

Summary of Engineering Data -- Missouri River Mainstem System

Big Bend Dam - Lake Sharpe		Fort Randall Dam - Lake Francis Case		Gavins Point Dam - Lewis & Clark Lake		Total	Item No.	Remarks
21 miles upstream Chamberlain, SD		Near Lake Andes, SD		Near Yankton, SD			1	(1) Includes 4,280 square miles of non-contributing areas. (2) Includes 1,350 square miles of non-contributing areas. (3) With pool at base of flood control. (4) Storage first available for regulation of flows. (5) Damming height is height from low water to maximum operating pool. Maximum height is from average streambed to top of dam. (6) Based on latest available storage data. (7) River regulation is attained by flows over low-crested spillway and through turbines. (8) Length from upstream face of outlet or to spiral case. (9) Based on 8th year (1961) of drought drawdown (From study 8-83-1985). (10) Affected by level of Lake Francis case. Applicable to pool at elevation 1350. (11) Spillway crest. (12) 1967-2015 Average (13) Source: Annual Report on Civil Works Activities of the Corps of Engineers. Extract Report Fiscal Year 1999. (14) Based on Study 8-83-1985
Mile 987.4		Mile 880.0		Mile 811.1			2	
249,330 (1)	5,840	263,480 (1)	14,150	279,480 (1)	16,000		3	
80, ending near Pierre, SD		107, ending at Big Bend Dam		25, ending near Niobrara, NE		755 miles	4	
200 (elevation 1420)		540 (elevation 1350)		90 (elevation 1204.5)		5,940 miles	5	
28,900		30,000	1,100	32,000	2,000		6	
440,000 (April 1952)		447,000 (April 1952)		480,000 (April 1952)			7	
1959		1946		1952			8	
1964		1953		1955			9	
1440		1395		1234			10	
10,570 (including spillway)		10,700 (including spillway)		8,700 (including spillway)		71,596	11	
78		140		45		863 feet	12	
95		165		74			13	
1200, 700		4300, 1250		850, 450			14	
Pierre shale & Niobrara chalk		Niobrara chalk		Niobrara chalk & Carlile shale			15	
Rolled earth, shale, chalk fill		Rolled earth fill & chalk berms		Rolled earth & chalk fill			16	
17,000,000		28,000,000 & 22,000,000		7,000,000		358,128,000 cu. yds	17	
540,000		961,000		308,000		5,554,000 cu. yds.	18	
24 July 1963		20 July 1952		31 July 1955			19	
Left bank - adjacent		Left bank - adjacent		Right bank - adjacent			20	
1385		1346		1180			21	
376 gated		1000 gated		664 gated			22	
8 - 40' x 38' Tainter		21 - 40' x 29' Tainter		14 - 40' x 30' Tainter			23	
390,000 at elev 1433.6		620,000 at elev 1379.3		584,000 at elev 1221.4			24	
270,000		508,000		345,000			25	
1423 msl	62,000 acres	1375 msl	102,000 acres	1210 msl	29,000 acres	1,206,000 acres	26	
1422 msl	60,000 acres	1365 msl	94,000 acres	1208 msl	25,000 acres	1,146,000 acres	27	
1420 msl	58,000 acres	1350 msl	76,000 acres	1204.5 msl	21,000 acres	984,000 acres	28	
1415 msl	51,000 acres	1320 msl	36,000 acres	1204.5 msl	21,000 acres	437,000 acres	29	
1423-1422	61,000 a.f.	1375-1365	986,000 a.f.	1210-1208	54,000 a.f.	4,674,000 a.f.	30	
1422-1420	118,000 a.f.	1365-1350	1,306,000 a.f.	1208-1204.5	79,000 a.f.	11,626,000 a.f.	31	
		1350-1320	1,532,000 a.f.			38,536,000 a.f.	32	
1420-1345	1,631,000 a.f.	1320-1240	1,469,000 a.f.	1204.5-1160	295,000 a.f.	17,592,000 a.f.	33	
1423-1345	1,810,000 a.f.	1375-1240	5,293,000 a.f.	1210-1160	428,000 a.f.	72,428,000 a.f.	34	
November 1963		January 1953		August 1955			35	
25 March 1964		24 November 1953		22 December 1955			36	
3,445 a.f./year	525 yrs.	15,800 a.f./year	334 yrs.	2,700 a.f./year	159 yrs.	77,400	37	
None (7)		Left Bank		None (7)			38	
		4 - 22' diameter					39	
		1013					40	
		2 - 11' x 23' per conduit, vertical lift, cable suspension					41	
1385 (11)		1229		1180 (11)			42	
		Elev 1375					43	
		32,000 cfs - 128,000 cfs						
1351-1355(10)	25,000-100,000 cfs	1228-1237	10,000-60,000 cfs	1153-1161	15,000-60,000 cfs		44	
70		117		48		764 feet	45	
None: direct intake		8 - 28' dia., 22' penstocks		None: direct intake			46	
		1,074				55,083	47	
None		59' dia, 2 per alternate penstock		None			48	
8 Fixed blade, 81.8 rpm		8 Francis, 85.7 rpm		3 Kaplan, 75 rpm		36 units	49	
67'	103,000 cfs	112'	44,500 cfs	48'	36,000 cfs		50	
3 - 67,276, 5 - 58,500		40,000		44,100			51	
494,320		320,000		132,300		2,501,200 kw	52	
497,000		293,000		74,000		1,967,000 kw	53	
980		1,726		725		9,342 million kWh	54	
October 1964 - July 1966		March 1954 - January 1956		September 1956 - January 1957		July 1943 - July 1966	55	
	\$107,498,000		\$199,066,000		\$49,617,000	\$1,166,404,000	56	

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Item No.	Subject	Fort Peck Dam - Fort Peck Lake	Garrison Dam - Lake Sakakawea	Oahe Dam - Lake Oahe
1	Location of Dam	Near Glasgow, Montana	Near Garrison, ND	Near Pierre, SD
2	River Mile - 1960 Mileage	Mile 1771.5	Mile 1389.9	Mile 1072.3
3	Total & incremental drainage areas in square miles	57,500	181,400 (2) 123,900	243,490 (1) 62,090
4	Approximate length of full reservoir (in valley miles)	134, ending near Zortman, MT	178, ending near Trenton, ND	231, ending near Bismarck, ND
5	Shoreline in miles (3)	1520 (elevation 2234)	1340 (elevation 1837.5)	2250 (elevation 1607.5)
6	Average total & incremental inflow in cfs	10,200	25,600 15,400	28,900 3,300
7	Max. discharge of record near damsite in cfs	137,000 (June 1953)	348,000 (April 1952)	440,000 (April 1952)
8	Construction started - calendar yr.	1933	1946	1948
9	In operation (4) calendar yr.	1940	1955	1962
Dam and Embankment				
10	Top of dam, elevation in feet msl	2280.5	1875	1660
11	Length of dam in feet	21,026 (excluding spillway)	11,300 (including spillway)	9,300 (excluding spillway)
12	Damming height in feet (5)	220	180	200
13	Maximum height in feet (5)	250.5	210	245
14	Max. base width, total & w/o berms in feet	3500, 2700	3400, 2050	3500, 1500
15	Abutment formations (under dam & embankment)	Bearpaw shale and glacial fill	Fort Union clay shale	Pierre shale
16	Type of fill	Hydraulic & rolled earth fill	Rolled earth filled	Rolled earth fill & shale berms
17	Fill quantity, cubic yards	125,628,000	66,500,000	55,000,000 & 37,000,000
18	Volume of concrete, cubic yards	1,200,000	1,500,000	1,045,000
19	Date of closure	24 June 1937	15 April 1953	3 August 1958
Spillway Data				
20	Location	Right bank - remote	Left bank - adjacent	Right bank - remote
21	Crest elevation in feet msl	2225	1825	1596.5
22	Width (including piers) in feet	820 gated	1336 gated	456 gated
23	No., size and type of gates	16 - 40' x 25' vertical lift gates	28 - 40' x 29' Tainter	8 - 50' x 23.5' Tainter
24	Design discharge capacity, cfs	275,000 at elev 2253.3	827,000 at elev 1858.5	304,000 at elev 1644.4
25	Discharge capacity at maximum operating pool in cfs	230,000	660,000	80,000
Reservoir Data (6)				
26	Max. operating pool elev. & area	2250 msl 245,000 acres	1854 msl 383,000 acres	1620 msl 386,000 acres
27	Max. normal op. pool elev. & area	2246 msl 240,000 acres	1850 msl 365,000 acres	1617 msl 362,000 acres
28	Base flood control elev & area	2234 msl 211,000 acres	1837.5 msl 308,000 acres	1607.5 msl 311,000 acres
29	Min. operating pool elev. & area	2160 msl 89,000 acres	1775 msl 125,000 acres	1540 msl 115,000 acres
Storage allocation & capacity				
30	Exclusive flood control	2250-2246 971,000 a.f.	1854-1850 1,495,000 a.f.	1620-1617 1,107,000 a.f.
31	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.
32	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.
33	Permanent	2160-2030 4,088,000 a.f.	1775-1673 4,794,000 a.f.	1540-1415 5,315,000 a.f.
34	Gross	2250-2030 18,463,000 a.f.	1854-1673 23,451,000 a.f.	1620-1415 22,983,000 a.f.
35	Reservoir filling initiated	November 1937	December 1953	August 1958
36	Initially reached min. operating pool	27 May 1942	7 August 1955	3 April 1962
37	Estimated annual sediment inflow	17,200 a.f./year 1073 yrs.	21,600 a.f./year 1,086 yrs.	14,800 a.f./year 1553 yrs.
Outlet Works Data				
38	Location	Right bank	Right Bank	Right Bank
39	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
40	Length of conduits in feet (8)	No. 3 - 6,615, No. 4 - 7,240	1529	3496 to 3659
41	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)
42	Entrance invert elevation (msl)	2095	1672	1425
43	Avg. discharge capacity per conduit & total	Elev. 2250 22,500 cfs - 45,000 cfs	Elev. 1854 30,400 cfs - 98,000 cfs	Elev. 1620 18,500 cfs - 111,000 cfs
44	Present tailwater elevation (ft msl)	2032-2036 5,000 - 35,000 cfs	1669-1677 15,000- 60,000 cfs	1422-1427 20,000-55,000 cfs
Power Facilities and Data				
45	Avg. gross head available in feet (14)	194	161	174
46	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
47	Length of conduits in feet (8)	No. 1 - 5,653, No. 2 - 6,355	1829	From 3,280 to 4,005
48	Surge tanks	PH#1: 3-40' dia., PH#2: 2-65' dia.	65' dia. - 2 per penstock	70' dia., 2 per penstock
49	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
50	Discharge 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
51	Generator nameplate rating in kW	1&3: 43,500; 2: 18,250; 4&5: 40,000	3 - 121,600, 2 - 109,250	112,290
52	Plant capacity in kW	185,250	583,300	786,030
53	Dependable capacity in kW (9)	181,000	388,000	534,000
54	Avg. annual energy, million kWh (12)	1,035	2,254	2,622
55	Initial generation, first and last unit	July 1943 - June 1961	January 1956 - October 1960	April 1962 - June 1963
56	Estimated cost September 1999 completed project (13)	\$158,428,000	\$305,274,000	\$346,521,000