

Summary of Engineering Data - Missouri River Main Stem System

Item No.	Subject	Fort Peck Lake	Garrison Dam - Lake Sakakawea	Oahe Dam - Lake Oahe	Big Bend Dam - Lake Sharpe	Fort Randall Dam - Lake Francis Case	Gavins Point Dam - Lewis & Clark Lake	Total	Item No.	Remarks
1	Location of Dam	Near Glasgow, Montana	Near Garrison, ND	Near Pierre, SD	21 miles upstream Chamberlain, SD	Near Lake Andes, SD	Near Yankton, SD		1	(1) Includes 4,280 square miles of non-contributing areas.
2	River Mile - 1960 Mileage	Mile 1771.5	Mile 1389.9	Mile 1072.3	Mile 987.4	Mile 880.0	Mile 811.1		2	
3	Total & incremental drainage areas in square miles	57,500	181,400 (2)	243,490 (1)	249,330 (1)	5,840	263,480 (1)	16,000	3	(2) Includes 1,350 square miles of non-contributing areas.
4	Approximate length of full reservoir (in valley miles)	134, ending near Zortman, MT	178, ending near Trenton, ND	231, ending near Bismarck, ND	80, ending near Pierre, SD	107, ending at Big Bend Dam	25, ending near Niobrara, NE	755 miles	4	(3) With pool at base of flood control.
5	Shoreline in miles (3)	1520 (elevation 2234)	1340 (elevation 1837.5)	2250 (elevation 1607.5)	200 (elevation 1420)	540 (elevation 1350)	90 (elevation 1204.5)	5,940 miles	5	(4) Storage first available for regulation of flows.
6	Average total & incremental inflow in cfs	10,200	25,600	15,400	28,900	3,300	28,900	30,000	6	(5) Damming height is height from low water to maximum operating pool. Maximum height is from average streambed to top of dam.
7	Max. discharge of record near damsite in cfs	137,000 (June 1953)	348,000 (April 1952)	440,000 (April 1952)	440,000 (April 1952)	447,000 (April 1952)	480,000 (April 1952)	480,000 (April 1952)	7	(6) Based on latest available storage data.
8	Construction started - calendar yr.	1933	1946	1948	1959	1946	1952	1952	8	(7) River regulation is attained by flows over low-crested spillway and through turbines.
9	In operation (4) cal. yr.	1940	1955	1962	1964	1953	1955	1955	9	(8) Length from upstream face of outlet or to spiral case.
10	Dam and Embankment									
11	Top of dam elevation in feet msl	2280.5	1875	1660	1440	1395	1234		10	(9) Based on 8th year (1961) of drought drawdown (From study 8-83-1985).
12	Length of dam in feet	21,026 (excluding spillway)	11,300 (including spillway)	9,300 (excluding spillway)	10,570 (including spillway)	1395	8,700 (including spillway)	71,596	11	(10) Affected by level of Lake Francis case. Applicable to pool at elevation 1350.
13	Damming height in feet (5)	220	180	200	78	140	45	863 feet	12	(11) Spillway crest.
14	Maximum height in feet (5)	250.5	210	245	95	165	74		13	(12) 1967-2010 Average
15	Max. base width, total & w/o berms in feet	3500, 2700	3400, 2050	3500, 1500	1200, 700	4300, 1250	850, 450		14	(13) Source: Annual Report on Civil Works Activities of the Corps of Engineers. Extract Report Fiscal Year 1999.
16	Abutment formations (under dam & embankment)	Bearpaw shale and glacial fill	Fort Union clay shale	Pierre shale	Pierre shale & Niobrara chalk	Niobrara chalk	Niobrara chalk & Carlisle shale		15	
17	Type of fill	Hydraulic & rolled earth fill	Rolled earth filled	Rolled earth fill & shale berms	Rolled earth, shale, chalk fill	Rolled earth fill & chalk berms	Rolled earth & chalk fill		16	
18	Fill quantity, cubic yards	125,628,000	66,500,000	55,000,000 & 37,000,000	17,000,000	28,000,000 & 22,000,000	7,000,000	358,128,000 cu. yds	17	
19	Volume of concrete (cubic yards)	1,200,000	1,500,000	1,045,000	540,000	961,000	308,000	5,554,000 cu. yds.	18	
20	Date of Closure	24 June 1937	15 April 1953	3 August 1958	24 July 1963	20 July 1952	31 July 1955		19	
21	Spillway Data									
22	Location	Right bank - remote	Left bank - adjacent	Right bank - remote	Left bank - adjacent	Left bank - adjacent	Right bank - adjacent		20	
23	Crest elevation in feet msl	2225	1825	1596.5	1385	1346	1180		21	
24	Width (including piers) in feet	820 gated	1336 gated	456 gated	376 gated	1000 gated	664 gated		22	
25	No., size and types of gates	16 - 40' x 25' vertical lift gates	28 - 40' x 29' Tainter	8 - 50' x 23.5' Tainter	8 - 40' x 38' Tainter	21 - 40' x 29' Tainter	14 - 40' x 30' Tainter		23	
26	Design discharge capacity, cfs	275,000 at elev 2253.3	827,000 at elev 1858.5	304,000 at elev 1644.4	390,000 at elev 1433.6	633,000 at elev 1379.8	584,000 at elev 1221.4		24	
27	Discharge capacity at maximum operating pool in cfs	230,000	660,000	80,000	270,000	508,000	345,000		25	
28	Reservoir Data (6)	(2007 Survey)	(2010 - 2012 Composite Survey)	(2007 & 2010 Composite Survey)	(2012 Survey)	(2011 Survey)	(2011 Survey)	Summary		
29	Max. operating pool elev & area	2250 msl 245,000 acres	1854 msl 383,000 acres	1620 msl 386,000 acres	1423 msl 62,000 acres	1375 msl 102,000 acres	1210 msl 28,000 acres	1,205,000 acres	26	
30	Max. normal op pool elev & area	2246 msl 240,000 acres	1850 msl 365,000 acres	1617 msl 362,000 acres	1422 msl 60,000 acres	1365 msl 94,000 acres	1208 msl 25,000 acres	1,146,000 acres	27	
31	Base flood control elev & area	2234 msl 211,000 acres	1837.5 msl 308,000 acres	1607.5 msl 311,000 acres	1420 msl 58,000 acres	1350 msl 76,000 acres	1204.5 msl 21,000 acres	984,000 acres	28	
32	Min. op. pool elev. & area	2160 msl 89,000 acres	1775 msl 125,000 acres	1540 msl 115,000 acres	1415 msl 51,000 acres	1320 msl 36,000 acres	1204.5 msl 21,000 acres	437,000 acres	29	
33	Storage allocation & capacity									
34	Exclusive flood control	2250-2246 971,000 a.f.	1854-1850 1,495,000 a.f.	1620-1617 1,107,000 a.f.	1423-1422 61,000 a.f.	1375-1365 984,000 a.f.	1210-1208 54,000 a.f.	4,673,000 a.f.	30	
35	Flood control & multiple use	2246-2234 2,704,000 a.f.	1850-1837.5 4,211,000 a.f.	1617-1607.5 3,208,000 a.f.	1422-1420 118,000 a.f.	1365-1350 1,309,000 a.f.	1208-1204.5 79,000 a.f.	11,625,000 a.f.	31	
36	Carryover multiple use	2234-2160 10,700,000 a.f.	1837.5-1775 12,951,000 a.f.	1607.5-1540 13,353,000 a.f.	1420-1415 5,315,000 a.f.	1350-1320 1,531,000 a.f.	1204.5 msl 21,000 acres	38,536,000 a.f.	32	
37	Permanent	2160-2030 4,088,000 a.f.	1775-1673 4,794,000 a.f.	1540-1415 5,315,000 a.f.	1420-1345 1,631,000 a.f.	1320-1240 1,469,000 a.f.	1204.5-1160 295,000 a.f.	17,582,000 a.f.	33	
38	Gross	2250-2030 18,463,000 a.f.	1854-1673 23,451,000 a.f.	1620-1415 22,983,000 a.f.	1423-1345 1,811,000 a.f.	1375-1240 5,293,000 a.f.	1210-1160 428,000 a.f.	72,416,000 a.f.	34	
39	Reservoir filling initiated	November 1937	August 1953	August 1958	November 1963	January 1953	August 1955		35	
40	Initially reached min. operating pool	27 May 1942	7 August 1955	3 April 1962	25 March 1964	24 November 1953	22 December 1955		36	
41	Estimated annual sediment inflow	17,200 a.f./year	21,600 a.f./year	14,800 a.f./year	3,445 a.f./year	15,800 a.f./year	2,700 a.f./year	75,545 a.f./year	37	
42	Outlet Works Data									
43	Location	Right bank	Right Bank	Right Bank	None (7)	Left Bank	None (7)		38	
44	Number and size of conduits	2 - 24' 8" diameter (nos. 3 & 4)	1 - 26' dia. and 2 - 22' dia.	6 - 19.75' dia. upstream, 18.25' dia. downstream		4 - 22' diameter			39	
45	Length of conduits in feet (8)	No. 3 - 6,615, No. 4 - 7,240	1529	3496 to 3659		1013			40	
46	No., size, and type of service gates	1 - 28' dia. cylindrical gate 6 ports, 7.6' x 8.5' high (net opening) in each control shaft	1 - 18' x 24.5' Tainter gate per conduit for fine regulation	1 - 13' x 22' per conduit, vertical lift, 4 cable suspension and 2 hydraulic suspension (fine regulation)		2 - 11' x 23' per conduit, vertical lift, cable suspension			41	
47	Entrance invert elevation (msl)	2095	1672	1425	1385 (11)	1229	1180 (11)		42	
48	Avg. discharge capacity per conduit & total	Elev. 2250	Elev. 1854	Elev. 1620		Elev 1375			43	
49	Present tailwater elevation (ft msl)	2032-2036	1670-1680	1423-1428	1351-1355(10)	1228-1239	1155-1163		44	
50	Power Facilities and Data									
51	Avg. gross head avail in feet (14)	194	161	174	70	117	48	764 feet	45	
52	Number and size of conduits	No. 1-24'8" dia., No. 2-22'4" dia.	5 - 29' dia., 25' penstocks	7 - 24' dia., imbedded penstocks	None: direct intake	8 - 28' dia., 22' penstocks	None: direct intake		46	
53	Length of conduits in feet (8)	No. 1 - 5,653, No. 2 - 6,355	1829	From 3,280 to 4,005		1,074		55,083	47	
54	Surge tanks	PH#1: 3-40' dia., PH#2: 2-65' dia.	65' dia. - 2 per penstock	70' dia., 2 per penstock	None	59' dia., 2 per alternate penstock	None		48	
55	No., type and speed of turbines	5 Francis, PH#1-2: 128.5 rpm, 1-164 rpm, PH#2-2: 128.6 rpm	5 Francis, 90 rpm	7 Francis, 100 rpm	8 Fixed blade, 81.8 rpm	8 Francis, 85.7 rpm	3 Kaplan, 75 rpm	36 units	49	
56	Disch. cap. at rated head in cfs	PH#1, units 1&3 170', 2-140' 8,800 cfs, PH#2-4&5 170'-7,200 cfs	150' 41,000 cfs	185' 54,000 cfs	67' 103,000 cfs	112' 44,500 cfs	48' 36,000 cfs		50	
57	Generator nameplate rating in kW	1&3: 43,500; 2: 18,250; 4&5: 40,000	3 - 121,600, 2 - 109,250	112,290	3 - 67,276, 5 - 58,500	40,000	44,100	2,501,200 kw	51	
58	Plant capacity in kW	185,250	583,300	786,030	494,320	320,000	132,300	1,967,000 kw	52	
59	Dependable capacity in kW (9)	181,000	388,000	534,000	497,000	293,000	74,000	9,372 million kWh	53	
60	Avg annual energy, million kWh (12)	1,048	2,253	2,635	983	1,728	726		54	
61	Initial generation, first and last unit	July 1943 - June 1961	January 1956 - October 1960	April 1962 - June 1963	October 1964 - July 1966	March 1954 - January 1956	September 1956 - January 1957	July 1943 - July 1966	55	Corps of Engineers, U.S. Army
62	Estimated cost September 1999 Completed project (13)	\$158,428,000	\$305,274,000	\$346,521,000	\$107,498,000	\$199,066,000	\$49,617,000	\$1,166,404,000	56	Missouri River Division August 2011