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,	Near Lake Andes, SD	Near Yankton, SD		1	(1) Includes 4,280 square
2	River Mile - 1960 Mileage	Mile 1771.5	Mile 1389.9	Mile 1072.3	Mile 987.4	Mile 880.0	Mile 811.1		2	miles of non-contributing
3	Total & incremental drainage areas in square miles	57,500	181,400 (2) 123,900	243,490 (1) 62,090	249,330 (1) 5,840	263,480 (1) 14,150	279,480 (1) 16,000		3	areas. (2) Includes 1,350 square
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	miles of non-contributing areas.
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	(3) With pool at base of flood
6	Average total & incremental inflow in cfs	10,200	25,600 15,400	28,900 3,300	28,900	30,000 1,100	32,000 2,000		6	control. (4) Storage first available for
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)		7	regulation of flows. (5) Damming height is height
8	Construction started - calendar yr.	1933	1946	1948	1959	1946	1952		8	from low water to maximum
9	In operation (4) cal. yr.	1940	1955	1962	1964	1953	1955		9	operating pool. Maximum
	Dam and Embankment									height is from average
10	Top of dam elevation in feet msl	2280.5	1875	1660	1440	1395	1234		10	streambed to top of dam.
11	Length of dam in feet	21,026 (excluding spillway)	11,300 (including spillway)	9,300 (excluding spillway)	10,570 (including spillway)	10,700 (including spillway)	8,700 (including spillway)	71,596	11	(6) Based on latest available
12	Damming height in feet (5)	220	180	200	78	140	45	863 feet	12	storage data.
13	Maximum height in feet (5)	250.5	210	245	95	165	74		13	(7) River regulation is attained
14	Max. base width, total & w/o berms in feet	3500, 2700	3400, 2050	3500, 1500	1200, 700	4300, 1250	850, 450		14	by flows over low-crested spillway and through
15	Abutment formations (under dam & embankment)	Bearpaw shale and glacial fill	Fort Union clay shale	Pierre shale	Pierre shale & Niobrara chalk	Niobrara chalk	Niobrara chalk & Carlile shale		15	turbines. (8) Length from upstream face
16	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	of outlet or to spiral case.
17	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	(9) Based on 8th year (1961)
18	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	of drought drawdown
19	Date of Closure	24 June 1937	15 April 1953	3 August 1958	24 July 1963	20 July 1952	31 July 1955		19	(From study 8-83-1985).
	Spillway Data									(10) Affected by level of Lake
20	Location	Right bank - remote	Left bank - adjacent	Right bank - remote	Left bank - adjacent	Left bank - adjacent	Right bank - adjacent		20	Francis case. Applicable to
21	Crest elevation in feet msl	2225	1825	1596.5	1385	1346	1180		21	pool at elevation 1350.
22	Width (including piers) in feet	820 gated	1336 gated	456 gated	376 gated	1000 gated	664 gated		22	(11) Spillway crest.
23	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	(12) 1967-2012 Average
24	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	(13) Source: Annual Report on
25	Discharge capacity at maximum operating pool in cfs	230,000	660,000	80,000	270,000	508,000	345,000		25	Civil Works Activities of the Corps of Engineers. Extract Report Fiscal Year 1999.
	Reservoir Data (6)									
26	Max. operating pool elev & area	2250 msl 241,000 acres	1854 msl 380,000 acres	1620 msl 374,000 acres	1423 msl 61,000 acres	1375 msl 102,000 acres	1210 msl 30,000 acres	1,188,000 acres	26	
27	Max. normal op pool elev & area	2246 msl 234,000 acres	1850 msl 364,000 acres	1617 msl 360,000 acres	1422 msl 60,000 acres	1365 msl 95,000 acres	1208 msl 27,000 acres	1,140,000 acres	27	
28	Base flood control elev & area	2234 msl 210,000 acres	1837.5 msl 307,000 acres	1607.5 msl 312,000 acres	1420 msl 57,000 acres	1350 msl 77,000 acres	1204.5 msl 23,000 acres	986,000 acres	28	
29	Min. op. pool elev. & area	2160 msl 89,000 acres	1775 msl 128,000 acres	1540 msl 117,000 acres	1415 msl 51,000 acres	1320 msl 38,000 acres	1204.5 msl 23,000 acres	446,000 acres	29	
	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.	1423-1422 60,000 a.f.	1375-1365 986,000 a.f.	1210-1208 54,000 a.f.	4,673,000 a.f.	30	
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.	1422-1420 117,000 a.f.	1365-1350 1,306,000 a.f.	1208-1204.5 79,000 a.f.	11,625,000 a.f.	31	
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.		1350-1320 1,532,000 a.f.		38,536,000 a.f.	32	
33	Permanent	2160-2030 4,088,000 a.f.	1775-1673 4,794,000 a.f.	1540-1415 5,315,000 a.f.	1420-1345 1,621,000 a.f.	1320-1240 1,469,000 a.f.	1204.5-1160 295,000 a.f.	17,582,000 a.f.	33	
34	Gross	2250-2030 18,463,000 a.f.	1854-1673 23,451,000 a.f.	1620-1415 22,983,000 a.f.	1423-1345 1,798,000 a.f.	1375-1240 5,293,000 a.f.	1210-1160 428,000 a.f.	72,416,000 a.f.	34	
35	Reservoir filling initiated	November 1937	December 1953	August 1958	November 1963	January 1953	August 1955		35	
36	Initially reached min. operating pool	27 May 1942	7 August 1955	3 April 1962	25 March 1964	24 November 1953	22 December 1955		36	
37	Estimated annual sediment inflow	15,600 a.f. 1180 yrs.	21,600 a.f. 1080 yrs.	17,800 a.f. 1560 yrs.	5,300 a.f. 340 yrs.	15,800 a.f. 340 yrs.	2,600 a.f. 160 yrs.	78,700 a.f.	37	
	Outlet Works Data									
38	Location	Right bank	Right Bank	Right Bank		Left Bank			38	
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	None (7)	4 - 22' diameter	None (7)		39	
40	Length of conduits in feet (8)	No. 3 - 6,615, No. 4 - 7,240	1529	3496 to 3659		1013			40	
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)		2 - 11' x 23' per conduit, vertical lift, cable suspension			41	
42	Entrance invert elevation (msl)	2095	1672	1425	1385 (11)	1229	1180 (11)		42	
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		Elev 1375 32,000 cfs - 128,000 cfs			43	
44	Present tailwater elevation (ft msl)	2032-2036 5,000 - 35,000 cfs	1670-1680 ,000- 60,000 cfs	1423-1428 20,000-55,000 c	1351-1355(10) 25,000-100,000	1228-1239 ,000-60,000 cfs	1155-1163 ,000-60,000 cfs		44	
	Power Facilities and Data									
45	Avg. gross head avail in feet (14)	194	161	174	70	117	48	764 feet	45	
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	None: direct intake	8 - 28' dia., 22' penstocks	None: direct intake		46	
47	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	
48	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	
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	8 Fixed blade, 81.8 rpm	8 Francis, 85.7 rpm	3 Kaplan, 75 rpm	36 units	49	
50	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	
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	3 - 67,276, 5 - 58,500	40,000	44,100		51	
52	Plant capacity in kW	185,250	583,300	786,030	494,320	320,000	132,300	2,501,200 kw	52	
53	Dependable capacity in kW (9)	181,000	388,000	534,000	497,000	293,000	74,000	1,967,000 kw	53	
54	Avg annual energy, million kWh (12)	1,048	2,259	2,641	986	1,733	726	9,394 million kWh	54	Corps of Engineers, U.S. Army
55	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	Compiled by
56	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 2013