

Reservoir Operations and Recreation

Recreational use of reservoir facilities is somewhat restricted during low water levels as the reservoir recedes during the irrigation season (see Webster Unit Map on page 63a). The exposed shoreline can cause some public discomfort due to mud and blowing dust. The fluctuating water levels expose what were once submerged objects. The Department may buoy those areas off to protect boaters and water skiers. Low water boat ramps must be made available to facilitate boat launching during prolonged periods of low water levels. (see figures 21 and 22 which show the historic lake levels).

The spillway consists of three radial gates located at the north abutment to protect the dam during flood events. The spillway structure can pass a peak flow of 138,000 cubic feet per second (cfs) into an expanding chute section and then into a stilling basin.

When water rises into the flood control pool, releases from the reservoir will normally be made through the spillway. All releases from the flood control space will be made as directed by the Corps of Engineers in accordance with Flood Control Regulations published in the Federal Register of February 14, 1969, and the Field Working Agreement, dated August 19, 1968.

Table 5 –Webster Reservoir Maximum and Minimum Reservoir Levels

Year	Date	Max Level (feet msl)	Contents (acre-feet)	Date	Min. Level (feet msl)	Contents (acre-feet)
1956	July 16	1857.62	3,405	May 6	1839.90	0
1957	July 4	1899.55	107,080	Feb 28	1855.20	21,160
1958	Sept 10	1895.65	90,005	Mar 28	1886.10	55,700
1959	Mar 6	1894.55	85,530	Sept 17	1888.03	61,720
1960	Apr 6	1896.10	91,880	Oct 20	1888.25	62,462
1961	June 9	1899.65	107,460	Sept 23	1884.16	49,760
1962	Aug 7	1898.00	100,060	Jan 8	1886.76	57,792
1963	Feb 23	1890.35	69,715	Sept 18	1886.05	55,545
1964	Apr 6	1889.90	68,140	Dec 5	1879.10	36,590
1965	Nov 9	1890.40	69,891	Jan 6	1879.05	36,470
1966	Feb 14	1890.95	71,850	Dec 13	1875.95	29,420
1967	June 26	1877.90	33,760	Dec 9	1869.70	17,601
1968	June 10	1871.95	21,520	Aug 14	1861.65	6,893
1969	June 2	1878.95	36,230	Jan 1	1866.85	13,206
1970	June 14	1877.10	31,951	Dec 12	1863.72	9,148
1971	June 16	1868.78	16,118	Oct 22	1857.35	3,224
1972	Aug 15	1863.40	8,785	Mar 30	1857.45	3,290
1973	June 9	1873.59	24,610	Jan 1	1863.10	8,445
1974	June 14	1879.62	37,850	Oct 24	1868.53	15,725
1975	July 1	1886.31	56,341	Jan 1	1868.61	15,846
1976	June 3	1882.81	46,138	Dec 1	1867.93	14,796
1977	June 14	1871.72	21,106	Aug 5	1861.41	6,650
1978	Sept 4	1873.05	23,576	Aug 14	1865.30	11,081
1979	June 11	1879.62	37,850	Oct 29	1871.70	21,070
1980	June 7	1875.22	27,880	Dec 19	1863.99	9,464
1981	June 8	1867.76	14,541	Apr 8	1863.85	9,300
1982	Aug 2	1870.94	19,713	Apr 26	1864.55	10,135
1983	June 13	1872.73	22,967	Dec 31	1860.90	6,145
1984	June 24	1868.75	16,071	Jan 4	1860.83	6,079
1985	June 8	1868.72	16,022	Jan 6	1866.40	12,571
1986	July 15	1873.03	23,538	Oct 9	1866.57	12,809
1987	June 14	1880.11	39,065	Jan 4	1867.43	14,052
1988	May 26	1880.09	39,016	Dec 31	1871.49	20,962
1989	Jan 5	1871.50	20,710	Aug 18	1864.83	10,479
1990	June 16	1872.37	22,293	Dec 2	1865.95	11,950
1991	June 10	1867.33	13,906	Oct 30	1858.73	4,225
1992	Dec 31	1863.98	9,452	Jan 4	1859.24	4,640
1993	Oct 17	1904.32	130,122	Jan 1	1864.00	9,475
1994	Jan 1	1897.03	95,830	Oct 29	1892.78	78,624
1995	June 5	1907.04	144,654	Sept 10	1891.99	75,653
1996	June 25	1895.16	87,996	Oct 22	1892.49	77,523
1997	June 4	1894.80	86,530	Sept 14	1889.39	66,376
1998	May 18	1894.84	85,480	Oct 23	1889.05	64,003
1999	July 2	1894.91	85,763	Jan 1	1890.12	67,688
2000	May 31	1894.75	85,117	Dec 3	1886.81	56,668
2001	June 18	1892.16	75,069	Oct 9	1886.10	54,450
2002	May 8	1888.27	61,391	Dec 25	1879.16	35,497
2003	May 24	1879.69	36,773	Dec 30	1871.12	19,143
2004	Mar 5	1871.29	19,437	Oct 6	1865.20	10,113
2005	June 17	1865.85	12,405	No 25	1865.16	10,060

(NOTE: New area capacity table published January 1, 1998)

Downstream Releases and Operations Land

The operations land, on the downstream side of Webster Dam, is operated and maintained for the protection of project facilities. The Department manages a portion of the lands below the dam as a Wildlife Management Area under Special Use Permit # 9-LM-60-4737. Reclamation will retain primary jurisdiction over the lands designated as operations area. Reclamation will retain full access to and unlimited use of any areas developed for wildlife habitat, if required for the purpose of ensuring proper operations and protection of Webster Dam/Reservoir.

The normal irrigation season for Webster Irrigation District #4 is from May 1st to September 30th. Irrigation water can be released any time during this period. The district has a water right to store water in Webster Reservoir. The District also has a storage use right in Webster Reservoir and a natural flow water right for irrigation from the South Fork Solomon River of 158 cfs (23,607 acre-feet per year). There are 8,537 irrigable acres within the Webster Irrigation District #4. Water is initially released into the South Fork Solomon River and diverted into the Osborne canal approximately 19 miles downstream at Woodston Diversion Dam. Bypasses are made at the request of the State for senior water rights.

Ground-water depletions of the base flow and numerous farm conservation practices have greatly reduced inflow to the reservoir. Since the mid 1950s the surface water supply in the rivers basin has decreased significantly (see Figure 3). The 10-year moving average inflow to Webster Reservoir has decreased from 81,800 acre-feet in 1955, to 44,200 acre-feet in 1970, to 12,700 acre-feet in 1985, to 11,700 acre-feet in 1992. This decrease in reservoir inflow has drastically changed district operations. The reduced inflow has created lower pool levels, and demands cause a greater fluctuation at these lower pool levels. See Table 5 for maximum/minimum reservoir levels for Webster Reservoir.

WEBSTER 10 YEAR RESERVOIR LEVELS

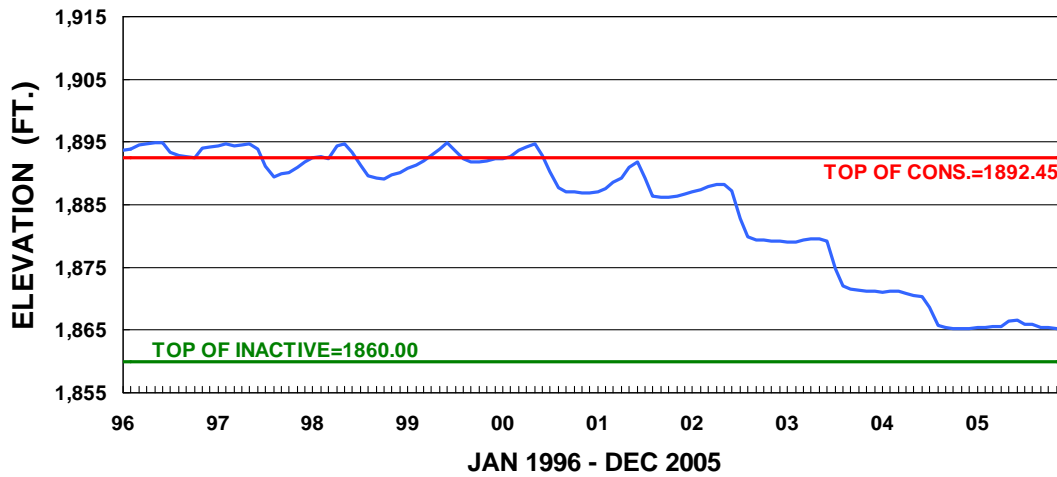


Figure 21 – Webster Reservoir 10-Year Lake Level

WEBSTER 20 YEAR RESERVOIR LEVELS

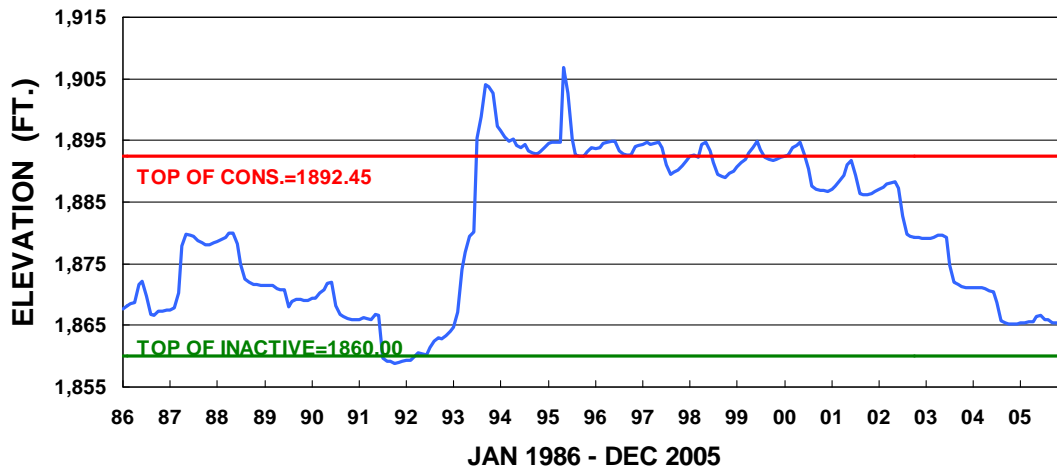


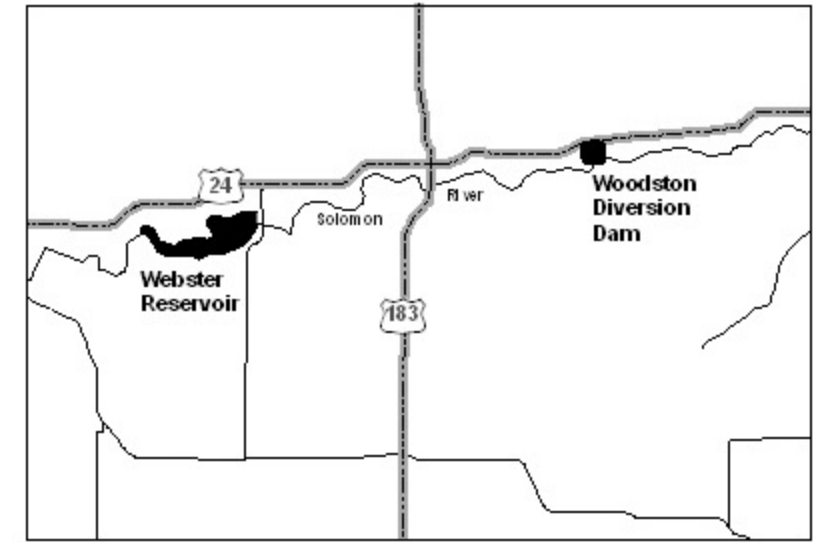
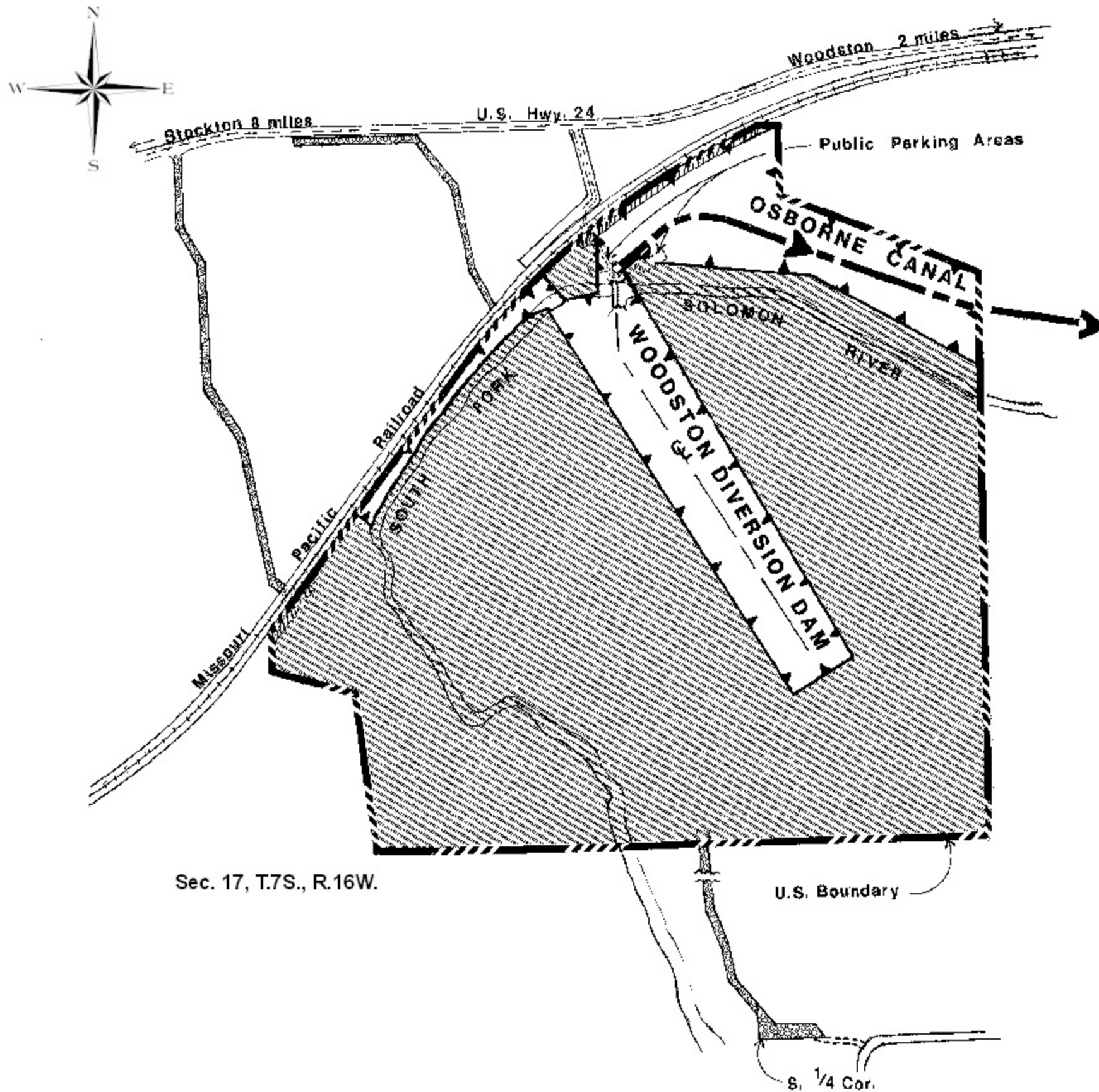
Figure 22 – Webster Reservoir 20-Year Lake Level

Woodston Diversion Dam

Woodston Diversion Dam is located eight miles east of Stockton, Kansas, approximately 19 miles downstream from Webster Dam, on the south fork of the Solomon River. Woodston Diversion Dam diverts water from the river into the Osborne Canal. The diversion dam consists of an uncontrolled concrete ogee spillway 151 feet long and 10 feet high above the base of the sluiceway.

Adjoining the spillway on the south is an earth embankment approximately 2,150 feet long with a maximum height of 15 feet above the original ground surface of the river channel. The diversion control system includes one 8-foot by 18-foot radial sluiceway gate and one 84-inch by 78-inch canal outlet gate to the Osborne Canal. When the water level reaches elevation 1,686.5 feet above sea level, it will form a pool approximately 1 ³/₄ miles upstream from the dam.

The site includes 264 land acres and 10 surface water acres. 210 acres of the land is managed under lease agreement by the Department and 54 acres are reserved for operation and maintenance purposes. Hunting for pheasant, waterfowl, deer, wild turkey, and dove is available. Page 66a details the designated land use areas for Woodston Diversion Dam.



264 - TOTAL LAND ACRES
 10 - TOTAL WATER ACRES
 210 - ACRES, WILDLIFE MANAGEMENT AREA
 54 - ACRES, OPERATIONS & MANAGEMENT AREA

Legend

-  Operation Lands
-  Wildlife Lands
-  Access Easement Granted to U.S.
-  Access Easement Granted Over U.S. Lands



**Woodston Diversion Dam
 Land Uses**

SCALE: 8" = 1 MILE