From: "Moorer, Tom C." <TCMOORER@southernco.com>
To: <mdn@nrc.gov>, <michael.sackschewsky@pnl.gov>
Date: 12/26/2006 11:50:01 PM
Subject: FW: Coosa River Low Flow Estimate

Barton information we discussed.

TCM

> _____
> From: Williams, Dana M.
> Sent: Wednesday, December 13, 2006 8:42 AM
> To: Moorer, Tom C.
> Subject: Coosa River Low Flow Estimate
>
> <<Coosa River Low Flow Estimate.pdf>>
>
> Merry Christmas!
>
> Dana Williams
> Southern Nuclear Operating Company
> Nuclear Development
> P.O. Box 1295
> Birmingham, AL 35201
> P 205.992.5934
> F 205.992.5296
>
>

Mail Envelope Properties (4591F98B.C99 : 10 : 40089)

Subject:	FW: Coosa River Low Flow Estimate
Creation Date	12/26/2006 11:40:55 PM
From:	"Moorer, Tom C." <TCMOORER@southernco.com>
Created By:	TCMOORER@southernco.com

Recipients

nrc.gov
TWGWPO01.HQGWDO01
mdn (Mark Notich)

pnl.gov
michael.sackschewsky

Post Office	**Route**
TWGWPO01.HQGWDO01	nrc.gov
	pnl.gov

Files	**Size**	**Date & Time**
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Coosa River Low Flow Estimate.pdf	620887	
Mime.822	871131	

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Return Notification:	None
Concealed Subject:	No
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United States Department of the Interior
GEOLOGICAL SURVEY
2350 Fairlane Drive, Suite 120
Montgomery, Alabama 36116

November 28, 2001

Mr. William C. Dykes
Alabama Power Company
600 North 18th Street
P.O. Box 2641
Birmingham, Alabama 35291

Dear Mr. Dykes:

Enclosed are the following items utilized in the 7-day 10-year low-flow estimate for Coosa River near Childersburg, Alabama:

1. Spreadsheet of minimum 7-day values with dates of occurrence and ranking for period 1965-2001 for Logan Martin, Lay, Mitchell, and Jordan Dams.
2. Same spreadsheet with plotting position handwritten on it.
3. Plots of discharge vs. plotting position for Logan Martin, Lay, Mitchell, and Jordan Dams.

Daily discharges for this analysis were obtained from Alabama Power Company on a spreadsheet giving the daily turbine releases and gate or spillway spillages. This data was processed using EXCEL to compute a 7-day running average for the period of record beginning January 1, 1964 to December 31, 2000. Discharges for Logan Martin did not include the leakage flow until 1993 so a value of 650 cubic feet per second was added to the 7-day running averages prior to this date.

The 7-day values were ranked for each climatic year (ending March 31) and plotting position computed using n=37 years and the equation n+1/rank. So the lowest value for 37 years is plotted at a recurrence interval of 38 years, the 2nd lowest at 19 years, ...,and the 37th lowest at 1.03 years. This method is known as a Log-Pearson Type III distribution, which is the technique used by USGS in the determination of low-flow estimates. A hand drawn line was done because our computer program uses discharges input into our database. Since the discharges for three of the dams were not in our database it was easier to do the plots by hand.

The graphical fit of the line giving the relationship of discharge to recurrence interval demonstrates the reason that the 7-day 10-year low-flow is considered to be an estimate. It must be stated that frequency curves are based on random homogeneous data and changes in operation procedures can impact the data. An example of this is the minimum flow at Jordan Dam. The current 1-day and 3-day discharge figures have certainly been impacted and differ from those prior to 1990. A time-sampling error can occur with shorter periods of data as an extraordinary event can bias the relationship. Certainly as more years of data are obtained the fit becomes tighter and more reliable. However, the results appear to be within 100 cubic feet per second for each of the four dams.

Hopefully this explanation of the process used is adequate for your need. Let me know if further explanation is necessary.

Sincerely,

James L. Pearman

James L. Pearman
Hydrologist

Enclosure

YEAR	LOGAN MARTIN DATE	FLOW	RANK	LAY DAM DATE	FLOW	RANK	MITCHELL DAM DATE	FLOW	RANK	JORDAN DAM DATE	FLOW	RANK
1965	21-Jul	3200	31	13-Jul	2850	23	10-Jul	3590	31	11-Jul	4000	32
1966	1-Sep	3660	36	17-Oct	3140	29	19-Oct	3210	27	19-Oct	2900	17
1967	31-Jul	3310	34	29-Jul	3260	30	29-Jul	3500	30	29-Jul	3840	30
1968	18-Apr	2790	23	23-Apr	2890	25	17-Apr	3070	24	18-Apr	3230	24
1969	12-Sep	2070	11	13-Sep	1580	6	13-Sep	1760	7	13-Sep	1710	4
1970	22-Jul	1800	8	23-Jul	1800	10	23-Jul	2190	9	22-Jul	2320	10
1971	10-Jul	2120	12	3-Oct	1410	5	4-Oct	1580	5	6-Oct	1550	3
1972	13-Oct	1370	4	13-Oct	810	2	13-Oct	871	1	13-Oct	1190	2
1973	9-Oct	2410	17	12-Oct	1920	11	6-Oct	2340	12	12-Oct	2110	7
1974	19-Sep	2770	22	19-Sep	2190	17	19-Sep	2550	18	19-Sep	2690	15
1975	3-Oct	893	2	2-Oct	387	1	2-Oct	894	2	2-Oct	2050	6
1976	2-Sep	2950	27	2-Sep	3170	27	2-Sep	3830	33	2-Sep	4490	35
1977	6-Sep	2530	20	6-Sep	2470	21	27-Nov	2750	20	27-Nov	3270	25
1978	6-Sep	1960	9	4-Jul	1620	7	6-Sep	1690	6	5-Jul	2360	12
1979	1-Oct	2500	19	28-Sep	2190	16	28-Sep	2540	17	10-Oct	3310	27
1980	5-Jul	3790	37	5-Jul	3740	37	5-Jul	4570	37	5-Jul	5370	37
1981	20-Jan	2280	14	20-Jan	2130	15	20-Jan	2710	19	20-Jan	2800	16
1982	26-May	1480	6	27-May	1750	9	18-Aug	2080	8	18-Aug	2230	8
1983	6-Sep	2860	24	6-Sep	3050	26	2-Sep	3020	23	2-Sep	2980	20
1984	6-Sep	2750	21	6-Sep	2520	22	6-Sep	2820	21	5-Sep	3150	23
1985	24-Sep	2370	16	28-Sep	1640	8	28-Sep	2210	10	26-Sep	2600	14
1986	30-Sep	3030	29	30-Sep	3290	31	20-Sep	3180	26	18-Sep	3320	28
1987	23-May	733	1	23-May	990	3	25-May	1520	4	17-May	1830	5
1988	12-Aug	2410	18	12-Aug	2430	20	12-Aug	2470	14	11 Aug	2550	13
1989	13-Jul	1240	3	15-Jul	1050	4	15-Jul	1290	3	15-Jul	1170	1
1990	29-Apr	2950	26	14-Aug	3630	35	14-Aug	3180	25	14-Aug	3410	29
1991	6-Jul	3210	32	4-Jul	3100	28	4-Sep	3220	28	4-Sep	3080	21
1992	24-Sep	3180	30	24-Sep	3300	32	24-Sep	3690	32	10-Oct	3280	26
1993	8 Aug	3450	35	8-Aug	3600	34	8-Aug	3990	34	8 Aug	4240	33
1994	7-Nov	1610	7	12-Oct	1990	12	8-Oct	2500	15	15-Oct	2290	9
1995	9-Jun	2940	25	8-Jun	3730	36	5-Jun	4460	36	20-Nov	4330	34
1996	15-Sep	2370	15	15-Sep	2000	13	14-Sep	2210	11	8 Aug	2970	19
1997	5-Sep	3230	33	5-Sep	3440	33	5-Sep	4110	35	5-Sep	4580	36
1998	24-Sep	3030	28	24-Sep	2880	24	24-Sep	3400	29	7-Sep	3940	31
1999	19-Oct	1400	5	6-Oct	2420	19	25-Oct	2920	22	25 Oct	2970	18
2000	21-Sep	2240	13	22-Sep	2210	18	22-Sep	2450	13	26-Sep	3100	22
2001	25-Jun	2060	10	29-Jun	2080	14	1-Jul	2500	16	4-Jul	2350	11

n=37 plotting position $\frac{n+1}{n} = \frac{38}{1}$

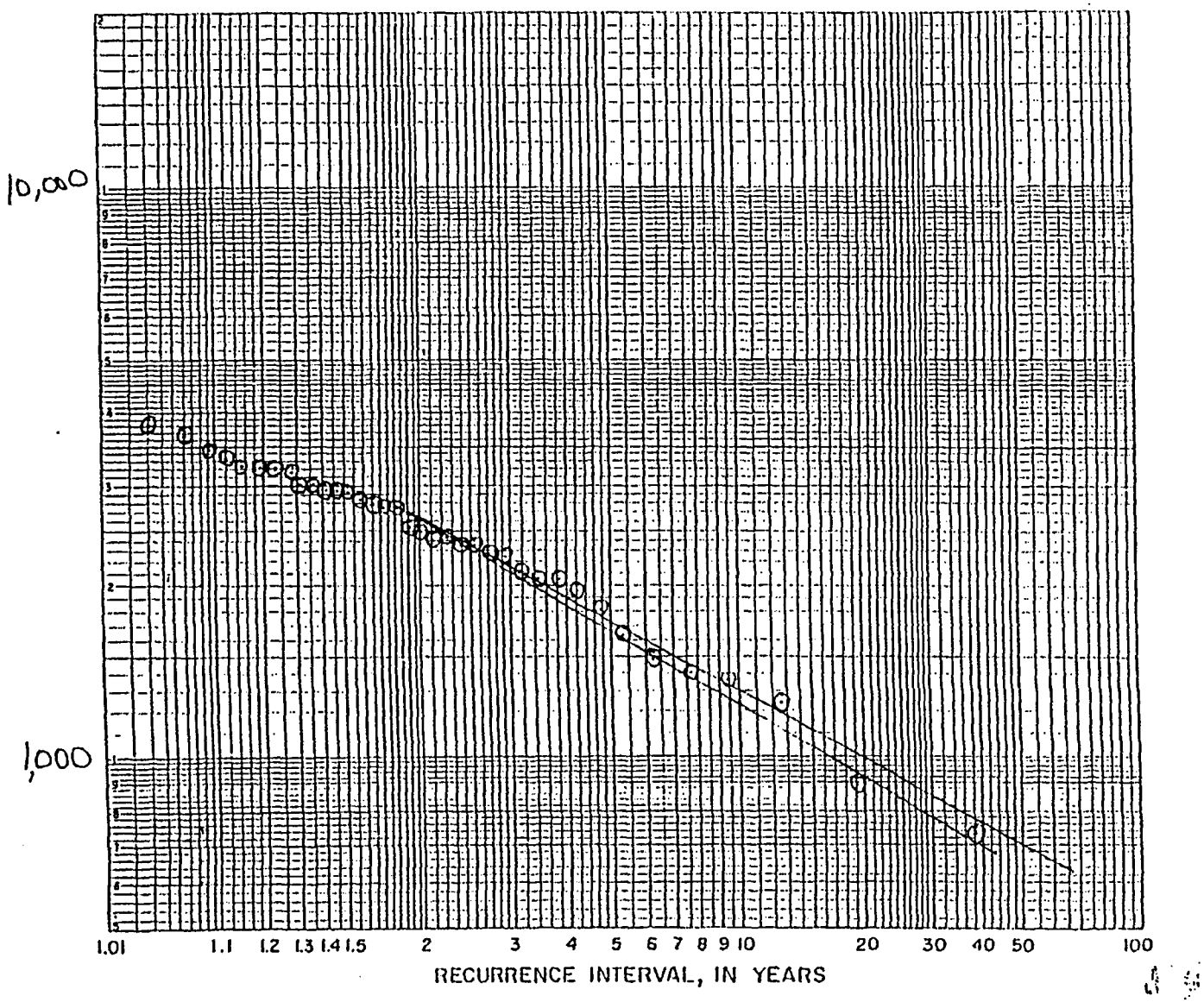
added to Logan Martin for surge

YEAR	LOGAN MARTIN DATE	FLOW		LAY DAM DATE	FLOW		MITCHELL DAM DATE	FLOW		JORDAN DAM DATE	FLOW	
			1200			1250			1500			1700
1965	21-Jul	3200	-31-1.73	13-Jul	2850	-23-1.65	10-Jul	3590	-31-1.73	11-Jul	4000	-32-1.19
1966	1-Sep	3660	-36-1.06	17-Oct	3140	-29-1.31	19-Oct	3210	-27-1.41	19-Oct	2900	-17-2.24
1967	31-Jul	3310	-34-1.12	29-Jul	3260	-30-1.27	29-Jul	3500	-30-1.27	29-Jul	3840	-30-1.27
1968	18-Apr	2790	-23-1.65	23-Apr	2890	-25-1.52	17-Apr	3070	-24-1.58	18-Apr	3230	-24-1.58
1969	12-Sep	2070	-11-3.45	13-Sep	1580	-6-6.3	13-Sep	1760	7-5.42	13-Sep	1710	-4-9.5
1970	22-Jul	1800	-8-4.75	23-Jul	1800	-10-3.8	23-Jul	2190	9-4.2	22-Jul	2320	-10-3.8
1971	10-Jul	2120	-12-3.17	3-Oct	1410	-5-7.6	4-Oct	1580	-5-7.6	6-Oct	1550	-3-12.7
1972	13-Oct	1370	-4-9.5	13-Oct	810	2-19	13-Oct	871	1-38	13-Oct	1190	-7-19
1973	9-Oct	2410	-17-2.24	12-Oct	1920	-11-3.45	6-Oct	2340	-12-3.17	12-Oct	2110	7-5.42
1974	19-Sep	2770	-22-1.73	19-Sep	2190	-17-2.24	19-Sep	2550	-18-2.11	19-Sep	2690	15-2.53
1975	3-Oct	893	-2-19	2-Oct	387	1-38	2-Oct	894	-2-19	2-Oct	2050	-6-6.3
1976	2-Sep	2950	-27-1.41	2-Sep	3170	-27-1.41	2-Sep	3833	-33-1.15	2-Sep	4490	-35-1.09
1977	6-Sep	2530	-20-1.9	6-Sep	2470	-21-1.81	27-Nov	2751	-20-1.9	27-Nov	3270	-25-1.52
1978	6-Sep	1960	-9-4.2	4-Jul	1620	-7-5.42	6-Sep	1690	-6-6.3	5-Jul	2360	-13-3.17
1979	1-Oct	2500	-19-2.00	28-Sep	2190	-16-2.38	28-Sep	2540	-17-2.24	10-Oct	3310	-27-1.41
1980	5-Jul	3790	37-1.03	5-Jul	3740	37-1.03	5-Jul	4570	-37-1.03	5-Jul	5370	-37-1.03
1981	20-Jan	2280	-14-2.71	20-Jan	2130	-15-2.53	20-Jan	2710	19-2.00	20-Jan	2800	-16-2.38
1982	26-May	1480	-6-6.3	27-May	1750	-9-4.2	18-Aug	2080	-8-4.75	18-Aug	2230	-9-4.75
1983	6-Sep	2860	-24-1.58	6-Sep	3050	-26-1.46	2-Sep	3020	-23-1.65	2-Sep	2980	-20-1.78
1984	6-Sep	2750	-21-1.81	6-Sep	2520	-22-1.73	6-Sep	2820	21-1.81	5-Sep	3150	-23-1.65
1985	24-Sep	2370	-16-2.38	28-Sep	1640	-8-4.75	28-Sep	2210	10-3.8	26-Sep	2600	-14-2.71
1986	30-Sep	3030	-25-1.31	30-Sep	3290	-31-1.73	20-Sep	3180	26-1.46	18-Sep	3320	28-1.36
1987	23-May	733	-1-38	23-May	990	3-12.7	25-May	1520	-4-9.5	17-May	1830	-5-7.6
1988	12-Aug	2410	-18-2.11	12-Aug	2430	-20-1.9	12-Aug	2470	-14-2.71	11-Aug	2550	-13-2.92
1989	13-Jul	1240	-3-12.7	15-Jul	1050	-4-9.5	15-Jul	1290	-3-12.7	15-Jul	1170	-1-28
1990	29-Apr	2950	-26-1.46	14-Aug	3630	35-1.09	14-Aug	3180	-25-1.52	14-Aug	3410	-29-1.31
1991	6-Jul	3210	-32-1.19	4-Jul	3100	-28-1.36	4-Sep	3220	-28-1.36	4-Sep	3080	-21-1.81
1992	24-Sep	3180	-30-1.27	24-Sep	3300	-32-1.19	24-Sep	3690	-32-1.19	10-Oct	3280	-26-1.46
1993	8-Aug	3450	-35-1.09	8-Aug	3600	-34-1.12	8-Aug	3990	-34-1.12	8-Aug	4240	-33-1.15
1994	7-Nov	1610	-7-5.42	12-Oct	1990	-12-3.17	8-Oct	2500	-15-2.53	15-Oct	2290	9-4.2
1995	9-Jun	2940	-25-1.52	8-Jun	3730	-36-1.06	5-Jun	4460	-36-1.06	20-Nov	4330	-34-1.12
1996	15-Sep	2370	-15-2.53	15-Sep	2000	-13-2.92	14-Sep	2210	-11-3.45	8-Aug	2970	-19-2.00
1997	5-Sep	3230	-33-1.15	5-Sep	3440	-33-1.15	5-Sep	4110	-35-1.09	5-Sep	4580	-36-1.06
1998	24-Sep	3030	-28-1.36	24-Sep	2880	-24-1.58	24-Sep	3400	-29-1.31	7-Sep	3940	-31-1.23
1999	19-Oct	1400	-5-7.6	6-Oct	2420	-19-2	25-Oct	2920	-22-1.73	25-Oct	2970	-18-2.11
2000	21-Sep	2240	-13-2.92	22-Sep	2210	-18-2.11	22-Sep	2450	-13-2.92	26-Sep	3100	-22-1.73
2001	25-Jun	2060	-10-3.8	29-Jun	2080	-14-2.71	1-Jul	2500	-16-2.38	4-Jul	2350	-11-3.45

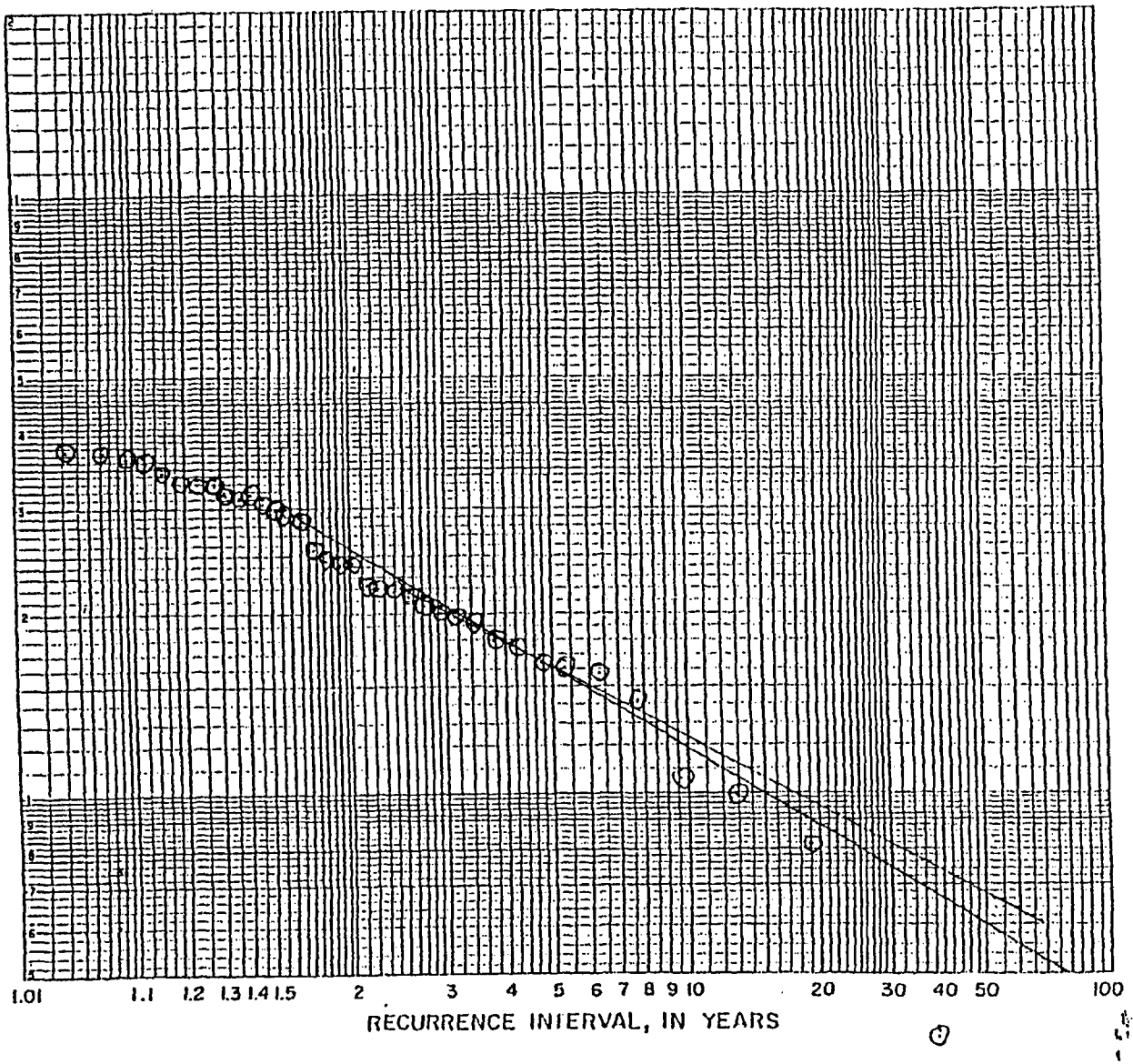
drainage area mi2

Logan 7740
Charlotteville 8390
Lay 9050
Mitchell 9780
Jordan 10,100

Logan Martin Dam use 1200 cfs

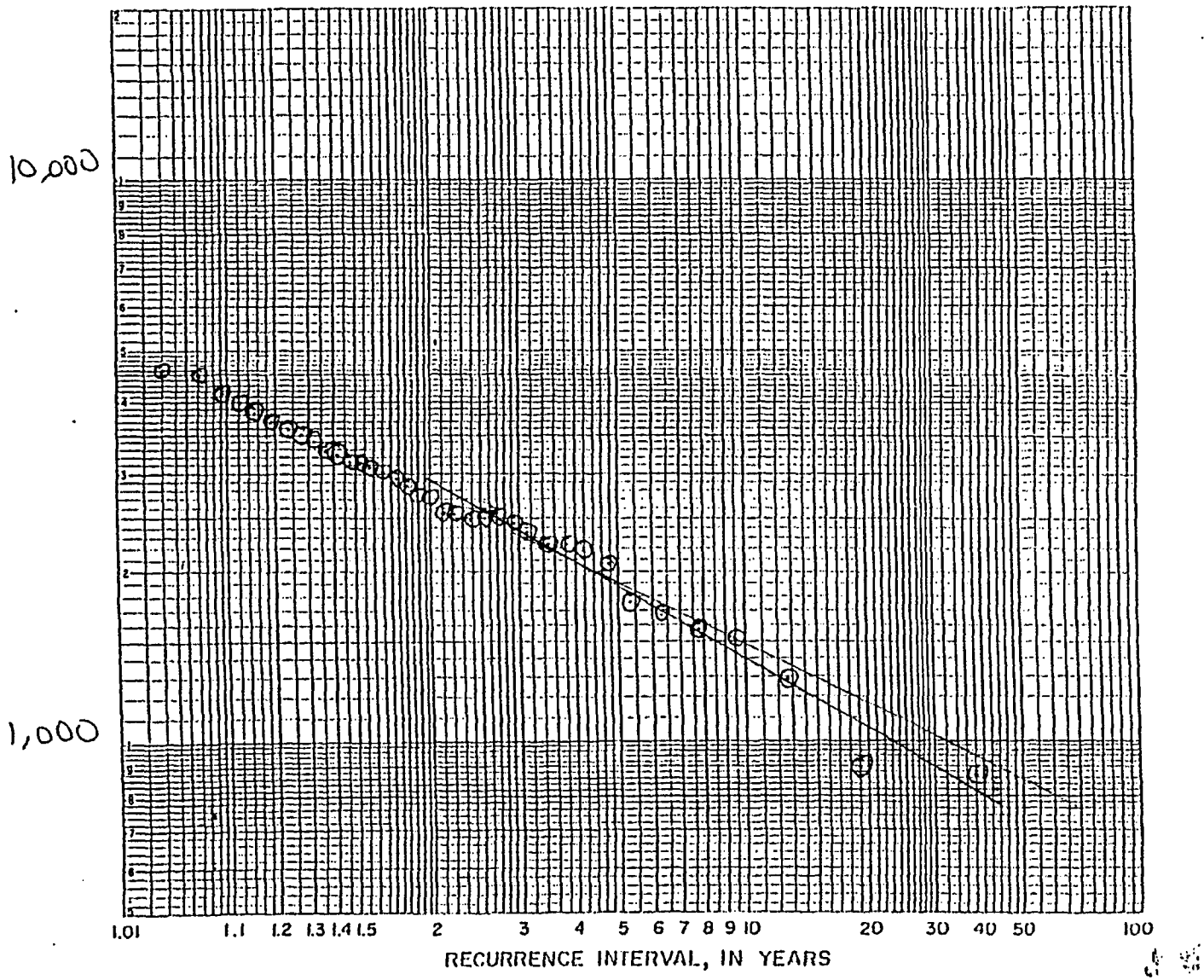


Lay Dam use 1250 cfs

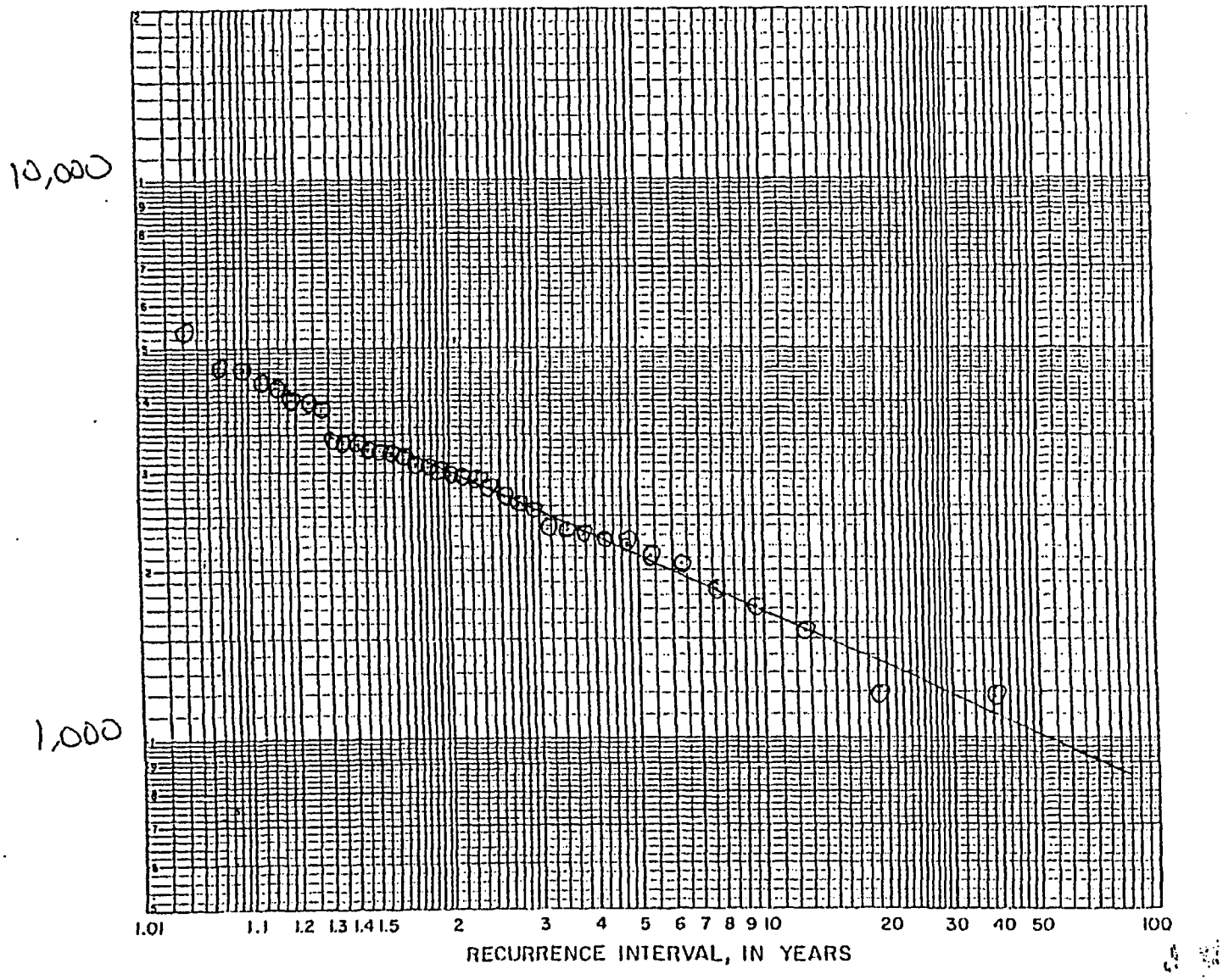


Mitchell Dam

use 1500 cfs



Jordan Dam Use 1700 cfs



Moorer, Tom C.

From: Dykes, William C.
Sent: Monday, November 13, 2006 4:25 PM
To: Moorer, Tom C.
Cc: Stover, Charles M.; Graham, Stacey A.
Subject: RE: Hydro Budget Average Flows at Mitchell and Jordan
Attachments: USGS November 28 2001 Letter on 7Q10 on the Coosa River.pdf

Tom,

Attached are 7Q10 determinations for APC's reservoirs on the Coosa River. These 7Q10 flows were determined by the USGS in 2001. For Mitchell and Jordan, the 7Q10 flows are 1,500 cfs and 1,700 cfs respectively.

From the 2006 Hydro Budget, the 2005 average flow at Mitchell is 13,914 cfs (88% of average) and the 2005 average flow at Jordan/Bouldin is 13,941 cfs (92% of average). The actual flows recorded in 2005 at both Mitchell and Jordan/Bouldin are within a ¼ of a percentage point when compared with 2006 Hydro Budget flow values for 2005.

Bill Dykes
Southern Company Generation
Hydro Services
Ph: (205) 257-3585
SoLINC Local: (205) 438-8072
SoLINC Toll Free: (888) 325-1593
SoLINC Radio: 10*10018

From: Moorer, Tom C.
Sent: Monday, November 13, 2006 2:58 PM
To: Dykes, William C.
Cc: Stover, Charles M.; Graham, Stacey A.
Subject: RE: Hydro Budget Average Flows at Mitchell and Jordan

Thanks, Bill. This is exactly what I needed. Do we have a 7Q10 or other statistical measurement offlow available? Also, how does the 2005 average compare with other water years? Is it a high, low, or average year?

TCM

From: Dykes, William C.
Sent: Monday, November 13, 2006 2:52 PM
To: Moorer, Tom C.
Cc: Stover, Charles M.; Graham, Stacey A.
Subject: Hydro Budget Average Flows at Mitchell and Jordan

Tom,

From Reservoir Management's 2006 Hydro Budget, the average daily flows are as follows:

Mitchell	15,733 cfs

Jordan/Bouldin 16,386 cfs

Jordan 6,538 cfs
Bouldin 9,848 cfs

Please call or email if wish to discuss or need further information.

Take care,

Bill Dykes
Southern Company Generation
Hydro Services
Ph: (205) 257-3585
SoLINC Local: (205) 438-8072
SoLINC Toll Free: (888) 325-1593
SoLINC Radio: 10*10018