

APPENDIX B

IHA and RVA Output in $\text{ft}^3 \text{ sec}^{-1}$ (CFS) for 11 stations along the Missouri and lower Yellowstone
rivers

Understanding IHA Output

(Adapted from: Nature Conservancy 1997)

The IHA Parameters

The principal result of an IHA analysis is a set of 32 parameters that are calculated for each year (see Table 2). The IHA software computes values of these parameters for both annual and multi-year (e.g., pre- and post-regulation) periods. The results of these computations are organized for display purposes into five statistical groups.

Group 1 is the monthly average values (either means or medians).

Group 2 is the maximum and minimum values for 1- to 90-day averages. There are 10 of these parameters: 1-day minimum and 1-day maximum are the 1-day extreme values; 3-day minimum and 3-day maximum are the extreme 3-day averages; 7-, 30-, and 90-day minimum/maximum, similarly, are the extrema of the data when smoothed with 7-day, 30-day, and 90-day averaging windows.

Group 3 is the Julian Dates (day of year) of the 1-day minimum and maximum values for the complete year (JD 1-366) and for the March-October growing season (JD 122–305).

Group 4 counts “pulses” in the water conditions. These are defined as periods when the water conditions are greater than the default or user-defined high pulse (flood) level, or less than the low pulse level (also default or user-defined). There are four parameters: the number of high and low pulses during the year, and their average duration. See text for how high and low pulses were determined.

Group 5 parameters describe the rises, falls, and reversals in water conditions. There are three of these parameters: the average rate at which flow rises, the average rate of fall, and the number of times the hydrograph switched from a rising to a falling condition or vice versa. This latter parameter is called the “number of reversals.”

The output of the IHA included here for each Missouri and lower Yellowstone river station consists of four files: 1) IHA Parametric Scorecard; 2) Non-parametric IHA Scorecard; 3) IHA Percentile Data, IHA Parametric RVA Scorecard; and 4) IHA Non-parametric RVA Scorecard. Flows are reported in these files as $\text{ft}^3 \text{ sec}^{-1}$ (CFS), not $\text{m}^3 \text{ sec}^{-1}$ (CMS) as in text and Appendix A tables.

1. The Parametric IHA Scorecard

This is the primary summary document for an IHA analysis. The header panel contains a number of parameters that apply only to the period of analysis as a whole. These are

- Watershed Area
- Mean Annual Flow
- $(\text{Mean Flow}) / (\text{Watershed Area})$
- Annual Coefficient of Variation
- Flow Predictability
- Flow Constancy
- $(\text{Flow Constancy}) / (\text{Flow Predictability})$
- Flow Contingency

These are modeled after the suite of flow parameters described by Poff and Ward (1989).

For each IHA parameter, and for both the pre- and post-regulation periods, the mean and standard deviation of annual values is calculated. The rest of the table is then organized as follows:

Columns 1 and 2 are the means for each period

Columns 3 and 4 are the coefficients of variation, defined as (standard deviation) / mean

Column 5 gives the magnitude of the change in mean values for the pre- to the post-regulation period

Column 6 expresses this change as a percentage

Columns 7 and 8 give the magnitude and percentage change in the coefficients of variation

For each IHA statistics group, the absolute values of the percentage deviation in mean and coefficient of variation are averaged. These means are shown at the bottoms of the respective column, and offer an at-a-glance summary of the impact on each parameter group.

2. The Non-parametric IHA Scorecard

This is an alternative calculation of the IHA scorecard, using non-parametric statistics based on percentile distributions of the data. The IHA parameters are first calculated for each year. Then, for the ensemble of years in the pre- and post-regulation periods, the 10th, 25th, 50th, 75th, and 90th percentiles (%ile) are calculated for each IHA parameter.

The header panel, containing the period of record parameters, is identical to that in the Parametric IHA Scorecard described above. Then

Columns 1 and 2 display the median (i.e., the 50th%ile) for each of the two periods

Columns 3 and 4 display the coefficient of dispersion (CD) for each period. This is defined as $= (75\text{th}\%ile - 25\text{th}\%ile) / 50\text{th}\%ile$

Columns 5 and 6 show the deviation of the post-regulation period from the pre-regulation. This is defined as Deviation Factor $= [(Post\text{-regulation value}) - (Pre\text{-regulation value})] / (Pre\text{-regulation value})$. This deviation is shown both for the median and for the coefficient of dispersion.

Columns 7 and 8 calculate a “significance count” for the deviation values. To calculate this, the software program randomly shuffled all years of input data and recalculated (fictitious) pre- and post-regulation medians and CDS 1000 times. The significance count reported in this table is the fraction of trials for which the deviations between the medians or CDs were less than that for the real case: i.e., if the real case produces the largest deviation of all the trials, the significance count = 1.0. If the real case deviation is greater than only 30% of the randomized trials, the significance count = 0.30.

3. Percentile Statistics

This table shows the details of the percentile statistics.

The first five columns show the 10th, 25th, 50th, 75th, and 90th percentile values for the pre-regulation period. The sixth column portrays the value of the coefficient of dispersion, calculated as $(75\text{th}\%ile - 25\text{th}\%ile) / 50\text{th}\%ile$.

The last 6 columns give the analogous values for the post-regulation period.

4. The RVA Scorecard

This scorecard can be calculated using either Parametric or Non-parametric statistics. It omits the period of record parameters, and gives the following information on each of the IHA parameters:

Columns 1-4 give the mean, standard deviation, and low and high extreme values for each parameter during the pre-regulation period

Columns 5-8 give the same information for the post-regulation period

Columns 9-10 give the low and high RVA target values. These are the mean, plus or minus one standard deviation (or the 25th and 75th percentile values). If the target falls outside the range of the pre-regulation data, it is replaced by the pre-regulation range limit.

Column 11 gives the Rate of Non-attainment; that is, the percentage of post-regulation years in which each parameter falls outside the RVA target window.

IHA Output - Missouri and Lower Yellowstone Rivers

Fort Benton, Montana
Least-impacted Section

Report Station ID: **3336FB**
USGS Station Number: 06090800

Missing Years: None

IIA Parametric Scorecard

FORT BENTON, MONTANA

Pre-impact period: 1929-1948 (20 years) Post-impact period: 1967-1996 (30 years)

Watershed Area		24749.00			
Parameter	Group #1	Pre	Post	COEFF. of VAR.	DEVIATION FACTOR
		Mean	Post	Pre	Post
October	4282.1	5898.6	.24	.26	1616.5
November	4342.9	6240.5	.23	.25	1897.6
December	4224.1	6332.9	.25	.19	2108.8
January	4006.3	6748.5	.23	.16	2742.3
February	4039.3	6917.2	.24	.18	2877.9
March	5147.0	7263.6	.23	.26	2116.6
April	7518.9	8160.5	.44	.30	641.7
May	10637.4	12644.4	.43	.40	2007.0
June	14886.5	14931.4	.59	.52	45.0
July	6085.5	9528.6	.55	.49	3443.1
August	3641.8	6271.0	.28	.26	2629.2
September	3763.3	5848.9	.24	.29	2085.6
Mean % change				43.7	16.6
Parameter	Group #2	Pre	Post	COEFF. of VAR.	DEVIATION FACTOR
		Mean	Post	Pre	Post
1-day minimum	2157.1	3398.7	.43	.25	1241.6
3-day minimum	2569.7	3855.1	.34	.20	1285.4
7-day minimum	2926.2	4295.5	.31	.21	1369.2
30-day minimum	3124.0	4695.2	.26	.21	1571.2
90-day minimum	3535.2	5119.0	.25	.21	1583.8
1-day maximum	21760.0	22664.0	.49	.51	904.0
3-day maximum	21178.0	21838.2	.50	.49	660.2
7-day maximum	20444.4	20531.3	.51	.47	86.9
30-day maximum	16578.9	17306.9	.52	.45	728.1
90-day maximum	11563.1	13135.1	.46	.38	1572.1
Mean % change				25.9	20.5

THA Parametric Scorecard, continued
 FORT BENTON, MONTANA

Pre-impact period: 1929-1948 (20 years) Post-impact period: 1967-1996 (30 years)

	MEAN		COEFF. OF VAR.		DEVIATION FACTOR		DEV. OF C.V.	
	Pre	Post	Pre	Post	Magnitude	%	Magnitude	%
Parameter Group #3								
Date of minimum JD 1-366,	197.8	300.5	.36	.18	102.7	56.1	-.18	-49.8
Date of maximum JD 1-366,	154.6	177.6	.05	.15	23.0	12.6	.10	180.7
Mean % change					34.3		115.3	
WARNING: dates of minimum flow are widely distributed throughout the year. Use statistics with caution.								
WARNING: dates of maximum flow are widely distributed throughout the year. Use statistics with caution.								
Date of minimum JD 122-305,	243.1	259.0	.07	.11	15.9	8.7	.04	52.7
Date of maximum JD 122-305,	158.1	156.2	.04	.05	1.9	1.0	.02	51.3
Mean % change					4.9		52.0	
Parameter Group #4								
Low pulse count	15.7	.8	.93	1.60	-14.9	-95.1	.67	71.9
Low pulse duration	3.0	.6	.86	1.43	-2.5	-80.7	.57	67.2
High pulse count	1.0	1.3	1.22	1.04	.2	20.6	-.18	-14.8
High pulse duration	6.8	10.1	1.26	1.27	3.3	48.6	.01	.6
Mean % change					61.3		38.6	
The low pulse threshold is 3156.00								
The high pulse level is 19320.00								
Parameter Group #5								
Rise rate	553.4	473.1	.22	.30	-80.3	-14.5	.08	37.5
Fall rate	-536.0	-442.5	-.22	-.30	93.5	-17.4	-.08	35.0
Number of reversals	172.8	162.5	.14	.11	-10.3	-6.0	-.03	-21.5
Mean % change					12.6		31.4	

Non-Parametric IHA Scorecard

FORT BENTON, MONTANA

Pre-impact period: 1929-1948 (20 years) Post-impact period: 1967-1996 (30 years)

		MEDIAN		COEFF. of VAR.	DEVIATION FACTOR	SIGNIFICANCE	COUNT	
	Parameter	Group #1	Pre	Post	Medians	C.V.	Medians	C.V.
Watershed area			24749.00					
Mean annual flow	Mean flow/area	6184.57	.25					
Annual C. V.			.21					
Flow predictability	Flow constancy		.68					
Flow constancy	Constancy/Predictability		.54					
Constancy/Predictability	Flow contingency		.80					
			.14					
October	Parameter	Group #1	5387.7	.34	.49	.46	.00	.32
November			3971.0	.38	.38	.02	.00	.97
December			4531.0	.39	.20	.50	.00	.20
January			6086.7	.41	.16	.77	.00	.11
February			6503.5	.41	.16	.61		
March			7103.5	.40	.28	.72	.29	.00
April			7126.1	.29	.34	.45	.18	.00
May			7248.7	.87	.40	.21	.54	.15
June			6306.7	.87	.46	.21	.04	.03
July			7641.7	.45	.86	.37	.17	.18
August			9717.1	.45	.86	.10	.00	.73
September			11782.6	.03	.92	.63	.00	.06
			10992.0	1.03	.86	.85	.51	.77
			15053.3					
4510.6	Parameter	Group #2	9264.5	.84	.92	1.05	.10	.62
3416.8			6309.0	.27	.44	.85	.57	
3682.0			5559.3	.33	.37	.51	.15	
1-day minimum	Parameter	Group #2	3310.0	.70	.36	.69	.48	.23
3-day minimum			1960.0					
7-day minimum			2436.7	.36	.32	.50	.12	.74
30-day minimum			3656.7					
90-day minimum			2855.7	.43	.39	.41	.08	.81
1-day maximum			4034.3					
3-day maximum			2964.3	.34	.33	.51	.05	.90
7-day maximum			4478.7					
30-day maximum			3293.3	.47	.34	.43	.27	.52
90-day maximum			4719.3					
1-day maximum			17600.0	.69	.55	.30	.20	.60
3-day maximum			22900.0					
7-day maximum			17033.3	.68	.57	.30	.16	.70
30-day maximum			22133.3					
90-day maximum			16228.6	.82	.59	.27	.28	.44
			20557.1					
13100.0			17440.0	.73	.65	.33	.11	.77
9552.0			13868.0	.56	.57	.45	.02	.94

Non-Parametric IHA Scorecard, continued

FORT BENTON, MONTANA

Pre-impact period: 1929-1948 (20 years) Post-impact period: 1967-1996 (30 years)

	MEDIAN		COEFF.		DEVIATION		SIGNIFICANCE	COUNT
	Pre	Post	Pre	Post	Medians	C.V.	Medians	C.V.

Parameter Group #3

Date of minimum JD 1-366, 225.0	288.0	.36	.26	.34	.27	.69	.25
Date of maximum JD 1-366, 161.0	166.0	.04	.08	.03	.94	.30	.07

WARNING: dates of minimum flow are widely distributed throughout the year. Use statistics with caution.

WARNING: dates of maximum flow are widely distributed throughout the year. Use statistics with caution.

Date of minimum JD 122-305, 246.0	271.0	.08	.13	.14	.48	.02	.14
Date of maximum JD 122-305, 161.0	160.0	.04	.09	.01	1.43	.89	.02

Parameter Group #4

Low pulse count	9.0	8.0	1.44	.88	.11	.39	.57
Low pulse duration	13.5	3.1	1.28	3.22	.77	1.52	.05
High pulse count	3.0	6.0	.67	.83	1.00	.25	.65
High pulse duration	16.0	12.6	.58	.97	.21	.68	.34

The low pulse threshold is 3156.00

The high pulse level is 19320.00

Parameter Group #5

Rise rate	532.4	430.9	.27	.47	.19	.74	.14	.07
Fall rate	-498.8	-428.5	-.30	-.40	.14	.33	.07	.46
Number of reversals	173.0	159.0	.17	.14	.08	.14	.06	.70

IHA Percentile Data
FORT BENTON, MONTANA

Pre-impact period: 1929-1948 (20 years)						Post-impact period: 1967-1996 (30 years)							
		10%	25%	50%	75%	90%	(75-25)/50	10%	25%	50%	75%	90%	(75-25)/50
Parameter	Group #1	2995.16	3530.65	3970.97	4871.61	5744.19	.34	3977.74	4535.81	5387.74	7199.03	7853.55	.49
October		2921.33	3378.67	4531.00	5089.33	5387.00	.38	4012.00	4976.33	6086.67	7312.33	7510.33	.38
November		2929.68	3163.55	4402.26	4901.61	5345.48	.39	4410.32	5728.06	6503.55	7017.74	7431.61	.20
December		2669.35	3062.90	4015.16	4696.77	5059.35	.41	4904.52	6198.39	7103.55	7329.03	7733.87	.16
January		2593.10	3032.76	4151.43	4687.14	5236.43	.40	5091.07	5703.45	7126.07	7716.90	8289.29	.28
February		3452.26	4237.10	4988.06	5662.26	6251.94	.29	4653.55	5587.74	7248.71	8023.55	10243.23	.34
March		4339.67	4604.00	6306.67	10072.33	12273.33	.87	4850.33	6506.33	7641.67	9580.33	11038.33	.40
April		4481.29	7185.16	9717.10	11510.32	14894.52	.45	5978.84	9850.00	11782.58	15287.10	19503.23	.46
May		5413.33	7949.33	10992.00	19320.00	23530.00	1.03	4588.33	7353.33	15053.33	20233.33	24566.67	.86
June		2691.29	3392.90	4510.65	7160.65	11888.39	.84	3975.48	4576.13	9264.52	13105.48	15155.16	.92
July		2626.45	3156.45	3416.77	4078.71	4684.19	.27	3994.19	4581.94	6309.03	7364.84	7961.94	.44
August		2839.67	3119.33	3682.00	4321.67	5026.33	.33	3939.67	4474.33	5559.33	6557.00	7826.00	.37
September													
Parameter	Group #2	830.00	1420.00	1960.00	2790.00	3440.00	.70	2230.00	2800.00	3310.00	4000.00	4380.00	.36
1-day minimum		1193.33	2086.67	2436.67	2963.33	3736.67	.36	2800.00	3346.67	3656.67	4500.00	4926.67	.32
3-day minimum		1337.14	2245.71	3465.71	4020.00	4295.71	.43	2975.71	3557.14	4034.29	5134.29	5544.86	.39
7-day minimum		1691.93	2538.00	2964.33	3557.67	4195.67	.34	3600.67	3867.00	4478.74	5330.67	5889.33	.33
30-day minimum		2395.94	2892.89	3293.33	4431.00	4708.56	.47	3874.67	4233.00	4719.33	5850.89	6761.89	.34
90-day minimum		9090.00	14500.00	17600.00	26600.00	31400.00	.69	9140.00	14800.00	22900.00	27400.00	31100.00	.55
1-day maximum		8966.67	14433.33	17033.33	25966.67	31000.00	.68	8280.00	14366.67	22133.33	27000.00	29800.00	.57
3-day maximum		8465.71	12428.57	16228.57	25685.71	30714.29	.82	7608.57	13400.00	20557.14	25528.57	28928.57	.59
7-day maximum		6644.33	10448.00	13100.00	19966.67	26366.67	.73	6635.67	10816.33	17440.00	22146.67	25720.00	.65
30-day maximum		5616.56	7486.78	9552.00	12853.89	18086.11	.56	6426.00	8617.56	13868.00	16540.22	17985.89	.57
Date of minimum JD 1-366, 16.00		26.00	225.00	262.00	359.00	.36	196.00	260.00	288.00	355.00	7.00	.26	
Date of maximum JD 1-366, 109.00		150.00	161.00	165.00	168.00	.04	130.00	145.00	166.00	176.00	276.00	.08	
Date of minimum JD 122-305, 206.00		225.00	246.00	256.00	270.00	.08	196.00	242.00	271.00	288.00	300.00	.13	
Date of maximum JD 122-305, 129.00		152.00	161.00	166.00	168.00	.04	127.00	137.00	160.00	171.00	176.00	.09	
Parameter Group #3													
Low pulse count	Group #4	3.00	7.00	9.00	20.00	21.00	1.44	3.00	6.00	8.00	13.00	16.00	.88
Low pulse duration		5.95	8.74	13.50	26.00	38.00	1.28	1.27	1.64	3.14	11.78	14.43	3.22
High pulse count		1.00	2.00	3.00	4.00	7.00	.67	1.00	3.00	6.00	8.00	13.00	.83
High pulse duration		3.50	9.43	16.00	18.67	47.50	.58	1.00	7.90	12.60	20.13	27.75	.97
Rise rate	Parameter Group #5	380.51	474.36	532.40	617.15	699.94	.27	319.29	364.17	430.86	565.30	656.43	.47
Fall rate		-749.20	-632.57	-498.79	-483.37	-383.73	-.30	-692.08	-500.00	-428.51	-329.72	-314.67	-.40
Number of reversals		126.00	160.00	173.00	189.00	198.00	.17	139.00	152.00	159.00	175.00	182.00	.14

IHA Parametric RVA Scorecard
 FORT BENTON, MONTANA

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA Targets				Rate of Non-Attainment	
		Std.	Range Limits			Std.	Range Limits			Low	High		
		Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High		
Parameter Group #1													
October	4282.1	.2	2782.3	6676.5	5898.6	.3	3586.1	8865.5	3238.3	5326.0	53.3%		
November	4342.9	.2	2826.0	5943.7	6240.5	.3	3673.7	10185.3	3364.0	5321.7	66.7%		
December	4224.1	.2	2446.1	6318.7	6332.9	.2	3728.7	9645.8	3168.8	5279.4	83.3%		
January	4006.3	.2	2376.9	6748.5	6748.5	.2	4407.4	8199.4	3074.5	4938.1	90.0%		
February	4039.3	.2	2492.1	5478.6	6917.2	.2	4669.7	9208.3	3074.9	5003.6	96.7%		
March	5147.0	.2	2986.1	8076.1	7263.6	.3	4405.2	11014.5	3946.7	6347.4	66.7%		
April	7518.9	.4	4126.3	14810.0	8160.5	.3	4180.0	13791.3	4231.4	10806.3	16.7%		
May	10637.4	.4	4143.9	21880.6	12644.4	.4	4612.3	25432.3	6029.5	15245.4	36.7%		
June	14886.5	.6	4591.7	36690.0	14931.4	.5	4055.3	30266.7	6068.6	23704.3	33.3%		
July	6085.5	.6	2663.9	12367.7	9528.6	.5	3674.8	23170.6	2736.5	9434.5	46.7%		
August	3641.8	.3	1576.5	6279.0	6271.0	.3	3782.6	10551.0	2635.0	4648.7	73.3%		
September	3763.3	.2	1890.0	5398.3	5848.9	.3	3678.3	10239.7	2878.0	4648.6	66.7%		
Parameter Group #2													
1-day minimum	2157.1	.4	627.0	3680.0	3398.7	.2	1720.0	5070.0	1235.3	3078.9	66.7%		
3-day minimum	2569.7	.3	985.0	4266.7	3855.1	.2	2566.7	5230.0	1683.5	3455.9	66.7%		
7-day minimum	2926.2	.3	1193.6	4422.9	4295.5	.2	2790.0	5767.1	2021.8	3830.7	60.0%		
30-day minimum	3124.0	.3	1574.3	4555.3	4695.2	.2	3518.0	7005.0	2304.6	3943.4	66.7%		
90-day minimum	3535.2	.2	1947.9	5032.9	5119.0	.2	3638.6	7312.4	2660.7	4409.7	63.3%		
1-day maximum	21760.0	.5	6110.0	51300.0	22664.0	.5	7220.0	58600.0	11121.3	32398.7	30.0%		
3-day maximum	21178.0	.5	5660.0	49966.7	21838.2	.5	6483.3	52133.3	10658.1	31697.9	30.0%		
7-day maximum	20444.4	.5	5021.4	47985.7	20531.3	.5	6174.3	45257.1	10077.7	30811.0	30.0%		
30-day maximum	16578.9	.5	4680.7	38530.0	17306.9	.5	5593.3	34046.7	7977.6	25180.1	30.0%		
90-day maximum	11563.1	.5	4501.0	25006.9	13135.1	.4	5145.6	25642.2	6210.3	16915.8	30.0%		

IHA Parametric RVA Scorecard, continued
FORT BENTON, MONTANA

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA Targets				Rate of Non-Attainment	
Std.		Range Limits		Std.		Range Limits		Low		High			
Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High	Low	High		
Parameter Group #3													
Date of minimum JD 1-366,	197.8	.4	1.0	361.0	300.5	.2	7.0	364.0	127.4	268.2	73.3%		
Date of maximum JD 1-366,	154.6	.1	104.0	173.0	177.6	.1	117.0	340.0	146.3	162.8	86.7%		
WARNING: dates of minimum flow are widely distributed throughout the year. Use statistics with caution.													
WARNING: dates of maximum flow are widely distributed throughout the year. Use statistics with caution.													
Date of minimum JD 122-305,	243.1	.1	187.0	305.0	259.0	.1	125.0	305.0	225.3	260.8	73.3%		
Date of maximum JD 122-305,	158.1	.0	126.0	173.0	156.2	.1	124.0	194.0	152.6	163.7	83.3%		
Parameter Group #4													
Low pulse count	15.7	.9	.0	43.0	.8	1.6	.0	4.0	1.1	30.3	80.0%		
Low pulse duration	3.0	.9	.0	8.2	.6	1.4	.0	2.3	.4	5.7	63.3%		
High pulse count	1.0	1.2	.0	4.0	1.3	1.0	.0	4.0	.0	2.3	16.7%		
High pulse duration	6.8	1.3	.0	24.0	10.1	1.3	.0	43.0	.0	15.4	30.0%		
The low pulse threshold is				3156.00									
The high pulse threshold is				19320.00									
Parameter Group #5													
Rise rate	553.4	.2	312.5	813.6	473.1	-.3	196.4	769.5	430.8	676.0	56.7%		
Fall rate	-536.0	-.2	-756.8	.0	-442.5	-.3	-701.6	.0	-656.2	-415.8	56.7%		
Number of reversals	172.8	.1	114.0	216.0	162.5	.1	124.0	206.0	148.1	197.5	23.3%		

Note: Parameter numbers 14 and 16 use the 25th percentile level for RVA targets instead of -1SD.

IHA Non-Parametric RVA Scorecard

FORT BENTON, MONTANA

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA Targets				Rate of Non-Attainment	
		Range Limits		Range Limits									
	Means	Var.	Low	High	Means	Var.	Low	High	Low	High	Low	High	
Parameter Group #1													
October	3971.0	.3	2782.3	6676.5	5387.7	.5	3586.1	8865.5	3530.6	4871.6	66.7%		
November	4531.0	.4	2826.0	5943.7	6086.7	.4	3673.7	10185.3	3378.7	5089.3	70.0%		
December	4402.3	.4	2446.1	6318.7	6503.5	.2	3728.7	9645.8	3163.5	4901.6	86.7%		
January	4015.2	.4	2376.9	5386.1	7103.5	.2	4407.4	8199.4	3062.9	4696.8	93.3%		
February	4151.4	.4	2492.1	5478.6	7126.1	.3	4669.7	9208.3	3032.8	4687.1	96.7%		
March	4988.1	.3	2986.1	8076.1	7248.7	.3	4405.2	11014.5	4237.1	5662.3	73.3%		
April	6306.7	.9	4126.3	14810.0	7641.7	.4	4180.0	13791.3	4604.0	10072.3	16.7%		
May	9717.1	.4	4143.9	21880.6	11782.6	.5	4612.3	25432.3	7185.2	11510.3	76.7%		
June	10992.0	1.0	4591.7	36690.0	15053.3	.9	4055.3	30266.7	7949.3	19320.0	60.0%		
July	4510.6	.8	2663.9	9264.5	12367.7	.9	3674.8	23170.6	3392.9	7160.6	63.3%		
August	3416.8	.3	1576.5	6279.0	6309.0	.4	3782.6	10551.0	3156.5	4078.7	90.0%		
September	3682.0	.3	1890.0	5398.3	5559.3	.4	3678.3	10239.7	3119.7	4321.7	83.3%		
Parameter Group #2													
1-day minimum	1960.0	.7	627.0	3680.0	3310.0	.4	1720.0	5070.0	1420.0	2790.0	76.7%		
3-day minimum	2436.7	.4	985.0	4266.7	3656.7	.3	2566.7	5230.0	2086.7	2963.3	86.7%		
7-day minimum	2855.7	.4	1193.6	4422.9	4034.3	.4	2790.0	5767.1	2245.7	3465.7	86.7%		
30-day minimum	2964.3	.3	1574.3	4555.3	4478.7	.3	3518.0	7005.0	2538.0	3557.7	93.3%		
90-day minimum	3293.3	.5	1947.9	5032.9	4719.3	.3	3638.6	7312.4	2892.9	4431.0	63.3%		
1-day maximum	17600.0	.7	6110.0	51300.0	22900.0	.6	7220.0	58600.0	14500.0	26600.0	53.3%		
3-day maximum	17033.3	.7	5660.0	49966.7	22133.3	.6	6483.3	52133.3	14433.3	25966.7	60.0%		
7-day maximum	16228.6	.8	5021.4	47985.7	20557.1	.6	6174.3	45257.1	12428.6	25685.7	46.7%		
30-day maximum	13100.0	.7	4680.7	38530.0	17440.0	.6	5593.3	34046.7	10448.0	19966.7	60.0%		
90-day maximum	9552.0	.6	4501.0	25006.9	13868.0	.6	5145.6	25642.2	7486.8	12853.9	73.3%		

III Non-Parametric RVA Scorecard, continued

FOBT BENTON MONTANA

Pre-impact Period: 1929-1948				Post-impact period: 1957-1996				RVA Targets		Rate of Non-Attainment
Parameter Group #3		Range Limits		Range Limits						
Means	Var.	Low	High	Means	Var.	Low	High	Low	High	
Date of minimum JD 1-366, 225.0	.4	1.0	361.0	288.0	.3	7.0	364.0	26.0	262.0	70.0%
Date of maximum JD 1-366, 161.0	.0	104.0	173.0	166.0	.1	117.0	340.0	150.0	166.0	76.7%
WARNING: dates of minimum flow are widely distributed throughout the year. Use statistics with caution.										
WARNING: dates of maximum flow are widely distributed throughout the year. Use statistics with caution.										
Date of minimum JD 122-305, 246.0	.1	187.0	305.0	271.0	.1	125.0	305.0	225.0	256.0	80.0%
Date of maximum JD 122-305, 161.0	.0	126.0	173.0	160.0	.1	124.0	194.0	152.0	166.0	80.0%
Parameter Group #4										
Low Pulse Count	9.0	1.4	3.0	31.0	8.0	.9	1.0	18.0	7.0	20.0
Low Pulse Duration	13.5	1.3	2.0	53.8	3.1	3.2	1.0	47.0	8.7	26.0
High Pulse Count	3.0	.7	.0	9.0	6.0	.8	.0	16.0	2.0	70.0%
High Pulse Duration	16.0	.6	.0	113.0	12.6	1.0	.0	48.3	9.4	80.0%
The low pulse threshold is 3156.00										
The high pulse level is 19320.00										
Parameter Group #5										
Rise rate	532.4	.3	312.5	813.6	430.9	.5	196.4	769.5	474.4	617.2
Fall rate	-498.8	-.3	-756.8	.0	-428.5	-.4	-701.6	.0	0	-483.4
Number of reversals	173.0	.2	114.0	216.0	159.0	.1	124.0	206.0	160.0	189.0

IHA Output - Missouri and Lower Yellowstone Rivers

Wolf Point, Montana
Inter-reservoir Section

Report Station ID: 2738WP
USGS Station Number: 06177000

Missing Years: None

THA Parametric Scorecard

WOLF POINT, MONTANA

Pre-impact period: 1929-1948 (20 years)

	Post-impact period: 1967-1996 (30 years)	
Watershed Area	82290.00	10596.31
Mean Annual Flow	7485.74	.13
Mean Flow/Area	.09	.38
Annual C. V.	.85	.68
Flow Predictability	.44	.63
Flow Constancy	.35	.93
Constancy/Predictability	.80	.05
Flow Contingency	.09	

MEAN COEFF. OF VAR.

	Pre	Post	Pre	Post	Magnitude	%	Magnitude	%	DEVIATION FACTOR	DEV. OF C.V.
Parameter Group #1										
October	7768.7	8892.2	.82	.40	1123.6	14.5	-42	-51.0		
November	570.7	9163.5	.66	.37	3392.8	58.8	-29	-43.8		
December	4266.4	10210.9	.81	.15	5944.5	139.3	-66	-81.6		
January	3779.0	11730.2	.66	.16	7951.3	210.4	-50	-75.1		
February	3410.6	12596.7	.73	.20	9186.1	269.3	-53	-72.2		
March	6828.6	10916.5	.63	.27	4087.8	59.9	-36	-56.8		
April	8768.6	10212.2	.55	.48	1443.6	16.5	-07	-12.8		
May	8498.6	10534.6	.69	.40	2036.0	24.0	-29	-41.8		
June	10332.5	11150.9	.73	.42	818.4	7.9	-31	-42.5		
July	7846.8	11381.4	.71	.47	3534.6	45.0	-23	-33.0		
August	10169.4	10721.9	.69	.30	552.4	5.4	-39	-56.2		
September	9518.7	9750.4	.82	.35	231.7	2.4	-47	-57.4		
Mean % change					71.1		52.0			

Mean |%| change

	Parameter Group #2									
1-day minimum	1420.4	5398.0	.56	.33	3977.6	280.0	-23	-40.8		
3-day minimum	1501.9	5581.8	.52	.33	4079.9	271.6	-19	-36.8		
7-day minimum	1638.1	5751.6	.48	.33	4113.5	251.1	-15	-30.6		
30-day minimum	2202.3	6186.8	.49	.35	3984.4	180.9	-14	-29.0		
90-day minimum	2575.1	7473.4	.47	.31	4898.4	190.2	-15	-33.2		
1-day maximum	25615.0	18113.7	.39	.35	-7501.3	-29.3	-04	-9.5		
3-day maximum	23933.3	17609.7	.33	.36	-6323.7	-26.4	-02	-7.0		
7-day maximum	22621.4	17132.7	.33	.36	-5488.7	-24.3	-03	9.1		
30-day maximum	18538.6	15626.6	.30	.37	-2912.1	-15.7	-07	22.6		
90-day maximum	14838.9	13800.6	.32	.29	-1038.4	-7.0	-03	-8.4		
Mean % change							128.1	25.9		

IHA Parametric Scorecard, continued
 WOLF POINT, MONTANA

Pre-impact period: 1929-1948 (20 years) Post-impact period: 1967-1996 (30 years)

	MEAN		COEFF. OF VAR.		DEVIATION FACTOR		DEV. OF C.V.	
	Pre	Post	Pre	Post	Magnitude	%	Magnitude	%
Parameter Group #3								
Date of minimum JD 1-366,	348.4	245.8	.14	.29	102.6	56.0	.15	109.5
Date of maximum JD 1-366,	173.1	122.3	.18	.18	50.8	27.8	.00	1.5
Mean % change					41.9		55.5	
Parameter Group #4								
Low pulse count	3.2	.0	1.32	.00	-3.2	-100.0	-1.32	-100.0
Low pulse duration	4.4	.0	1.96	.00	-4.4	-100.0	-1.96	-100.0
High pulse count	4.5	7.0	.51	.93	2.5	54.8	.42	83.6
High pulse duration	12.0	7.9	.63	1.09	-4.0	-33.6	.47	74.7
Mean % change					72.1		89.6	
The low pulse threshold is 1195.00 The high pulse level is 13850.00								
Parameter Group #5								
Rise rate	703.1	431.0	.39	.30	-272.1	-38.7	-.09	-22.9
Fall rate	-583.6	-425.2	-.32	-.32	158.4	-27.1	.00	-.7
Number of reversals	101.7	153.7	.22	.17	52.0	51.2	-.05	-22.1
Mean % change					39.0		15.2	

Non-Parametric IHA Scorecard

WOLF POINT, MONTANA

Pre-impact period: 1929-1948 (20 years)

Watershed area	82290.00
Mean annual flow	7485.74
Mean flow/area	.09
Annual C. V.	.76
Flow predictability	.44
Flow constancy	.35
Constancy/predictability	.80
Flow contingency	.09

Post-impact period: 1967-1996 (30 years)

Parameter	Group #1	MEDIANs		COEFF. of VAR. Pre	COEFF. of VAR. Post	DEVIATION FACTOR Medians	C.V.	SIGNIFICANCE COUNT Medians	C.V.
		Pre	Post						
October	4715.5	8345.8	1.62	.81	.77	.50	.01	.18	
November	4368.7	8384.0	.77	.56	.92	.27	.00	.39	
December	3231.0	10674.2	.88	.17	2.30	.81	.00	.06	
January	3203.2	12341.9	1.12	.18	2.85	.84	.00	.03	
February	2820.7	13142.9	1.11	.21	3.66	.81	.00	.08	
March	5546.8	10525.8	.93	.42	.90	.55	.00	.17	
April	8634.3	7593.3	.77	.99	.12	.28	.33	.81	
May	7035.8	9141.3	1.66	.73	.30	.56	.33	.12	
June	9896.0	9311.3	1.15	.60	.06	.48	.80	.12	
July	5966.8	9807.4	.98	.47	.64	.52	.00	.25	
August	7103.5	10407.4	1.54	.49	.47	.68	.00	.04	
September	4492.3	8979.0	2.50	.63	1.00	.75	.00	.04	
Parameter	Group #2								
1-day minimum	1120.0	5260.0	.88	.44	3.70	.50	.00	.25	
3-day minimum	1173.3	5353.3	.91	.42	3.56	.54	.00	.22	
7-day minimum	1245.7	5560.0	.91	.43	3.46	.53	.00	.22	
30-day minimum	2134.0	5685.7	.90	.54	1.76	.39	.00	.36	
90-day minimum	2718.3	7132.9	.79	.38	1.62	.53	.00	.13	
1-day maximum	22000.0	16000.0	.42	.40	.27	.05	.02	.94	
3-day maximum	21233.3	15666.7	.44	.39	.26	.12	.02	.78	
7-day maximum	20571.4	14828.6	.45	.33	.28	.27	.01	.47	
30-day maximum	17776.7	14010.0	.46	.27	.21	.40	.01	.31	
90-day maximum	14310.7	13153.3	.38	.27	.08	.30	.40	.51	

Non-Parametric IHA Scorecard, continued

WOLF POINT, MONTANA

Pre-impact period: 1929-1948 (20 years)				Post-impact period: 1967-1996 (30 years)			
MEDIAN		COEFF.	DEVIATION	SIGNIFICANCE		COUNT	
Pre	Post	of VAR.	Medians	C.V.	Medians	C.V.	
Parameter Group #3							
Date of minimum JD 1-366,	345.0	.276.0	.10	.48	.38	.06	.00
Date of maximum JD 1-366,	166.0	110.0	.34	.30	.31	-.10	.06
							.78
Date of minimum JD 122-305,	223.0	263.0	.27	.40	.22	.49	.48
Date of maximum JD 122-305,	173.0	183.0	.20	.12	.05	-.38	.08
							.39
Parameter Group #4							
Low pulse count	5.0	3.0	.40	2.33	.40	4.83	.08
Low pulse duration	35.6	10.1	.85	1.16	.72	.38	.00
							.50
High pulse count	4.0	6.0	1.00	1.50	.50	.50	.10
High pulse duration	12.3	6.4	.81	2.17	.48	1.68	.24
The low pulse threshold is	1195.00						.04
The high pulse level is	13850.00						

Parameter Group #5			
Rise rate	591.2	408.9	.56
Fall rate	-551.5	-444.5	-.31
Number of reversals	106.0	157.0	.33

THA Percentile Data
WOLF POINT, MONTANA

Pre-impact period: 1929-1948 (20 years)										Post-impact period: 1967-1996 (30 years)									
		10%	25%	50%	Pre-Impact	75%	90%	(75-25)/50	10%	25%	50%	Post-Impact	75%	90%	(75-25)/50				
	Parameter Group #1																		
October	3096.13	3610.65	4715.48	11266.13	15115.16	1.62	4032.90	5611.94	8345.81	12406.13	13411.61	.81							
November	2136.33	3077.00	4368.67	6423.67	12075.67	.77	7959.33	7158.67	8384.00	11830.00	11420.00	.56							
December	1216.26	1511.29	3230.55	4367.74	9093.55	.88	7580.00	9509.68	10674.19	11291.29	11877.42	.17							
January	995.16	1416.13	3203.23	5013.55	5348.39	1.12	8096.77	10870.97	12341.94	13074.97	13635.48	.18							
February	1063.57	1194.64	2820.69	4333.57	5375.00	1.11	7606.90	11514.29	13142.86	14253.57	15357.14	.21							
March	2415.16	3298.39	5546.77	8478.39	10971.61	.93	7020.65	8513.81	10525.81	12954.84	14107.10	.42							
April	2001.33	3831.67	9634.33	10503.33	16255.00	.77	6113.00	6805.33	7593.33	14290.00	15970.00	.99							
May	1296.45	2126.45	7035.81	13805.16	15841.94	1.66	6278.06	6933.55	9141.29	13639.35	16312.90	.73							
June	1618.67	2510.33	9896.00	13849.67	21923.33	1.15	6611.00	7537.00	9311.33	13080.00	16223.33	.60							
July	2256.45	3813.87	5966.77	9678.71	12313.55	.98	7308.06	8511.61	9807.42	13141.94	14596.77	.47							
August	3079.03	3763.55	7103.55	14729.03	16897.74	1.54	7537.10	8043.55	10407.42	13164.52	14225.81	.49							
September	3133.67	3730.00	4492.33	14980.00	18603.33	2.50	5395.33	7241.00	8979.00	12896.67	14176.67	.63							
	Parameter Group #2																		
1-day minimum	501.00	800.00	1120.00	1790.00	2300.00	.88	2970.00	4170.00	5260.00	6500.00	8230.00	.44							
3-day minimum	564.00	880.00	1173.33	1943.33	2300.00	.91	2983.33	4353.33	5353.33	6586.67	8413.33	.42							
7-day minimum	905.71	937.14	1245.71	2071.43	2585.71	.91	3072.86	4334.29	5560.00	6708.57	8517.14	.43							
30-day minimum	990.67	1097.33	2134.00	3011.67	3284.67	.90	3130.33	4331.33	5885.67	7536.00	8379.67	.54							
90-day minimum	1113.56	1202.41	2718.33	3356.77	4093.33	.79	4655.22	5769.89	7132.89	8451.67	11017.67	.38							
1-year maximum	15100.00	18900.00	22000.00	28200.00	33900.00	.42	12300.00	14000.00	16000.00	20400.00	21900.00	.40							
1-day maximum	14800.00	18600.00	21233.33	27900.00	33300.00	.44	12000.00	13900.00	15666.67	19933.33	21866.67	.39							
3-day maximum	14485.71	16642.86	20571.43	25871.43	30457.14	.45	11414.29	13771.43	14828.57	18600.00	21000.00	.33							
7-day maximum	10472.00	14420.00	17776.67	22533.33	26276.67	.46	9688.67	12856.67	14010.00	16693.33	18180.00	.27							
30-day maximum	8181.67	11169.22	14310.67	16562.22	18564.45	.38	8782.78	11821.11	13153.33	15310.00	15905.56	.27							
	Parameter Group #3																		
Date of minimum JD 1-366,	290.00	331.00	345.00	366.00	26.00	.10	98.00	125.00	276.00	314.00	352.00	.48							
Date of maximum JD 1-366,	84.00	103.00	166.00	226.00	241.00	.34	44.00	54.00	110.00	165.00	197.00	.30							
	Parameter Group #4																		
Low pulse count	2.00	4.00	5.00	6.00	9.00	.40	.00	2.00	3.00	9.00	12.00	2.33							
Low pulse duration	12.20	17.17	35.60	47.25	76.00	.85	.00	5.50	10.07	17.22	21.14	1.16							
High pulse count	1.00	3.00	4.00	7.00	9.00	1.00	.00	3.00	6.00	12.00	14.00	1.50							
High pulse duration	3.50	6.00	12.33	16.00	22.00	.81	.00	2.86	6.40	16.75	27.00	2.17							
	Parameter Group #5																		
Rise rate	385.63	494.62	591.16	827.38	991.45	.56	244.60	340.43	408.87	550.26	618.87	.51							
Fall rate	-969.49	-641.26	-551.46	-468.49	-446.23	-.31	-622.32	-543.27	-444.45	-301.62	-257.68	-.54							
Number of reversals	63.00	83.00	106.00	118.00	127.00	.33	115.00	141.00	157.00	172.00	183.00	.20							

IHA Parametric RVA Scorecard

WOLF POINT, MONTANA

Pre-impact period: 1929-1948 Std.				Post-impact period: 1967-1996 Std.				RVA Targets				Rate of Non-Attainment	
				Range Limits		Range Limits							
		Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High		
Parameter Group #1													
October	7768.7	.8	1148.7	25493.5	8892.2	.4	3150.6	14729.0	1409.8	14127.6	6.7%		
November	5770.7	.7	1176.7	9163.5	.4	3133.3	14903.3	1948.2	9593.2	40.0%			
December	4266.4	.8	1144.8	13416.1	10210.9	.1	7001.0	11985.8	1511.3	7737.7	90.0%		
January	3779.0	.7	914.0	10620.6	11730.2	.2	7641.3	14274.2	1286.9	6271.1	100.0%		
February	3410.6	.7	1049.6	10483.9	12596.7	.2	7045.7	15824.1	1194.6	5891.6	100.0%		
March	6828.6	.6	2301.0	17084.2	10916.5	.3	5469.7	16754.8	2527.5	11129.7	46.7%		
April	8768.6	.5	1470.3	17527.3	10212.2	.5	5679.7	26080.0	3959.4	13577.7	30.0%		
May	8498.6	.7	1182.3	16722.6	10534.6	.4	5670.6	21800.0	2671.4	14325.7	20.0%		
June	10332.5	.7	1268.0	25920.0	11150.9	.4	6348.7	26036.7	2768.8	17896.1	6.7%		
July	7846.8	.7	1170.9	23716.1	11381.4	.5	6845.2	36267.7	2297.0	13396.6	20.0%		
August	10169.4	.7	2396.8	26264.5	10721.9	.3	5826.5	20751.6	3202.3	17136.6	3.3%		
September	9518.7	.8	2300.3	26300.0	9750.4	.3	3273.7	15490.0	3730.0	17284.2	3.3%		
Parameter Group #2													
1-day minimum	1420.4	.6	320.0	3500.0	5398.0	.3	2800.0	9000.0	631.8	2209.1	100.0%		
3-day minimum	1501.9	.5	356.7	3500.0	5581.8	.3	2883.3	9266.7	720.3	2283.6	100.0%		
7-day minimum	1638.1	.5	592.0	3585.7	5751.6	.3	2974.3	9871.4	855.9	2420.4	100.0%		
20-day minimum	2202.3	.5	794.5	4199.3	6186.8	.3	3080.0	11625.3	1119.6	3285.1	90.0%		
90-day minimum	2575.1	.5	1091.7	4805.6	7473.4	.3	3139.4	12726.8	1377.1	3773.1	96.7%		
1-day maximum	25615.0	.4	14000.0	56700.0	18113.7	.4	9110.0	38200.0	15578.9	35651.1	46.7%		
3-day maximum	23933.3	.3	1233.3	45433.3	17609.7	.4	8723.3	37300.0	15957.9	31908.8	60.0%		
7-day maximum	22621.4	.3	10714.3	41514.3	17132.7	.4	8452.9	37157.1	15157.8	30085.1	56.7%		
30-day maximum	18538.6	.3	7540.0	26380.0	15626.6	.4	8318.7	36386.7	13013.7	24063.6	33.3%		
90-day maximum	14838.9	.3	7201.7	25481.1	13800.6	.3	7840.6	28972.2	10082.9	19595.0	20.0%		

IHA Parametric RVA Scorecard, continued

WOLF POINT, MONTANA

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA TARGETS			RATE OF NON-ATTAINMENT	
Std.		Range Limits		Std.		Range Limits		Low	High			
Means	Dev.	Low	High	Means	Dev.	Low	High					
Parameter Group #3												
Date of minimum JD 1-366,	.1	5.0	366.0	245.8	.3	8.0	352.0	300.7	366.0	76.7%		
Date of maximum JD 1-366,	.2	80.0	287.0	122.3	.2	22.0	283.0	141.6	204.7	70.0%		
Date of minimum JD 122-305,	.2	123.0	302.0	227.4	.2	122.0	303.0	181.9	247.2	86.7%		
Date of maximum JD 122-305,	.1	131.0	290.0	189.8	.1	122.0	303.0	172.9	225.9	56.7%		
Parameter Group #4												
Low pulse count	3.2	1.3	0	12.0	0	0	0	0	0	7.4	.0%	
Low pulse duration	4.4	2.0	0	37.5	0	0	0	0	0	12.9	.0%	
High pulse count	4.5	.5	1.0	8.0	7.0	.9	0	25.0	2.2	6.8	80.0%	
High pulse duration	12.0	.6	1.0	27.5	7.9	1.1	0	36.0	4.5	19.4	56.7%	
The low pulse threshold is			1195.00									
The high pulse threshold is			13850.00									
Parameter Group #5												
Rise rate	703.1	.4	332.7	1382.2	431.0	.3	228.7	633.7	426.1	980.0	53.3%	
Fall rate	-583.6	-.3	-1017.8	.0	-425.2	-.3	-646.2	0	-770.3	-396.9	43.3%	
Number of reversals	101.7	.2	61.0	130.0	153.7	.2	106.0	206.0	79.6	123.8	80.0%	

Note: Parameter numbers 3, 5, 12, 13, 15, 16, 21, 23 and 24 use the 25th percentile level for RVA targets instead of -1SD
 Parameter number 22 uses the 75th percentile level for RVA targets instead of +1SD

IHA Non-Parametric RVA Scorecard

WOLF POINT, MONTANA

Pre-impact period: 1929-1948

Post-impact period: 1967-1996
Range Limits

	Means	Var.	Low	High	Means	Var.	Low	High	RVATARGETS	RATE OF NON-ATTAINMENT
Parameter Group #1										
October	4715.5	1.6	1148.7	25493.5	8345.8	.8	3150.6	14729.0	3610.6	11266.1
November	4368.7	.8	1176.7	14280.0	8384.0	.6	3133.3	14903.3	3077.0	6423.7
December	3231.0	.9	1144.8	13416.1	10674.2	.2	7001.0	11985.8	1511.3	4367.7
January	3203.2	1.1	914.0	10620.6	12341.9	.2	7641.3	14274.2	1416.1	5013.5
February	2820.7	1.1	1049.6	10483.9	13142.9	.2	7045.7	15824.1	1194.6	4333.6
March	5546.8	.9	2301.0	17084.2	10525.8	.4	5469.7	16754.8	3298.4	8478.4
April	8634.3	.8	1470.3	17527.3	7593.3	1.0	5679.7	26080.0	3831.7	10503.3
May	7035.8	1.7	1182.3	16722.6	9141.3	.7	5670.6	21800.0	2126.5	13805.2
June	9896.0	1.1	1268.0	25920.0	9311.3	.6	6348.7	26036.7	2510.3	13849.7
July	5966.8	1.0	1170.9	23716.1	9807.4	.5	6845.2	36267.7	3813.9	9678.7
August	7103.5	1.5	2396.8	26264.5	10407.4	.5	5826.5	20751.6	3763.5	14729.0
September	4492.3	2.5	2300.3	26300.0	8979.0	.6	3273.7	15490.0	3730.0	14980.0

Parameter Group #2

1-day minimum	1120.0	.9	320.0	3500.0	5260.0	.4	2800.0	9000.0	800.0	1790.0
3-day minimum	1173.3	.9	356.7	3500.0	5353.3	.4	2883.3	9266.7	880.0	1943.3
7-day minimum	1245.7	.9	592.0	5585.7	5560.0	.4	2974.3	9871.4	937.1	2071.4
30-day minimum	2134.0	.9	794.5	4199.3	5885.7	.5	3080.0	11625.3	1097.3	3011.7
90-day minimum	2718.3	.8	1091.7	4805.6	7132.9	.4	3139.4	12726.8	1202.4	3356.8
1-day maximum	22000.0	.4	14000.0	56700.0	16000.0	.4	9110.0	38200.0	18900.0	28200.0
3-day maximum	21233.3	.4	12833.3	45433.3	15666.7	.4	8723.3	37300.0	18600.0	27900.0
7-day maximum	20571.4	.4	10714.3	41514.3	14828.6	.3	8452.9	37157.1	16642.9	25871.4
30-day maximum	17776.7	.5	7540.0	26380.0	14010.0	.3	8318.7	36386.7	14420.0	22533.3
90-day maximum	14310.7	.4	7201.7	25481.1	13153.3	.3	7840.6	28972.2	11169.2	16562.2

IHA Non-Parametric RVA Scorecard, continued

WOLF POINT, MONTANA

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA TARGETS		RATE OF NON-ATTAINMENT	
		Range Limits		Range Limits				Low	High	Low	High
Means	Var.	Low	High	Means	Var.	Low	High				
Parameter Group #3											
Date of minimum JD 1-366,	.1	5.0	366.0	276.0	.5	8.0	352.0	89.0	345.0	10.0%	
Date of maximum JD 1-366,	.3	80.0	287.0	110.0	.3	22.0	283.0	103.0	226.0	43.3%	
Date of minimum JD 122-305,	.3	123.0	302.0	263.0	.4	122.0	303.0	155.0	253.0	83.3%	
Date of maximum JD 122-305,	.2	131.0	290.0	183.0	.1	122.0	303.0	162.0	235.0	46.7%	
Parameter Group #4											
Low Pulse Count	.4	1.0	12.0	3.0	.3	.0	17.0	4.0	6.0	90.0%	
Low Pulse Duration	.8	11.3	263.0	10.1	1.2	.0	47.5	17.2	47.3	76.7%	
High Pulse Count	1.0	1.0	11.0	6.0	1.5	.0	23.0	3.0	7.0	63.3%	
High Pulse Duration	.8	1.0	31.0	6.4	2.2	.0	52.7	6.0	16.0	73.3%	
The low pulse threshold is		1195.00									
The high pulse level is		13850.00									
Parameter Group #5											
Rise rate	591.2	.6	332.7	1382.2	408.9	.5	228.7	633.7	494.6	827.4	70.0%
Fall rate	-551.5	-.3	-1017.8	.0	-444.5	-.5	-646.2	.0	0	-468.5	100.0%
Number of reversals	106.0	.3	61.0	130.0	157.0	.2	106.0	206.0	83.0	118.0	90.0%

IHA Output - Missouri and Lower Yellowstone Rivers

Sidney, Montana
Least-impacted Section, Yellowstone River

Report Station ID: **2592SN**
USGS Station Number: 06329500

Missing Years: 1932-1933

IHA Parametric Scorecard

L. YELLOWSTONE RIVER AT SIDNEY, MONTANA

Pre-impact period: 1929-1948 (18 years)			Post-impact period: 1967-1996 (30 years)		
Watershed Area	Mean Annual Flow		MEAN	COEFF. OF VAR.	DEVIATION FACTOR
	Mean Flow/Area		Pre	Post	Magnitude %
Mean Annual Flow	69103.00				
Mean Flow/Area	11743.12				
Annual C. V.	.17				
Flow Predictability	1.07				
Flow Constancy	.59				
Constancy/Predictability	.37				
Flow Contingency	.62				
	.22				
Parameter Group #1					
October	7597.4	8823.3	.34	.28	1225.9
November	6626.2	8177.7	.23	.25	1551.6
December	4782.8	6965.7	.27	.18	2182.9
January	4169.9	6828.6	.26	.20	2658.7
February	5421.4	8083.4	.55	.32	2662.0
March	11180.4	11621.4	.45	.46	441.0
April	9299.3	9715.6	.38	.29	416.3
May	16938.2	18446.4	.28	.30	1508.1
June	38490.9	34811.4	.33	.36	-3679.4
July	20737.0	22236.5	.56	.53	1499.5
August	7145.5	8373.5	.47	.42	1228.0
September	6005.6	7697.2	.57	.35	1691.6
Mean % change					23.1
Parameter Group #2					
1-day minimum	1543.0	3197.3	.35	.42	1654.3
3-day minimum	1661.5	3350.4	.34	.41	1689.0
7-day minimum	1931.3	3700.2	.33	.37	1768.9
30-day minimum	3134.4	5085.5	.28	.29	1951.2
90-day minimum	4222.7	6234.8	.22	.24	2012.1
1-day maximum	62494.4	53826.7	.36	.34	-8667.8
3-day maximum	57935.2	51312.2	.34	.33	-6623.0
7-day maximum	51807.9	47004.3	.34	.33	-4803.6
30-day maximum	40681.9	37723.1	.35	.36	-2958.8
90-day maximum	25932.7	25828.1	.33	.33	-104.5
Mean % change					18.9

9.4

47.9

IHA Parametric Scorecard, continued

L. YELLOWSTONE RIVER AT SIDNEY, MONTANA

Pre-impact period: 1929-1948 (18 years)

Post-impact period: 1967-1996 (30 years)

MEAN COEFF. OF VAR.

Pre Post Pre Post

Parameter Group #3

Date of minimum JD 1-366,	342.6	49.5	.14	.27	72.9	39.8	.13	92.4
Date of maximum JD 1-366,	154.4	161.4	.07	.09	7.0	3.8	.01	17.1

Mean |%| change

Date of minimum JD 122-305,	247.4	238.8	.05	.10	8.6	4.7	.05	90.9
Date of maximum JD 122-305,	164.4	169.6	.03	.04	5.1	2.8	.01	20.8

Mean |%| change

Parameter Group #4

Low pulse count	4.4	1.8	.59	1.13	-2.7	-60.3	.54	91.7
Low pulse duration	12.3	3.8	.81	.95	-8.5	-69.1	.13	16.4
High pulse count	2.1	1.4	.87	1.22	-.7	-35.3	.35	40.0
High pulse duration	3.7	5.7	.84	1.53	2.0	54.2	.69	81.8

Mean |%| change

The low pulse threshold is 3710.00
The high pulse level is 46470.00

Parameter Group #5

Rise rate	1578.9	1052.5	.50	.32	-526.4	-33.3	-.18	-35.4
Fall rate	-1139.0	-753.0	-.45	-.27	386.0	-33.9	-.18	-39.5
Number of reversals	89.6	86.1	.16	.12	-3.4	-3.8	-.04	-26.5

Mean |%| change

Post-impact period: 1967-1996 (30 years)

DEVIATION FACTOR

DEV. of C.V.

Magnitude % Magnitude %

Non-Parametric IHA Scorecard

L. YELLOWSTONE RIVER AT SIDNEY, MONTANA

Pre-impact period: 1929-1948 (18 years)

	Watershed area	Median	COEFF. of VAR.	DEVIATION FACTOR	SIGNIFICANCE	COUNT
	Pre	Post	Pre	Post	Medians	C.V.
Mean annual flow	69103.00	9448.4	.54	.40	.35	.26
Mean flow/area	111743.12	.33	.41	.26	.25	.03
Annual C. V.	.17	.44	.44	.28	.70	.18
Flow predictability	.44	.59	.49	.23	.49	.33
Flow Constancy	.59	.37	.31	.23	.49	.64
Constancy/predictability	.59	.62	.62	.47	.47	.47
Flow Contingency	.22	.22	.22	.17	.74	.17

Post-impact period: 1967-1996 (30 years)

	Parameter Group #1	Median	COEFF. of VAR.	DEVIATION FACTOR	SIGNIFICANCE	COUNT
	Pre	Post	Pre	Post	Medians	C.V.
October	7019.0	9448.4	.54	.40	.35	.26
November	6522.7	8208.3	.33	.41	.26	.25
December	4235.5	7213.9	.49	.28	.70	.44
January	4398.7	6548.4	.31	.23	.49	.25
February	4508.6	7566.8	.37	.43	.68	.17
March	11082.3	9764.5	.68	.64	.12	.06
April	7216.7	8942.0	.66	.47	.24	.28
May	15695.5	17373.9	.41	.40	.11	.04
June	39810.0	33440.0	.47	.70	.16	.50
July	21138.7	19641.9	.99	.78	.07	.21
August	6394.5	7471.6	.79	.65	.17	.19
September	5392.7	7669.0	.87	.53	.42	.39
					.01	.51
	Parameter Group #2	Median	COEFF. of VAR.	DEVIATION FACTOR	SIGNIFICANCE	COUNT
	Pre	Post	Pre	Post	Medians	C.V.
1-day minimum	1400.0	3160.0	.36	.54	1.26	.48
3-day minimum	1466.7	3333.3	.50	.49	1.27	.01
7-day minimum	1711.4	3457.1	.40	.47	1.02	.18
30-day minimum	3370.0	5100.0	.35	.34	.51	.02
90-day minimum	4069.1	6017.8	.44	.33	.48	.26
1-day maximum	62500.0	55000.0	.56	.42	.12	.25
3-day maximum	58833.3	52100.0	.53	.45	.11	.15
7-day maximum	55528.6	42914.3	.55	.58	.23	.05
30-day maximum	39810.0	34953.3	.56	.72	.12	.29
90-day maximum	25525.3	25970.0	.53	.53	.02	.00

Non-Parametric IHA Scorecard, continued

L. YELLOWSTONE RIVER AT SIDNEY, MONTANA

Pre-impact period: 1929-1948 (18 years)

Post-impact period: 1967-1996 (30 years)

	MEDIAN		COEFF. of VAR.		DEVIATION FACTOR		SIGNIFICANCE	COUNT
	Pre	Post	Pre	Post	Medians	C.V.	Medians	C.V.
Parameter Group #3								
Date of minimum JD 1-3666,	355.0	4.0	.08	.20	.08	1.59	.43	.18
Date of maximum JD 1-3666,	159.0	167.0	.04	.03	.04	.15	.01	.76
Date of minimum JD 122-305,	248.0	243.0	.04	.05	.03	.25	.58	.81
Date of maximum JD 122-305,	161.0	167.0	.03	.04	.03	.08	.06	1.54

Parameter Group #4

Low pulse count	6.0	5.0	.50	1.00	.17	1.00	.44	.13
Low pulse duration	19.5	10.7	.75	.75	.45	.00	.01	.99
High pulse count	4.0	4.0	.75	1.00	.00	.33	.45	.40
High pulse duration	17.0	21.0	.88	.89	.24	.02	.24	.97
The low pulse threshold is	3710.00							
The high pulse level is	46470.00							

Parameter Group #5

Rise rate	1327.0	1024.3	.66	.46	.23	.31	.02	.50
Fall rate	-1015.7	-745.6	-.46	-.37	.27	.19	.00	.68
Number of reversals	87.0	86.0	.28	.12	.01	.58	.60	.19

IHA Percentile Data
L. YELLOWSTONE RIVER AT SIDNEY, MONTANA

	Pre-impact period: 1929-1948 (18 years)				Post-impact period: 1967-1996 (30 years)								
	10%	25%	50%	75%	90%	(75-25)/50	10%	25%	50%	Post-Impact	75%	90%	(75-25)/50
Parameter Group #1													
October	4784.19	5385.48	7019.03	9179.03	10091.94	.54	5839.03	6723.87	9448.39	10522.90	11170.97	.40	
November	4516.00	5506.33	6522.67	7659.67	8114.33	.33	4747.67	6634.67	8208.33	10027.33	10676.67	.41	
December	3132.90	3710.32	4235.48	5801.94	6097.10	.49	5022.90	5858.06	7213.87	7845.16	82258.06	.28	
January	2187.74	3477.42	4398.71	4822.16	4886.13	.31	5083.87	6006.45	6548.39	7500.00	8538.71	.23	
February	2853.21	3836.90	4508.62	5489.64	6031.03	.37	5810.71	6500.00	7566.79	9739.29	10428.57	.43	
March	5248.39	5881.34	11082.26	13395.68	18370.97	.68	6095.81	8051.61	9764.52	14259.35	18996.77	.64	
April	5911.33	6801.67	7216.67	11574.00	12348.33	.66	6066.00	7677.67	8942.00	11913.67	13326.00	.47	
May	12519.03	12934.19	15695.48	19429.03	22554.84	.41	11651.94	14744.84	17373.87	21661.29	23670.97	.40	
June	26186.67	27830.00	39810.00	46470.00	57700.00	.47	16270.00	24100.00	33440.00	47586.67	49710.00	.70	
July	4737.42	10171.61	21138.71	31064.52	32877.42	.99	5726.77	14015.81	19641.94	29383.87	36532.26	.78	
August	2604.52	4679.68	6394.52	9756.45	10582.90	.79	3709.03	5909.68	7471.61	10740.00	13470.97	.65	
September	2719.33	3344.00	5392.67	8017.33	8963.33	.87	3747.33	5659.33	7669.00	9720.33	12096.00	.53	
Parameter Group #2													
1-day minimum	868.00	1190.00	1400.00	1700.00	2000.00	.36	1400.00	2300.00	3160.00	4000.00	5000.00	.54	
3-day minimum	1032.67	1273.33	1466.67	2000.00	2143.33	.50	1500.00	2400.00	3333.33	4033.33	5600.00	.49	
7-day minimum	1244.00	1454.29	1711.43	2134.29	2801.43	.40	1685.71	2757.14	3457.14	4380.00	5771.43	.47	
30-day minimum	1727.00	2641.67	3370.00	3810.00	4126.67	.35	3176.67	4334.67	5100.00	6063.33	7120.00	.34	
90-day minimum	2758.57	3307.90	4069.11	5094.89	5224.33	.44	4172.22	5333.89	6017.78	7301.11	8072.22	.33	
1-day maximum	36500.00	44900.00	62500.00	79800.00	85800.00	.56	28700.00	39300.00	55000.00	62200.00	75700.00	.42	
3-day maximum	35566.67	44100.00	58833.33	75100.00	82133.34	.53	26766.67	38000.00	52100.00	61400.00	74300.00	.45	
7-day maximum	32571.43	36785.71	55528.57	67185.71	72842.86	.55	25157.14	34414.29	42914.29	59142.86	70071.43	.58	
30-day maximum	26186.67	28993.33	39810.00	51116.67	58463.33	.56	17693.33	25286.67	34953.33	52716.67	72166.67	.72	
90-day maximum	16532.78	18991.11	25525.33	32480.11	34347.67	.53	12194.22	18881.11	25970.00	32645.55	34051.11	.53	
Parameter Group #3													
Date of minimum JD 1-366,	343.00	355.00	6.00	12.00	.08	331.00	360.00	4.00	69.00	11.00	233.00	.20	
Date of maximum JD 1-366,	157.00	159.00	170.00	171.00	.04	82.00	164.00	167.00	175.00	181.00	181.00	.03	
Date of minimum JD 122-305,	238.00	248.00	254.00	266.00	.04	220.00	233.00	243.00	253.00	271.00	271.00	.05	
Date of maximum JD 122-305,	159.00	161.00	171.00	179.00	.03	152.00	164.00	167.00	177.00	182.00	182.00	.04	
Parameter Group #4													
Low pulse count	4.00	5.00	6.00	8.00	.50	3.00	4.00	5.00	9.00	11.00	11.00	1.00	
Low pulse duration	11.10	14.00	19.50	28.57	.75	4.33	8.20	10.67	16.20	19.30	19.30	.75	
High pulse count	2.00	3.00	4.00	6.00	.75	1.00	2.00	4.00	6.00	7.00	7.00	1.00	
High pulse duration	8.89	14.38	17.00	29.25	.88	13.17	16.75	21.00	35.50	49.50	49.50	.89	
Parameter Group #5													
Rise rate	668.12	1015.54	1326.96	1895.17	2765.83	.66	702.10	808.87	1024.33	1275.31	1405.30	.46	
Fall rate	-2147.33	-1291.29	-1015.73	-825.38	-777.59	-.46	-983.47	-856.07	-745.60	-578.39	-520.67	-.37	
Number of reversals	71.00	80.00	87.00	104.00	106.00	.28	70.00	81.00	86.00	91.00	97.00	.12	

IHA Parametric RVA Scorecard

I. YELLOWSTONE RIVER AT SIDNEY, MONTANA

Pre-impact period: 1929-1948 Std.				Range Limits				Post-impact period: 1967-1996 Std.				RVA Targets				Rate of Non- Attainment	
	Means	Dev.	Low	High	Means	Dev.	Low	High	Means	Dev.	Low	High	Targets	Actual		%	
Parameter Group #1																	
October	7597.4	.3	4209.7	14464.5	8823.3	.3	4353.5	15407.1	5048.1	10146.8	33.3%						
November	6626.2	.2	4195.3	9697.7	8177.7	.3	3974.0	11440.7	5085.3	8167.0	63.3%						
December	4782.8	.3	3089.0	7551.9	6965.7	.2	4451.6	9593.5	3491.1	6074.5	73.3%						
January	4169.9	.3	2086.7	6409.7	6828.6	.2	4183.9	9674.2	3079.6	5260.2	86.7%						
February	5421.4	.6	2702.4	14252.9	8083.4	.3	4182.1	17750.0	3836.9	8410.7	33.3%						
March	11180.4	.5	5211.9	21235.5	11621.4	.5	5840.0	25980.6	6100.7	16260.2	30.0%						
April	9299.3	.4	5458.0	18360.0	9715.6	.3	4234.0	14933.3	5778.9	12819.8	23.3%						
May	16938.2	.3	9759.7	28425.8	18446.4	.3	10405.8	34600.0	12272.1	21604.4	43.3%						
June	38490.9	.3	12232.0	58260.0	34811.4	.4	14445.3	56540.0	25859.9	51121.9	36.7%						
July	20737.0	.6	36822.9	46412.9	22236.5	.5	4807.4	49709.7	9053.2	32420.8	33.3%						
August	7145.5	.5	2510.0	14108.4	8373.5	.4	1604.5	16245.2	3787.0	10503.9	40.0%						
September	6005.6	.6	2389.0	16000.0	7697.2	.4	3313.7	12924.7	2599.7	9411.6	26.7%						
Parameter Group #2																	
1-day minimum	1543.0	.3	860.0	2940.0	3197.3	.4	800.0	6500.0	1003.4	2082.6	80.0%						
3-day minimum	1661.5	.3	1007.0	3046.7	3350.4	.4	933.3	6693.3	1103.7	2219.2	83.3%						
7-day minimum	1931.3	.3	1095.7	3260.0	3700.2	.4	1497.1	6771.4	1286.4	2576.2	83.3%						
30-day minimum	3134.4	.3	1681.0	4342.3	5085.5	.3	1598.3	7566.7	2268.6	4000.2	80.0%						
90-day minimum	4222.7	.2	2744.6	5669.8	6234.8	.2	2855.3	8903.3	3280.2	5165.3	83.3%						
1-day maximum	62494.4	.4	17100.0	99000.0	53826.7	.3	22100.0	104000.0	39780.1	85208.8	30.0%						
3-day maximum	57935.2	.3	16466.7	87000.0	51312.2	.3	21133.3	91900.0	38214.5	77655.9	30.0%						
7-day maximum	51807.9	.3	1534.3	79514.3	47004.3	.3	20128.6	72614.3	34046.8	69569.1	36.7%						
30-day maximum	40681.9	.3	12740.0	66586.7	37723.1	.4	16636.7	65966.7	26512.4	54851.3	36.7%						
90-day maximum	25932.7	.3	10817.7	41712.2	25828.1	.3	11793.8	41837.8	17465.9	34399.5	26.7%						

IHA Parametric RVA Scorecard, continued

L. YELLOWSTONE RIVER AT SIDNEY, MONTANA

Pre-impact period: 1929-1948 Std.				Post-impact period: 1967-1996 Range Limits Std.				RVA TARGETS Range Limits				RATE OF NON- ATTAINMENT	
Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High	Low	High		
Parameter Group #3													
Date of minimum JD 1-366,	.1	1.0	366.0	49.5	.3	2.0	361.0	294.9	6.0	100.0%			
342.6													
Date of maximum JD 1-366,	.1	83.0	181.0	161.4	.1	66.0	211.0	143.0	165.7	66.7%			
154.4													
Date of minimum JD 122-305,	.1	210.0	287.0	238.8	.1	122.0	305.0	234.6	260.3	40.0%			
247.4													
Date of maximum JD 122-305,	.0	133.0	181.0	169.6	.0	138.0	211.0	159.3	169.6	60.0%			
Parameter Group #4													
Low pulse count	.6	2.0	12.0	1.8	1.1	.0	8.0	3.0	7.1	80.0%			
4.4													
12.3	.8	2.5	46.5	3.8	.9	.0	13.4	8.0	22.2	90.0%			
Low pulse duration													
2.1	.9	0	5.0	1.4	1.2	0	8.0	.3	4.0	43.3%			
High pulse count													
3.7	.8	0	9.0	5.7	1.5	0	41.0	.6	6.8	70.0%			
High pulse duration													
The low pulse threshold is			3710.00										
The high pulse threshold is			46470.00										
Parameter Group #5													
Rise rate	.5	597.8	3311.3	1052.5	.3	495.2	2183.9	796.1	2361.8	23.3%			
1578.9													
Fall rate	-.4	-2325.4	.0	-753.0	-.3	-1283.4	.0	-1649.8	-628.1	30.0%			
Number of reversals	.2	66.0	114.0	86.1	.1	63.0	105.0	75.3	103.8	20.0%			
89.6													

Note: Parameter numbers 5, 13, 15 and 16 use the 25th percentile level for RVA targets instead of -1SD
 Parameter number 22 uses the 75th percentile level for RVA target instead of +1SD

IHA Non-Parametric RVA Scorecard

L. YELLOWSTONE RIVER AT SIDNEY, MONTANA

Pre-impact period: 1929-1948			Range Limits			Post-impact period: 1967-1996 Range Limits			RVA Targets			Rate of Non- Attainment	
	Means	Var.	Low	High	Means	Var.	Low	High	Low	High			
Parameter Group #1													
October	7019.0	.5	4209.7	14464.5	9448.4	.4	4353.5	15407.1	5385.5	9179.0	56.7%		
November	6522.7	.3	4195.3	9697.7	8208.3	.4	3974.0	11440.7	5506.3	7659.7	73.3%		
December	4235.5	.5	3089.0	7551.9	7213.9	.3	4451.6	9593.5	3710.3	5801.9	76.7%		
January	4398.7	.3	2086.7	6409.7	6548.4	.2	4183.9	9674.2	3477.4	4822.3	96.7%		
February	4508.6	.4	2702.4	14252.9	7566.8	.4	4182.1	17750.0	3836.9	5489.6	93.3%		
March	11082.3	.7	5211.9	21235.5	9764.5	.6	5840.0	25980.6	5881.9	13395.5	30.0%		
April	7216.7	.7	5458.0	18360.0	8942.0	.5	4234.0	14933.3	6801.7	11574.0	36.7%		
May	15695.5	.4	9759.7	28425.8	17373.9	.4	10405.8	34600.0	12934.2	19429.0	53.3%		
June	39810.0	.5	12232.0	58260.0	33440.0	.7	14445.3	56540.0	27830.0	46470.0	63.3%		
July	21138.7	1.0	3682.9	46112.9	19641.9	.8	4807.4	49709.7	10171.6	31064.5	40.0%		
August	6394.5	.8	2510.0	14108.4	7471.6	.6	1604.5	16245.2	4679.7	9756.5	50.0%		
September	5392.7	.9	2389.0	16000.0	7669.0	.5	3313.7	12924.7	3344.0	8017.3	46.7%		
Parameter Group #2													
1-day minimum	1400.0	.4	860.0	2940.0	3160.0	.5	800.0	6500.0	1190.0	1700.0	93.3%		
3-day minimum	1466.7	.5	1007.0	3046.7	3333.3	.5	933.3	6693.3	1273.3	2000.0	90.0%		
7-day minimum	1711.4	.4	1095.7	3260.0	3457.1	.5	1497.1	6771.4	1454.3	2134.3	83.3%		
30-day minimum	3370.0	.3	1681.0	4342.3	5100.0	.3	1598.3	7566.7	2641.7	3810.0	86.7%		
90-day minimum	4069.1	.4	2744.6	5669.8	6017.8	.3	2855.3	8903.3	3307.9	5094.9	83.3%		
1-day maximum	62500.0	.6	17100.0	99000.0	55000.0	.4	22100.0	104000.0	44900.0	79800.0	36.7%		
3-day maximum	58833.3	.5	16466.7	87000.0	52100.0	.4	21133.3	91900.0	44100.0	75100.0	46.7%		
7-day maximum	55528.6	.5	15314.3	79514.3	42914.3	.6	20128.6	72614.3	36785.7	67185.7	43.3%		
30-day maximum	39810.0	.6	12740.0	66586.7	34953.3	.7	16636.7	65966.7	51116.7	53.3%			
90-day maximum	25525.3	.5	10817.7	41712.2	25970.0	.5	11793.8	41837.8	18991.1	32480.1	53.3%		

IHA Non-Parametric RVA Scorecard, continued

L. YELLOWSTONE RIVER AT SIDNEY, MONTANA

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA TARGETS		RATE OF NON-ATTAINMENT	
Means		Var.		Range Limits		Range Limits		Low	High	Low	High
Parameter Group #3											
Date of minimum JD 1-366,	355.0	.1	1.0	366.0	4.0	.2	2.0	361.0	14.0	353.0	43.3%
Date of maximum JD 1-366,	159.0	.0	83.0	181.0	167.0	.0	66.0	211.0	157.0	170.0	60.0%
Date of minimum JD 122-305,	248.0	.0	210.0	287.0	243.0	.1	122.0	305.0	238.0	254.0	56.7%
Date of maximum JD 122-305,	161.0	.0	133.0	181.0	167.0	.0	138.0	211.0	159.0	171.0	56.7%
Parameter Group #4											
Low Pulse Count	6.0	.5	4.0	10.0	5.0	1.0	1.0	12.0	5.0	8.0	56.7%
Low Pulse Duration	19.5	.7	10.4	39.0	10.7	.8	1.0	27.8	14.0	28.6	66.7%
High Pulse Count	4.0	.8	1.0	9.0	4.0	1.0	1.0	8.0	3.0	6.0	43.3%
High Pulse Duration	17.0	.9	5.8	66.0	21.0	.9	12.3	94.0	14.4	29.3	36.7%
The low pulse threshold is				3710.00							
The high pulse level is				46470.00							
Parameter Group #5											
Rise rate	1327.0	.7	597.8	3311.3	1024.3	.5	495.2	2183.9	1015.5	1895.2	50.0%
Fall rate	-1015.7	-.5	-2325.4	.0	-745.6	-.4	-1283.4	.0	.0	-825.4	100.0%
Number of reversals	87.0	.3	66.0	114.0	86.0	.1	63.0	105.0	80.0	104.0	20.0%

IHA Output - Missouri and Lower Yellowstone Rivers

Bismarck, North Dakota
Inter-reservoir Section

Report Station ID: 2115BM
USGS Station Number: 06342500

Missing Years: None

IHA Parametric Scorecard
 BISMARCK, NORTH DAKOTA

Pre-impact period: 1929-1948 (20 years)			Post-impact period: 1967-1996 (30 years)		
	MEAN	COEFF. of VAR.		DEVIATION FACTOR	DEV. of C.V.
	Pre	Post	Pre	Post	Magnitude %
Watershed Area	186400.00				
Mean Annual Flow	20616.87				
Mean Flow/Area	.11				
Annual C. V.	.89				
Flow Predictability	.58				
Flow Constancy	.39				
Constancy/Predictability	.68				
Flow Contingency	.19				
Parameter Group #1					
October	15733.0	21699.7	.48	.39	5966.6 37.9 -.09 -18.4
November	12590.5	22391.7	.40	.34	10101.1 80.2 -.06 -14.7
December	8324.7	23123.6	.40	.16	14798.9 177.8 -.24 -60.6
January	7933.5	25528.3	.38	.15	17894.7 225.6 -.23 -60.6
February	8612.4	28233.2	.38	.19	19620.8 227.8 -.19 -50.4
March	20882.6	24561.8	.43	.27	3679.2 17.6 -.16 -37.5
April	25673.9	22708.6	.49	.33	-2965.3 -11.5 -.16 -32.5
May	25417.7	23300.0	.36	.38	-1617.7 -6.4 .02 5.9
June	50876.7	25644.0	.30	.34	-25232.7 -49.6 .04 13.4
July	33126.4	27201.3	.42	.37	-5935.1 -17.9 -.05 -12.9
August	17991.9	27281.5	.47	.32	9289.6 51.6 -.15 -31.7
September	16413.3	233380.6	.53	.34	6967.4 42.4 -.19 -36.2
Mean % change				78.9	31.2
Parameter Group #2					
1-day minimum	4473.5	13191.0	.42	.28	8717.5 194.9 -.14 -32.7
3-day minimum	4552.5	13875.0	.41	.27	9322.5 204.8 -.14 -34.9
7-day minimum	4760.6	14380.5	.40	.27	9639.8 202.1 -.12 -31.3
30-day minimum	6079.9	15484.2	.30	.28	9404.3 154.7 -.01 -4.5
90-day minimum	7482.9	17396.2	.32	.27	10513.3 140.5 -.05 -16.0
1-day maximum	10715.0	37413.3	.60	.25	-70301.7 -65.3 -.36 -59.1
3-day maximum	93373.3	36660.0	.55	.25	-56513.3 -60.5 -.30 -55.4
7-day maximum	78529.3	36629.5	.45	.24	-42499.8 -54.1 -.20 -45.3
30-day maximum	55360.5	34351.9	.32	.26	-21008.6 -37.9 -.05 -16.9
90-day maximum	38477.4	31436.8	.27	.25	-7040.6 -18.3 -.02 -6.1
Mean % change					116.3 31.9

TIA Parametric Scorecard, continued

BISMARCK, NORTH DAKOTA

	MEAN		COEFF. OF VAR.		DEVIATION FACTOR		DEV. OF C.V.	
	Pre	Post	Pre	Post	Magnitude	%	Magnitude	%
Parameter Group #3								
Date of minimum JD 1-366,	1.1	223.3	.00	.25	143.8	78.6	.25	67706.6
Date of maximum JD 1-366,	133.9	100.7	.11	.23	33.2	18.1	.12	106.1
Mean % change					48.4			33906.3
Parameter Group #4								
Low pulse count	1.9	.0	.89	.00	-1.9	-100.0	-.89	-100.0
Low pulse duration	14.2	.0	1.36	.00	-14.2	-100.0	-1.36	-100.0
High pulse count	2.4	.0	.68	5.48	-2.4	-98.6	4.80	703.9
High pulse duration	4.9	1.5	.81	5.48	-3.4	-69.8	4.66	573.2
Mean % change					92.1			369.3

The low pulse threshold is 5681.00
 The high pulse level is 59597.00

	Parameter Group #5							
	Rise rate	Fall rate	Number of reversals					
Rise rate	2194.0	829.5	.38	.34	-1364.5	-62.2	-.03	-9.0
Fall rate	-1672.9	-864.9	-.30	-.34	808.0	-48.3	-.04	14.0
Number of reversals	65.8	161.1	.18	.13	95.4	145.1	-.05	-29.7
Mean % change					85.2			17.6

Non-Parametric IHA Scorecard
 BISMARCK, NORTH DAKOTA

Pre-impact period: 1929-1948 (20 years)				Post-impact period: 1967-1996 (30 years)			
	Parameter	Group #1	Group #2		Parameter	Group #1	Group #2
		Pre	Post	MEDIANS	Pre	Post	MEDIANS
Watershed area		186400.00	20616.87	186400.00	24665.41	24665.41	24665.41
Mean annual flow	Mean	.11	.11	.11	.13	.13	.13
Mean flow/area	Mean	.55	.55	.55	.25	.25	.25
Annual C. V.	Annual	.58	.58	.58	.68	.68	.68
Flow Predictability	Flow	.39	.39	.39	.64	.64	.64
Flow Constancy	Flow	.68	.68	.68	.94	.94	.94
Constancy/predictability	Flow	.19	.19	.19	.04	.04	.04
Flow Contingency	Flow						
	Parameter	Group #1	Group #2	MEDIANS	COEFF. of VAR.	COEFF. of VAR.	DEVIATION FACTOR
		Pre	Post	Pre	Post	Post	C.V.
October	October	13277.4	20754.8	.78	.68	.56	.12
November	November	11450.0	24910.0	.58	.53	1.18	.08
December	December	7596.8	22867.7	.43	.22	2.01	.48
January	January	6509.7	26977.4	.53	.18	3.14	.67
February	February	8007.1	29793.1	.53	.23	2.72	.56
March	March	20690.3	24377.4	.77	.37	.18	.52
April	April	19970.0	21836.7	.80	.31	.09	.60
May	May	22154.8	20206.5	.67	.43	.06	.36
June	June	48216.7	22380.0	.47	.51	.54	.09
July	July	29664.5	23345.2	.78	.40	.21	.49
August	August	17554.8	25119.4	.67	.36	.43	.47
September	September	15066.7	21606.7	.96	.49	.43	.49
1-day minimum	Parameter	Group #2	Group #2	.69	.43	2.56	.38
3-day minimum		3600.0	12800.0	.69	.43	2.56	.38
7-day minimum		3766.7	13996.7	.67	.44	2.71	.35
30-day minimum		4021.4	14485.7	.61	.44	2.60	.27
90-day minimum		5320.0	14740.0	.45	.49	1.77	.08
1-day maximum		6521.1	17791.1	.45	.44	1.67	.00
3-day maximum		88800.0	34700.0	.66	.32	.61	.51
7-day maximum		74833.3	33720.0	.75	.32	.55	.57
30-day maximum		70342.9	33528.6	.62	.33	.52	.47
90-day maximum		54250.0	32133.3	.58	.32	.41	.45
		35820.0	29335.6	.52	.41	.18	.21

Non-Parametric IHA Scorecard, continued

BISMARCK, NORTH DAKOTA

Pre-impact period: 1929-1948 (20 years)

	MEDIAN		COEFF. of VAR.		Post-impact period: 1967-1996 (30 years)		
	Pre	Post	Pre	Post	Medians	DEVIATION FACTOR C.V.	SIGNIFICANCE COUNT Medians

Parameter Group #3

Date of minimum JD 1-366, 358.0	258.0	.17	.41	.55	1.44	.20	.00
Date of maximum JD 1-366, 161.0	91.0	.20	.35	.38	.71	.06	.01
Date of minimum JD 122-305, 248.0	258.0	.11	.35	.05	2.12	.46	.01
Date of maximum JD 122-305, 165.0	195.0	.04	.23	.16	5.07	.01	.00

Parameter Group #4

Low pulse count	5.0	5.0	.60	1.20	.00	1.00	.30	.05
Low pulse duration	26.8	6.9	1.15	.79	.74	.31	.08	.49
High pulse count	4.0	5.0	.50	1.80	.25	2.60	.18	.00
High pulse duration	16.0	9.5	1.15	1.58	.41	.37	.24	.38
The low pulse threshold is 5661.00								
The high pulse level is 59597.00								

Parameter Group #5

Rise rate	1872.6	748.3	.62	.48	.60	.22	.07	.58
Fall rate	-1503.5	-854.8	-.42	-.46	.43	-.10	.04	.75
Number of reversals	66.0	155.0	.20	.18	1.35	-.08	.00	.72

IHA Percentile Data
BISMARCK, NORTH DAKOTA

Pre-impact period: 1929-1948 (20 years) Post-impact period: 1967-1996 (30 years)

	10%	25%	50%	75%	90%	(75-25)/50	Post-Impact	50%	75%	90%	(75-25)/50
Parameter Group #1											
October	7938.39	9342.90	13277.42	19661.29	25280.44	.78	11041.94	14167.74	20754.84	28371.19	34211.90
November	6420.00	8657.57	11450.00	15290.00	21010.00	.58	11523.33	15250.00	24910.00	28520.00	32463.33
December	5169.35	5525.81	7596.77	8794.52	12867.74	.43	18645.16	20809.68	22867.74	25922.58	27351.61
January	5029.03	5680.65	6509.68	9116.13	10796.77	.53	20190.32	23306.45	26977.42	28064.52	29096.77
February	4610.34	5832.14	8007.14	10065.90	12672.41	.53	21155.17	24539.29	29793.10	31489.29	33310.34
March	7519.35	12338.71	20890.32	28554.84	31258.06	.77	14235.48	20590.32	24377.42	29567.74	32764.52
April	12296.67	17446.67	19870.00	33356.67	39350.00	.80	12580.00	17950.00	21846.67	24826.67	33953.33
May	15448.39	16725.81	22154.84	31583.87	39038.71	.67	13841.94	17551.61	20906.45	26558.06	38964.52
June	30423.33	37173.33	48216.67	59596.67	70833.34	.47	16650.00	19690.00	22380.00	31050.00	40366.67
July	12612.26	20180.64	29664.52	43406.45	51703.23	.78	18845.16	20870.97	23345.16	30125.81	39503.23
August	9051.61	9806.13	17554.84	21600.00	26800.00	.67	19412.90	20925.81	25119.36	29919.36	39316.13
September	6119.00	7833.33	15066.67	22230.00	27863.33	.96	14640.00	17163.33	21606.67	27763.33	35456.67
Parameter Group #2											
1-day minimum	2800.00	3200.00	3600.00	5700.00	7300.00	.69	9000.00	10200.00	12800.00	15700.00	17300.00
3-day minimum	3013.33	3200.00	3766.67	5733.33	7366.67	.67	9833.33	10633.33	13966.67	16733.33	17633.33
7-day minimum	3214.29	3442.86	4021.43	5885.71	7814.29	.61	9971.43	10785.71	14485.71	17185.71	18800.00
30-day minimum	4100.00	4795.00	5320.00	7190.00	8866.57	.45	10853.00	11120.00	14740.00	18276.67	22200.00
90-day minimum	5031.56	5748.89	6521.11	8657.33	10773.33	.45	11975.56	14148.89	17391.11	21870.00	25455.55
1-day maximum	48500.00	57000.00	88300.00	116000.00	212000.00	.66	26200.00	31200.00	34700.00	42400.00	44100.00
3-day maximum	44066.67	52466.67	74433.34	108466.70	163333.30	.75	25900.00	31000.00	33700.00	41933.33	43633.33
7-day maximum	39714.29	47671.43	70442.86	95557.14	10571.40	.62	30371.43	33528.57	41514.29	43028.57	.33
30-day maximum	30660.00	39310.00	54250.00	71030.00	79183.34	.58	23416.67	29806.67	32133.33	40230.00	42666.67
90-day maximum	23196.67	29016.67	35820.00	47492.22	50721.11	.52	21944.45	26696.67	29535.55	38776.67	41087.78
Parameter Group #3											
Date of minimum JD 1-366, 315.00	341.00	358.00	361.00	48.00	.17	92.00	135.00	258.00	284.00	321.00	.41
Date of maximum JD 1-366, 80.00	89.00	161.00	164.00	173.00	.20	17.00	36.00	91.00	164.00	206.00	.35
Date of minimum JD 122-305, 134.00	222.00	248.00	263.00	275.00	.11	126.00	157.00	258.00	285.00	301.00	.35
Date of maximum JD 122-305, 159.00	162.00	165.00	176.00	182.00	.04	131.00	151.00	195.00	236.00	257.00	.23
Parameter Group #4											
Low pulse count	1.00	4.00	5.00	7.00	10.00	.60	2.00	4.00	5.00	10.00	12.00
Low pulse duration	13.75	17.90	26.80	48.80	112.00	1.15	.50	4.92	6.90	10.40	18.56
High pulse count	2.00	3.00	4.00	5.00	7.00	.50	.00	2.00	5.00	11.00	12.00
High pulse duration	5.00	8.80	16.00	27.25	39.50	1.15	.00	3.06	9.45	18.00	25.50
Parameter Group #5											
Rise rate	1326.85	1513.20	1872.57	2671.91	3082.88	.62	530.59	615.17	748.30	977.19	1308.38
Fall rate	-2529.26	-1861.45	-1503.54	-1329.34	-1132.83	-.42	-1392.79	-1001.72	-854.78	-607.69	-548.55
Number of reversals	50.00	57.00	66.00	70.00	74.00	.20	142.00	146.00	155.00	174.00	186.00

IHA Parametric RVA Scorecard

BISMARCK, NORTH DAKOTA

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA Targets				Rate of Non-Attainment	
		Std.	Range Limits			Std.	Range Limits						
		Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High		
Parameter Group #1													
October	15733.0	.5	7520.6	33935.5	21699.7	.4	10967.7	40148.4	8165.4	23300.7	40.0%		
November	12590.5	.4	6380.0	24620.0	22691.7	.3	10926.7	35043.3	7509.0	17672.1	63.3%		
December	8324.7	.4	4486.5	16496.8	23123.6	.2	13590.3	311693.5	4987.8	11661.5	100.0%		
January	7933.5	.4	3364.5	15280.6	25228.3	.2	14158.1	32351.6	4889.8	10977.3	100.0%		
February	8612.4	.4	4241.1	16008.9	28233.2	.2	13635.7	34842.9	5299.4	11925.4	100.0%		
March	20882.6	.4	6209.7	35983.9	24561.8	.3	10671.0	34371.0	11888.7	29876.5	26.7%		
April	25673.9	.5	11230.0	62140.0	22708.6	.3	10424.3	40366.7	13015.0	38332.8	13.3%		
May	25417.7	.4	14185.5	41961.3	23800.0	.4	10902.9	42029.0	16374.4	34460.9	36.7%		
June	50876.7	.3	28446.7	79396.7	25644.0	.3	11660.0	43536.7	35664.7	66088.6	80.0%		
July	33126.4	.4	10996.5	58019.4	27201.3	.4	13577.4	64609.7	19159.7	47093.1	13.3%		
August	17991.9	.5	6249.0	36303.2	27281.5	.3	17648.4	57006.5	9621.0	26362.8	40.0%		
September	16413.3	.5	4561.0	31773.3	23380.6	.3	12676.7	42666.7	7679.2	25147.4	33.3%		
Parameter Group #2													
1-day minimum	4473.5	.4	1800.0	8800.0	13191.0	.3	8660.0	23360.0	2585.4	6361.6	100.0%		
3-day minimum	4552.5	.4	1866.7	8833.3	13875.0	.3	8943.3	23733.3	2682.4	6422.6	100.0%		
7-day minimum	4760.6	.4	1971.4	9014.3	14380.5	.3	9117.1	23857.1	2870.3	6650.9	100.0%		
30-day minimum	6079.9	.3	3020.0	9483.3	15484.2	.3	10260.0	25596.7	4272.9	7887.0	100.0%		
90-day minimum	7482.9	.3	4236.4	12865.6	17962.2	.3	11370.3	28905.6	5106.3	9859.6	100.0%		
1-day maximum	10715.0	.6	45700.0	27300.0	37413.3	.2	24000.0	68800.0	57000.0	172543.2	96.7%		
3-day maximum	93373.3	.5	43566.7	243666.7	36860.0	.2	24000.0	68700.0	52466.7	144719.9	96.7%		
7-day maximum	78529.3	.4	39385.7	180885.7	36029.5	.2	23171.4	68614.3	43420.6	113637.9	93.3%		
30-day maximum	55360.5	.3	28490.0	81610.0	34451.9	.3	19376.7	67446.7	37877.0	72844.0	70.0%		
90-day maximum	38477.4	.3	21776.7	52375.6	31436.8	.3	18043.3	56001.1	28091.5	48863.4	46.7%		

THA Parametric RVA Scorecard, continued

BISMARCK, NORTH DAKOTA

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA TARGETS		RATE OF NON-ATTAINMENT	
		Std.		Range Limits		Std.		Range Limits	Low	High	
Means	Dev.	Low	High	Means	Dev.	Low	High				
Parameter Group #3											
Date of minimum JD 1-366,	1.1	.0	3.0	363.0	223.3	.2	78.0	357.0	341.0	1.1	100.0%
Date of maximum JD 1-366,	133.9	.1	79.0	195.0	100.7	.2	17.0	338.0	118.9	148.9	90.0%
Date of minimum JD 122-305,	233.2	.1	125.0	305.0	225.9	.2	123.0	305.0	199.2	267.2	93.3%
Date of maximum JD 122-305,	169.9	.0	157.0	195.0	194.4	.1	123.0	305.0	165.0	174.9	100.0%
 Parameter Group #4											
Low pulse count	1.9	.9	.0	5.0	.0	.0	.0	.0	.0	.2	3.6
Low pulse duration	14.2	1.4	.0	84.0	.0	.0	.0	.0	.0	.0	33.5
High pulse count	2.4	.7	.0	5.0	.0	5.5	.0	1.0	.8	4.0	96.7%
High pulse duration	4.9	.8	.0	11.7	1.5	5.5	.0	44.0	.9	8.8	100.0%
The low pulse threshold is	5681.00										
The high pulse threshold is	59597.00										
 Parameter Group #5											
Rise rate	2194.0	.4	996.0	4309.1	829.5	.3	487.4	1449.8	1363.4	3024.6	90.0%
Fall rate	-1672.9	-.3	-2547.0	.0	-864.9	-.3	-1537.2	.0	-2177.8	-1168.1	86.7%
Number of reversals	65.8	.2	49.0	95.0	161.1	.1	118.0	200.0	53.9	77.6	100.0%

Note: Parameter numbers 13, 15, 22, 28 and 29 use the 25th percentile level for RVA targets instead of -1SD

IHA Non-Parametric RVA Scorecard

BISMARCK, NORTH DAKOTA

Pre-impact period: 1929-1948

	Range Limits			Post-impact period: 1967-1996 Range Limits			RVA Targets			Rate of Non- Attainment	
	Means	Var.	Low	High	Means	Var.	Low	High	Low	High	
Parameter Group #1											

October	13277.4	.8	7520.6	33935.5	20754.8	.7	10967.7	40148.4	9342.9	19661.3	56.7%
November	11450.0	.6	6380.0	24620.0	24910.0	.5	10926.7	35043.3	8657.7	15290.0	73.3%
December	7596.8	.4	4486.5	16496.8	22867.7	.2	13590.3	31693.5	5525.8	8794.5	100.0%
January	6509.7	.5	3364.5	15280.6	26977.4	.2	14158.1	32351.6	5680.6	9116.1	100.0%
February	8007.1	.5	4241.1	16008.9	29793.1	.2	13635.7	34842.9	5832.1	10065.0	100.0%
March	20690.3	.8	6209.7	35983.9	24377.4	.4	10671.0	34371.0	12538.7	28554.8	36.7%
April	19970.0	.8	11230.0	62140.0	21846.7	.3	10424.3	40366.7	17446.7	33356.7	33.3%
May	22154.8	.7	14185.5	41961.3	20906.5	.4	10902.9	42029.0	16725.8	31583.9	43.3%
June	48216.7	.5	28446.7	79396.7	22380.0	.5	11660.0	43536.7	37173.3	59596.7	80.0%
July	29664.5	.8	10996.5	58019.4	23345.2	.4	13577.4	64609.7	20180.6	43406.5	20.0%
August	17554.8	.7	6249.0	36303.2	25119.4	.4	17648.4	57006.5	9806.1	21600.0	73.3%
September	15066.7	1.0	4561.0	31773.3	21606.7	.5	12676.7	42666.7	7833.3	22230.0	50.0%

Parameter Group #2

1-day minimum	3600.0	.7	1800.0	8800.0	12800.0	.4	8660.0	23600.0	3200.0	5700.0	100.0%
3-day minimum	3766.7	.7	1866.7	8833.3	13966.7	.4	8943.3	23733.3	3200.0	5733.3	100.0%
7-day minimum	4021.4	.6	1971.4	9014.3	14465.7	.4	9117.1	23857.1	3442.9	5885.7	100.0%
30-day minimum	5320.0	.5	3020.0	9483.3	14740.0	.5	10260.0	25596.7	4795.0	7190.0	100.0%
90-day minimum	6521.1	.4	4236.4	12865.6	17391.1	.4	11370.3	28905.6	5748.9	8657.3	100.0%
1-day maximum	88800.0	.7	45700.0	273000.0	34700.0	.3	24000.0	68800.0	57000.0	116000.0	96.7%
3-day maximum	74833.3	.7	43566.7	243666.7	33700.0	.3	24000.0	68700.0	52466.7	108466.7	96.7%
7-day maximum	70342.9	.6	39385.7	180685.7	33528.6	.3	23171.4	68614.3	48671.4	92557.1	96.7%
30-day maximum	54250.0	.6	28490.0	81610.0	32133.3	.3	19376.7	67446.7	39310.0	71030.0	70.0%
90-day maximum	35820.0	.5	21776.7	52955.6	29535.6	.4	18043.3	56001.1	29016.7	47492.2	50.0%

THA Non-Parametric RVA Scorecard, continued

BISMARCK, NORTH DAKOTA

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA TARGETS		RATE OF NON-ATTAINMENT	
		Range Limits		Range Limits				Low	High	Low	High
Means	Var.	Low	High	Means	Var.	Low	High				
Parameter Group #3											
Date of minimum JD 1-3666, 1948.0	.2	3.0	363.0	258.0	.4	78.0	357.0	44.0	345.0	10.0%	
Date of maximum JD 1-3666, 1948.0	.2	79.0	195.0	91.0	.3	17.0	338.0	89.0	164.0	70.0%	
Date of minimum JD 122-305, 1948.0	.1	125.0	305.0	258.0	.3	123.0	305.0	222.0	263.0	93.3%	
Date of maximum JD 122-305, 1948.0	.0	157.0	195.0	195.0	.2	123.0	305.0	162.0	176.0	93.3%	
Parameter Group #4											
Low Pulse Count	5.0	.6	1.0	12.0	5.0	1.2	.0	14.0	4.0	7.0	63.3%
Low Pulse Duration	26.8	1.2	12.4	142.0	6.9	.8	.0	43.8	17.9	48.8	83.3%
High Pulse Count	4.0	.5	1.0	9.0	5.0	1.8	.0	27.0	3.0	5.0	86.7%
High Pulse Duration	16.0	1.2	5.0	49.0	9.5	1.6	.0	87.0	8.8	27.3	46.7%
The low pulse threshold is 5681.00											
The high pulse level is 59597.00											
Parameter Group #5											
Rise rate	1872.6	.6	996.0	4309.1	748.3	.5	487.4	1449.8	1513.2	2671.9	100.0%
Fall rate	-1503.5	-.4	-2547.0	.0	-854.8	-.5	-1557.2	.0	.0	-1329.3	100.0%
Number of reversals	66.0	.2	49.0	95.0	155.0	.2	118.0	200.0	57.0	70.0	100.0%

IHA Output - Missouri and Lower Yellowstone Rivers

Yankton, South Dakota
Inter-reservoir Section

Report Station ID: 1297YT
USGS Station Number: 0646750

Missing Years: 1929-1930

IHA Parametric Scorecard
YANKTON, SOUTH DAKOTA

Pre-impact period: 1931-1948 (18 years)		Post-impact period: 1967-1996 (30 years)	
Watershed Area	249500.00		
Mean Annual Flow	244462.83		
Mean Flow/Area	.10		
Annual C. V.	.91		
Flow Predictability	.59		
Flow Constancy	.39		
Constancy/Predictability	.66		
Flow Contingency	.20		

Parameter	Group #1	MEAN		COEFF. OF VAR.		DEVIATION FACTOR		DEV. OF C.V.	
		Pre	Post	Pre	Post	Magnitude	%	Magnitude	%
October	17762.4	36872.1	.49	.28	19109.7	107.6	-.22	-44.1	
November	15367.6	33240.1	.44	.42	17872.4	116.3	-.02	-4.1	
December	8794.5	19557.9	.36	.31	11163.4	126.9	-.05	-12.7	
January	8845.9	17252.2	.35	.21	8406.4	95.0	-.14	-39.6	
February	10432.6	17372.4	.38	.23	6939.8	66.5	-.15	-39.0	
March	24395.6	20169.7	.45	.25	-4225.9	-17.3	-.20	-44.9	
April	37343.7	26883.3	.60	.26	-10460.4	-28.0	-.34	-56.7	
May	29352.0	30174.4	.48	.19	822.4	2.8	-.29	-60.4	
June	55511.5	31545.2	.32	.23	-23966.3	-43.2	-.09	-28.3	
July	43936.4	34771.0	.41	.25	-9165.3	-20.9	-.16	-38.7	
August	22096.3	37590.9	.39	.29	15494.6	70.1	-.11	-26.8	
September	19091.1	38050.2	.46	.27	18959.1	99.3	-.19	-41.1	
Mean % change						66.2		36.4	
Parameter	Group #2	MEAN		COEFF. OF VAR.		DEVIATION FACTOR		DEV. OF C.V.	
1-day minimum	5222.2	11864.7	.46	.39	6642.4	127.2	-.07	-15.7	
3-day minimum	5425.0	12403.2	.45	.37	6978.2	128.6	-.08	-17.3	
7-day minimum	5787.2	13186.6	.45	.33	7399.4	127.9	-.12	-26.6	
30-day minimum	7152.0	15106.6	.38	.27	7954.6	111.2	-.11	-29.5	
90-day minimum	8785.3	16799.0	.33	.22	8013.7	91.2	-.11	-33.2	
1-day maximum	120183.3	44810.0	.45	.23	-75313.3	-62.7	-.22	-49.3	
3-day maximum	110983.3	44625.6	.47	.23	-66357.8	-59.8	-.24	-50.7	
7-day maximum	99053.2	44327.1	.45	.23	-54726.0	-55.2	-.22	-48.2	
30-day maximum	65912.8	43302.3	.34	.24	-22610.5	-34.3	-.09	-27.9	
90-day maximum	45655.9	40339.6	.30	.24	-5316.3	-11.6	-.06	-19.7	
Mean % change								81.6	32.5

IHA Parametric Scorecard, continued

YANKTON, SOUTH DAKOTA

Pre-impact period: 1931-1948 (18 years)

Post-impact period: 1967-1996 (30 years)

	MEAN		COEFF. OF VAR.		DEVIATION FACTOR		DEV. OF C.V.	
	Pre	Post	Pre	Post	Magnitude	%	Magnitude	%
Parameter Group #3								
Date of minimum JD	354.2	62.4	.06	.17	74.2	40.6	.11	172.3
Date of maximum JD	1-366, 126.9	272.1	.12	.12	145.2	79.4	.00	2.9
Mean % change					60.0		87.6	
Date of minimum JD	122-305, 234.2	186.4	.16	.19	47.8	26.1	.03	17.8
Date of maximum JD	122-305, 172.5	229.9	.04	.14	57.4	31.4	.10	241.2
Mean % change					28.7		129.5	

	Parameter Group #4							
	Low pulse count	High pulse count	Low pulse duration	High pulse duration	Magnitude	%	Magnitude	%
Low pulse count	2.4	.4	.75	.75	2.53	-2.0	-84.7	1.78
Low pulse duration	13.9	.9	1.16	.68	3.04	-13.0	-93.4	1.87
High pulse count	2.6	.0	.00	.00	.00	-2.6	-100.0	161.1
High pulse duration	5.5	.0	.96	.96	.00	-5.5	-100.0	-.68
Mean % change					94.5		149.9	

The low pulse threshold is 6990.00
 The high pulse level is 71430.00

	Parameter Group #5							
	Rise rate	Fall rate	Number of reversals	Number of reversals	Magnitude	%	Magnitude	%
Rise rate	2822.2	676.4	.35	.41	-2145.8	-76.0	.06	17.9
Fall rate	-1967.3	-752.6	-.31	-.49	1214.7	-61.7	-.18	58.0
Number of reversals	76.8	119.9	.11	.19	43.1	56.1	.08	75.0
Mean % change					64.6		50.3	

Non-Parametric IHA Scorecard

YANKTON, SOUTH DAKOTA

Pre-impact period: 1931-1948 (18 years)

	Watershed area	279500.00	Post-impact period: 1967-1996 (30 years)
Mean annual flow	24462.83		
Mean flow/area	.09		
Annual C. V.	.45		
Flow Predictability	.59		
Flow Constancy	.39		
Constancy/predictability	.66		
Flow Contingency	.20		

		MEDIANS	COEFF. of VAR.	DEVIATION FACTOR	SIGNIFICANCE COUNT			
	Parameter	Pre	Post	Medians	Medians			
	Group #1	Pre	Post	C.V.	C.V.			
October	13585.8	34867.7	.98	.35	1.57	.65	.00	.19
November	13221.3	32093.3	.70	.44	1.43	.37	.00	.41
December	7813.5	17693.9	.41	.59	1.26	.46	.00	.27
January	7287.1	16609.7	.43	.32	1.28	.25	.00	.49
February	8830.7	17389.3	.56	.28	.97	.51	.00	.30
March	23754.8	20245.2	.71	.22	.15	.69	.08	.21
April	26780.0	28016.7	1.21	.25	.05	.79	.72	.07
May	25280.6	30096.8	.48	.18	.19	.63	.00	.14
June	54793.3	31343.3	.56	.25	.43	.55	.00	.44
July	40864.5	33635.5	.88	.25	.18	.72	.06	.22
August	21741.9	35254.8	.54	.45	.62	.17	.00	.68
September	18910.0	35520.0	.79	.43	.88	.45	.00	.30

	Parameter	Group #2	MEDIANS	COEFF. of VAR.	DEVIATION FACTOR	SIGNIFICANCE COUNT		
		Pre	Post	Medians	C.V.	Medians		
	Group #2	Pre	Post	C.V.	C.V.	C.V.		
1-day minimum	4500.0	11000.0	.60	.77	1.44	.28	.00	.58
3-day minimum	4633.3	11866.7	.58	.72	1.56	.26	.00	.59
7-day minimum	5110.0	12685.7	.62	.54	1.48	.12	.00	.75
30-day minimum	6200.0	15430.3	.36	.19	1.49	.46	.00	.29
90-day minimum	7666.7	17094.4	.39	.27	1.23	.29	.00	.52
1-day maximum	107000.0	43900.0	.44	.37	.59	.16	.00	.87
3-day maximum	102366.7	43833.3	.45	.37	.57	.17	.00	.94
7-day maximum	90028.6	43642.9	.48	.37	.52	.22	.00	.96
30-day maximum	64930.0	42843.3	.45	.39	.34	.14	.06	.73
90-day maximum	43474.4	38361.1	.54	.43	.12	.20	.36	.45

Non-Parametric IHA Scorecard, continued

YANKTON, SOUTH DAKOTA

Pre-impact period: 1931-1948 (18 years)

	MEDIANs		COEFF. of VAR.		DEVIATION FACTOR		SIGNIFICANCE	COUNT
	Pre	Post	Pre	Post	Medians	C.V.	Medians	C.V.
Parameter Group #3								
Date of minimum JD	350.0	71.0	.08	.24	.48	1.87	.00	.00
Date of maximum JD	1-366,	101.0	.274.0	.22	.19	.95	.12	.76
Date of minimum JD	122-305,	256.0	169.0	.18	.31	.48	.70	.05
Date of maximum JD	122-305,	173.0	234.0	.05	.17	.33	2.76	.06
								.76

Parameter Group #4

Low pulse count	4.0	1.0	.75	1.00	.75	.33	.02	.42
Low pulse duration	27.3	48.0	1.08	2.12	.76	.97	.05	.27
High pulse count	4.0	2.0	.75	2.00	.50	1.67	.10	.02
High pulse duration	14.8	14.3	.99	2.23	.03	1.25	.94	.10
The low pulse threshold is	6990.00							
The high pulse level is	71430.00							

Parameter Group #5

Rise rate	2567.9	573.3	.54	.54	.78	.00	.03	1.00
Fall rate	-1974.7	-654.0	-.46	-.39	.67	.15	.04	.69
Number of reversals	77.0	126.0	.14	.20	.64	.39	.00	.17

THA Percentile Data
YANKTON, SOUTH DAKOTA

Pre-impact period: 1931-1948 (18 years)							Post-impact period: 1967-1996 (30 years)							
	Parameter	Group #1	10%	25%	50%	75%	90%	(75-25)/50	10%	25%	50%	75%	90%	(75-25)/50
October		8811.29	10362.90	13585.81	23693.55	28716.13	.98	26816.13	31132.26	34867.74	43203.23	50561.29	.35	
November		8106.67	10016.33	13221.33	19290.00	26533.33	.70	9988.33	28126.67	32093.33	42380.00	52383.33	.44	
December		5741.94	6984.52	7813.55	10149.03	12193.55	.41	12435.48	14487.10	17693.87	24929.03	27516.13	.59	
January		5606.45	6990.32	7287.10	10145.16	12932.26	.43	12151.61	14525.81	16609.68	19919.36	20696.77	.32	
February		6337.50	7251.72	8830.71	12196.55	15010.34	.56	11095.52	15271.43	17389.29	20062.07	22978.57	.28	
March		10909.68	16330.65	23754.84	33180.64	33674.20	.71	12558.39	18267.74	20245.16	22683.87	25358.06	.22	
April		20496.67	21223.33	26780.67	67870.00	1.21	16873.33	23000.00	28016.67	30053.33	35103.33	35103.33	.25	
May		15377.42	20941.94	25280.64	33000.00	43019.36	.48	21251.61	27232.26	30096.71	32555.84	38161.29	.18	
June		29806.67	40903.33	54793.33	71430.00	73896.66	.56	20028.67	27626.67	31343.33	35446.67	40896.67	.25	
July		21006.45	25374.19	40864.52	61519.36	66748.39	.88	26670.97	30435.48	38850.48	46967.74	46967.74	.25	
August		10778.06	15712.90	21741.94	27545.16	30732.26	.54	27180.64	31361.29	35254.84	47209.68	52119.36	.45	
September		8054.00	10198.00	18910.00	25086.67	29683.33	.79	27583.33	31716.67	35520.00	46973.33	52000.00	.43	
Parameter Group #2														
1-day minimum		2900.00	3500.00	4500.00	6200.00	7800.00	.60	5940.00	7920.00	11000.00	16400.00	17300.00	.77	
3-day minimum		2933.33	3766.67	4633.33	6433.33	7933.33	.58	6356.67	8210.00	11866.67	16800.00	18566.67	.72	
7-day minimum		3214.29	4042.86	5110.00	7200.00	8928.57	.62	6371.43	9985.71	12685.14	19471.43	20471.43	.54	
30-day minimum		4604.33	5596.67	6200.00	7810.00	11153.33	.36	8194.00	14216.33	15420.33	17206.67	20290.00	.19	
90-day minimum		6198.11	6777.22	7666.67	9741.00	12107.78	.39	11211.33	14693.33	17094.45	19386.78	20682.22	.27	
1-day maximum		46100.00	86500.00	107000.00	134000.00	170900.00	.44	32100.00	36700.00	43900.00	53000.00	56100.00	.37	
3-day maximum		44000.00	80066.66	102366.70	126000.00	165000.00	.45	32000.00	36500.00	43600.00	52866.67	56033.33	.37	
7-day maximum		39842.86	69071.43	90028.57	112285.70	142971.40	.48	31957.14	36442.86	43642.86	52785.71	56028.57	.37	
30-day maximum		30660.00	52386.67	64930.00	81766.66	87606.66	.45	31283.33	35966.67	42843.33	52716.67	55190.00	.39	
90-day maximum		25516.67	35548.89	43474.45	58970.00	61504.45	.54	29422.22	33054.45	38361.11	49624.45	51470.00	.43	
Parameter Group #3														
Date of minimum JD 1-366,		330.00	335.00	350.00	366.00	10.00	.08	343.00	10.00	71.00	99.00	150.00	.24	
Date of maximum JD 1-366,		82.00	86.00	101.00	167.00	173.00	.22	205.00	241.00	274.00	312.00	328.00	.19	
Parameter Group #4														
Low pulse count		2.00	3.00	4.00	6.00	7.00	.75	1.00	1.00	1.00	2.00	5.00	1.00	
Low pulse duration		8.43	20.00	27.33	49.50	59.00	1.08	1.00	9.20	48.00	111.00	132.00	2.12	
High pulse count		2.00	3.00	4.00	6.00	8.00	.75	.00	1.00	2.00	5.00	6.00	2.00	
High pulse duration		2.33	7.00	14.83	21.75	25.00	.99	.00	.00	14.33	32.00	64.50	2.23	
Parameter Group #5														
Rise rate		1654.43	2114.49	2567.86	3510.62	3940.65	.54	449.22	483.02	573.29	793.51	1191.84	.54	
Fall rate		-2750.61	-2543.91	-1974.71	-1639.63	-1316.13	-.46	-1168.77	-804.48	-653.96	-550.34	-479.35	-.39	
Number of reversals		65.00	72.00	77.00	83.00	86.00	-.14	89.00	110.00	126.00	135.00	141.00	.20	

IHA Parametric RVA Scorecard

Pre-impact period: 1931-1948				Post-impact period: 1967-1996				RVA Targets				Rate of non-attainment	
		Std.	Range Limits			Std.	Range Limits			Low	High		
		Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High		
Parameter Group #1													
October	17762.4	.5	8573.2	36412.9	366872.1	.3	17955.5	62574.2	8974.2	26550.5	93.3%		
November	15367.6	.4	6795.7	28533.3	33240.1	.4	7723.3	62176.7	8559.9	22175.4	80.0%		
December	8794.5	.4	5195.8	17354.8	19957.9	.3	12338.7	36790.3	5646.2	11942.8	100.0%		
January	8845.9	.3	3761.3	14845.2	17252.2	.2	11096.5	26493.5	5768.3	11923.5	93.3%		
February	10432.6	.4	5572.4	21372.9	17372.4	.2	7836.8	24323.0	6435.2	14430.0	76.7%		
March	24395.6	.4	8835.5	52274.2	20169.7	.2	10929.7	31639.4	13511.2	35280.0	13.3%		
April	37343.7	.6	19023.3	93866.7	268883.3	.3	11504.3	40646.7	21223.3	59632.4	16.7%		
May	29352.0	.5	14551.6	72512.9	30174.4	.2	17524.2	44564.5	15241.3	43462.6	3.3%		
June	55511.5	.3	28403.3	88220.0	31545.2	.2	17096.7	48636.7	37664.3	73358.7	76.7%		
July	43936.4	.4	18896.8	73964.5	34771.0	.2	9006.5	53874.2	26019.7	61853.0	6.7%		
August	22096.3	.4	9035.2	39969.7	37590.9	.3	11041.3	62983.9	13404.0	30788.5	83.3%		
September	19091.1	.5	6818.0	32570.0	38050.2	.3	19203.3	62656.7	10337.5	27844.8	90.0%		
Parameter Group #2													
1-day minimum	5222.2	.5	2700.0	11700.0	11864.7	.4	5070.0	19900.0	2824.8	7619.6	80.0%		
3-day minimum	5425.0	.4	2733.3	11966.7	12403.2	.4	5226.7	19966.7	2987.4	7862.6	76.7%		
7-day minimum	5787.2	.5	3000.0	12300.0	13186.6	.3	5738.6	20500.0	3175.8	8398.7	86.7%		
30-day minimum	7152.0	.4	3683.3	13880.0	15106.6	.3	6420.0	23220.0	4398.7	9905.3	86.7%		
90-day minimum	8787.3	.3	5594.2	16532.2	16799.0	.2	9604.3	23561.1	5912.1	11658.5	83.3%		
1-day maximum	120183.3	.4	46000.0	274000.0	44810.0	.2	27600.0	63400.0	66630.6	173736.0	100.0%		
3-day maximum	110983.3	.5	42633.3	253000.0	44625.6	.2	26366.7	63400.0	59300.9	162665.8	93.3%		
7-day maximum	99053.2	.4	38171.4	213000.0	44327.1	.2	25328.6	63271.4	54485.6	143620.8	83.3%		
30-day maximum	65912.8	.3	30420.0	106703.3	43302.3	.2	21320.0	63040.0	43541.1	88284.5	53.3%		
90-day maximum	45655.9	.3	23186.7	40339.6	67012.2	.2	20328.9	62758.9	31829.2	59482.6	23.3%		

IHA Parametric RVA Scorecard, continued

YANKTON, SOUTH DAKOTA

Pre-impact period: 1931-1948				Post-impact period: 1967-1996				RVA Targets		Rate of Non-Attainment		
		Std.		Range Limits		Std.		Range Limits				
Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High			
Parameter Group #3												
Date of minimum JD	1-366,	354.2	.1	10.0	366.0	62.4	.2	6.0	361.0	332.6	366.0	
Date of maximum JD	1-366,	126.9	.1	63.0	198.0	272.1	.1	165.0	337.0	111.8	141.9	
Date of minimum JD	122-305,	234.2	.2	122.0	301.0	186.4	.2	122.0	305.0	197.4	271.1	
Date of maximum JD	122-305,	172.5	.0	136.0	198.0	229.9	.1	123.0	305.0	165.6	179.4	
Parameter Group #4												
Low pulse count	2.4	.7	.0	5.0	.4	2.5	.0	4.0	.6	4.2	83.3%	
Low pulse duration	13.9	1.2	.0	70.0	.9	3.0	.0	13.5	2.0	30.0	86.7%	
High pulse count	2.6	.7	.0	6.0	.0	0	.0	0	.8	4.4	100.0%	
High pulse duration	5.5	1.0	.0	23.0	.0	0	.0	0	.2	10.7	100.0%	
The low pulse threshold is	6990.00											
The high pulse threshold is	71430.00											
Parameter Group #5												
Rise rate	2822.2	.4	1082.9	4544.7	676.4	.4	298.6	1352.2	1830.4	3814.0	100.0%	
Fall rate	-1967.3	-.3	-2910.9	.0	-752.6	-.5	-2313.6	0.0	-2573.7	-1360.8	96.7%	
Number of reversals	76.8	.1	61.0	88.0	119.9	.2	44.0	159.0	68.6	85.1	96.7%	

Note: Parameter numbers 7, 13, 15, and 16 use the 25th percentile level for RVA targets instead of -1SD
 Parameter number 22 uses the 75th percentile level for RVA targets instead of +1SD

IHA Non-Parametric RVA Scorecard

YANKTON, SOUTH DAKOTA

Pre-impact period: 1931-1948			Range Limits			Post-impact period: 1967-1996 Range Limits			RVA Targets			Rate of Non-Attainment
	Means	Var.	Low	High	Means	Var.	Low	High	Low	High		
October	Parameter Group #1	1.0	8573.2	36412.9	34867.7	.3	17955.5	62574.2	10362.9	23693.5	93.3%	
November		.7	6795.7	28533.3	32093.3	.4	7723.3	62176.7	10016.3	19290.0	93.3%	
December		.4	5195.8	17354.8	17693.9	.6	12338.7	36790.3	6984.5	10149.0	100.0%	
January		.4	3761.3	14845.2	16609.7	.3	11096.5	26493.5	6990.3	10145.2	100.0%	
February		.6	5572.4	21392.9	17389.3	.3	7836.8	24323.0	7251.7	12196.6	90.0%	
March		.7	8835.5	52274.2	20245.2	.2	10929.7	31639.4	16330.6	33180.6	20.0%	
April		1.2	19023.3	93866.7	28016.7	.3	11504.3	40646.7	21223.3	53676.7	16.7%	
May		.5	14551.6	72512.9	30096.8	.2	17524.2	44564.5	20941.9	33000.0	26.7%	
June		.6	28403.3	88220.0	31343.3	.2	17096.7	48636.7	40903.3	71430.0	90.0%	
July		.9	18896.8	73964.5	33635.5	.3	9006.5	53874.2	25374.2	61519.4	6.7%	
August		.5	9035.2	39909.7	35254.8	.4	11041.3	62983.9	15712.9	27545.2	93.3%	
September		.8	6818.0	32570.0	35520.0	.4	19203.3	62656.7	10198.0	25086.7	93.3%	
	Parameter Group #2											
1-day minimum	4500.0	.6	2700.0	11700.0	11000.0	.8	5070.0	19900.0	3500.0	6200.0	83.3%	
3-day minimum	4633.3	.6	2733.3	11966.7	11866.7	.7	5226.7	19966.7	3766.7	6433.3	90.0%	
7-day minimum	5110.0	.6	3000.0	12300.0	12685.7	.5	5738.6	20500.0	4042.9	7200.0	90.0%	
30-day minimum	6200.0	.4	3683.3	13860.0	15430.3	.2	6420.0	22320.0	596.7	7810.0	93.3%	
90-day minimum	7666.7	.4	5594.7	16542.2	17094.4	.3	9604.3	23561.1	6777.2	9741.0	96.7%	
1-day maximum	10700.0	.4	46000.0	274000.0	43900.0	.4	27600.0	63400.0	86500.0	134000.0	100.0%	
3-day maximum	102366.7	.4	42633.3	253000.0	43833.3	.4	26366.7	63400.0	80666.7	126000.0	100.0%	
7-day maximum	90028.6	.5	38171.4	213000.0	43642.9	.4	25328.6	63271.4	69071.4	112285.7	100.0%	
30-day maximum	64930.0	.5	30420.0	106703.3	42843.3	.4	21320.0	63040.0	52386.7	81766.7	73.3%	
90-day maximum	43474.4	.5	23186.7	67012.2	38361.1	.4	20328.9	62758.9	35548.9	58970.0	40.0%	

IHA Non-Parametric RVA Scorecard, continued

YANKTON, SOUTH DAKOTA

Pre-impact period: 1931-1948				Post-impact period: 1967-1996				RVA TARGETS			RATE OF NON-ATTAINMENT	
Means		Var.	Range Limits	Means		Var.	Range Limits	Low	High			
Parameter Group #3												
Date of minimum JD 1-366,	350.0	.1	10.0	366.0	71.0	.2	6.0	361.0	320.0	355.0	86.7%	
Date of maximum JD 1-366,	101.0	.2	63.0	198.0	274.0	.2	165.0	337.0	86.0	167.0	96.7%	
Date of minimum JD 122-305,	256.0	.2	122.0	301.0	169.0	.3	122.0	305.0	209.0	275.0	96.7%	
Date of maximum JD 122-305,	173.0	.0	136.0	198.0	234.0	.2	123.0	305.0	166.0	183.0	96.7%	
Parameter Group #4												
Low Pulse Count	4.0	.8	1.0	9.0	1.0	.0	18.0	3.0	6.0	83.3%		
Low Pulse Duration	27.3	1.1	7.6	94.0	48.0	2.1	0	150.0	20.0	49.5	86.7%	
High Pulse Count	4.0	.8	2.0	9.0	2.0	2.0	0	9.0	3.0	6.0	66.7%	
High Pulse Duration	14.8	1.0	2.0	26.5	14.3	2.2	0	106.0	7.0	21.8	76.7%	
The low pulse threshold is	6990.00											
The high pulse level is	71430.00											
Parameter Group #5												
Rise rate	2567.9	.5	1082.9	4544.7	573.3	.5	298.6	1352.2	2114.5	3510.6	100.0%	
Fall rate	-1974.7	-.5	-2910.9	.0	-654.0	-.4	-2313.6	0	0	-1639.6	100.0%	
Number of reversals	77.0	.1	61.0	88.0	126.0	.2	44.0	159.0	72.0	.83.0	96.7%	

IHA Output - Missouri and Lower Yellowstone Rivers

Omaha, Nebraska
Channelized Section

Report Station ID: *9910M*
USGS Station Number: 06610000

Missing Years: None

TIA Parametric Scorecard
OMAHA, NEBRASKA

Pre-impact Period: 1929-1948 (20 years)			Post-impact period: 1967-1996 (30 years)		
	MEAN	COEFF. OF VAR.		MEAN	COEFF. OF VAR.
	Pre	Post	Pre	Post	Magnitude %
Watershed Area	326759.00				
Mean Annual Flow	27242.09	.08			
Mean Flow/Area		.86			
Annual C. V.		.58			
Flow Predictability		.38			
Flow Constancy		.65			
Constancy/Predictability		.20			
Flow Contingency					
Parameter Group #1					
October	18429.7	40988.9	.48	.25	22559.3
November	16643.1	37976.8	.42	.38	21333.7
December	9110.0	23967.6	.31	.34	14857.6
January	9349.7	19908.9	.33	.26	10559.3
February	12628.8	22124.6	.40	.26	9495.8
March	31264.6	30778.4	.48	.29	486.3
April	42398.2	40297.4	.53	.23	-2100.7
May	32919.0	40728.4	.44	.19	7809.4
June	59979.5	44117.6	.38	.24	-15861.9
July	48092.7	43560.7	.41	.25	-4532.1
August	24552.4	41985.4	.39	.24	17433.0
September	20792.7	41914.9	.43	.23	101.6
Mean % change					70.0
Parameter Group #2					
1-day minimum	4961.5	13213.3	.46	.46	8251.8
3-day minimum	5144.8	14440.7	.45	.41	9295.8
7-day minimum	5527.4	16264.0	.42	.33	10736.6
30-day minimum	7338.1	18682.1	.34	.27	11344.0
90-day minimum	9657.8	21093.4	.33	.26	11435.6
1-day maximum	112290.0	69023.3	.34	.31	-43266.7
3-day maximum	106763.3	65164.4	.38	.31	-41598.9
7-day maximum	98115.7	60431.4	.38	.30	-37684.3
30-day maximum	71105.7	53013.7	.35	.25	-18092.0
90-day maximum	49987.1	47440.1	.32	.22	-2547.0
Mean % change					98.0

19.2

98.0

IHA Parametric Scorecard, continued

OMAHA, NEBRASKA

Pre-impact period: 1929-1948 (20 years)

Post-impact period: 1967-1996 (30 years)

MEAN COEFF. of VAR.

Pre Post Pre Post

DEV. of C.V.

Parameter Group #3
 Date of minimum JD 1-366, 357.7
 Date of maximum JD 1-366 138.3

13.5 .05 .07 21.8
 193.0 .12 .19 54.8
 .16 .14 38.7
 .04 .14 24.6
 20.9

Mean |%| change

Date of minimum JD 122-305, 244.8
 Date of maximum JD 122-305, 169.1

206.0 .16 .19 38.7
 193.7 .04 .14 21.2
 .16 .14 13.4
 17.3

Mean |%| change

Parameter Group #4
 Low pulse count 2.1 .3 .64 2.79
 13.7 .3 1.09 2.42
 .7 .69 1.54
 6.0 1.2 .99 2.11

Mean |%| change

High pulse duration 2.11 -4.8

17.3 136.4

Mean |%| change

The low pulse threshold is 7093.00
 The high pulse level is 75593.00

Parameter Group #5
 Rise rate 2956.6 1391.4 -.35 -.33
 Fall rate -2148.5 -1198.6 -.31 -.27
 Number of reversals 89.3 124.9 .11 .08

.52.9
 -44.2
 39.8
 -.01
 -.03
 -.03
 -11.2
 -.03
 -28.1

Mean |%| change

14.5

Non-Parametric TIA Scorecard

OMAHA, NEBRASKA

Pre-impact period: 1929-1948 (20 years)

Watershed area	326759.00	
Mean annual flow	27242.09	
Mean flow/area	.08	
Annual C. V.	.48	
Flow predictability	.58	
Flow constancy	.38	
Constancy/predictability	.65	
Flow contingency	.20	

Post-impact period: 1967-1996 (30 years)

Parameter	Group #1	Median	COEFF. OF VAR.		DEVIATION FACTOR Medians	C.V.	SIGNIFICANCE COUNT Medians	C.V.
			Pre	Post				
October	16496.8	36329.0	.79	.38	1.20	.53	.00	.26
November	15379.0	35056.7	.64	.57	1.28	.12	.00	.73
December	8413.5	22258.1	.40	.61	1.65	.54	.00	.10
January	8943.5	18461.3	.45	.41	1.06	.08	.00	.81
February	10510.7	21903.6	.61	.40	1.08	.35	.00	.43
March	27051.6	30529.0	.72	.44	1.3	.38	.43	.17
April	32160.0	36510.0	1.13	.37	.14	.67	.13	.07
May	29145.2	38229.0	.54	.29	.31	.47	.00	.34
June	55536.7	40546.7	.61	.35	.27	.43	.03	.13
July	43174.2	40235.5	.66	.36	.07	.45	.39	.07
August	22409.7	36900.0	.50	.38	.65	.23	.00	.55
September	20486.7	37506.7	.84	.40	.83	.52	.00	.35
Parameter	Group #2	Median						
1-day minimum	4200.0	12900.0	.54	.70	2.07	.30	.00	.45
3-day minimum	4433.3	13466.7	.57	.74	2.04	.29	.00	.44
7-day minimum	4828.6	14657.1	.50	.49	2.04	.02	.00	.95
30-day maximum	6884.7	17678.3	.41	.44	1.57	.07	.00	.83
90-day minimum	8566.0	20355.6	.46	.38	1.38	.16	.00	.58
1-day maximum	10500.0	66800.0	.42	.43	.36	.01	.00	.97
3-day maximum	102566.7	60833.3	.49	.40	.41	.18	.00	.53
7-day maximum	94857.1	56928.6	.47	.41	.40	.13	.00	.67
30-day maximum	65286.7	54490.0	.48	.41	.17	.15	.07	.69
90-day maximum	47360.0	46710.0	.53	.41	.01	.23	.96	.56

Non-Parametric IHA Scorecard, continued

OMAHA, NEBRASKA

Pre-impact Period: 1929-1948 (20 years)

	MEDIANs		COEFF. of VAR.		Post-impact Period: 1967-1996 (30 years)	
	Pre	Post	Pre	Post	DEVIATION FACTOR Medians	SIGNIFICANCE C.V. Medians
Parameter Group #3						
Date of minimum JD 1-366,	352.0	10.0	.05	.09	.13	.60 .00
Date of maximum JD 1-366,	157.0	179.0	.23	.25	.12 .07	.01 .07

	Pre	Post	COEFF. of VAR.	Post	DEVIATION FACTOR Medians	SIGNIFICANCE C.V. Medians
Date of minimum JD 122-305,	266.0	173.0	.20	.37	.51 .84	.08 .28
Date of maximum JD 122-305,	169.0	175.0	.04	.19	.03 3.93	.08 .88

	Pre	Post	COEFF. of VAR.	Post	DEVIATION FACTOR Medians	SIGNIFICANCE C.V. Medians
Parameter Group #4						
Low pulse count	8.0	2.0	.63	1.00	.75 .56	.60 3.14
Low pulse duration	16.6	42.5	.52	2.15	.33 1.75	.00 2.50
High pulse count	6.0	4.0	.50	1.75	.41 3.32	.14 3.15
High pulse duration	8.9	5.2	.80	3.32	.41 3.15	.31 .31

The low pulse threshold is 7093.00
The high pulse level is 75593.00

	Pre	Post	COEFF. of VAR.	Post	DEVIATION FACTOR Medians	SIGNIFICANCE C.V. Medians
Rise rate	2848.0	1307.5	.39	.53	.54 .42	.36 .01
Fall rate	-2115.8	-1231.3	-.37	-.37	.40 .40	.24 .01
Number of reversals	90.0	126.0	.21	.13	.40 .40	.97 .00

IHA Percentile Data
OMAHA, NEBRASKA

	Pre-impact period: 1929-1948 (20 years)				Post-impact period: 1967-1996 (30 years)					
	10%	25%	50%	75%	90%	(75-25)/50	Post-Impact	75%	90%	(75-25)/50
Parameter Group #1										
October	8848.71	10425.48	16496.77	23474.19	29225.81	.79	30912.90	33570.97	36329.03	47206.45
November	9154.33	10533.33	15379.00	20433.33	28656.67	.64	13800.00	31543.33	35056.67	55483.87
December	5570.97	7092.90	8413.55	10420.65	11779.35	.40	13751.61	17096.77	22258.06	35116.13
January	5822.58	6816.13	8943.55	10838.71	13433.55	.45	14512.90	15824.52	18461.29	25832.26
February	6346.43	9137.86	10510.71	15582.14	18189.65	.61	15732.14	18075.00	21903.57	26757.14
March	15703.23	20603.23	27051.61	39990.32	51635.48	.72	18645.16	23616.13	30529.03	37106.45
April	21063.33	24143.33	32160.00	60560.00	76996.66	1.13	31016.67	32993.33	36510.00	46540.00
May	19935.48	22558.06	29145.16	38435.48	43819.36	.54	33235.48	34512.90	38229.03	45548.39
June	31980.00	41800.00	55336.67	75593.34	97600.00	.61	35686.67	40546.67	49683.33	59260.00
July	22938.71	27722.58	43174.20	56241.93	74270.97	.66	33403.23	35019.36	40235.48	49606.45
August	11200.00	19058.06	22409.68	30232.26	39561.29	.50	32377.42	34648.39	36900.00	48825.80
September	9093.00	11928.33	20486.67	29116.67	31643.33	.84	32513.33	35353.33	37506.67	50406.67
Parameter Group #2										
1-day minimum	2500.00	3500.00	4200.00	5750.00	6500.00	.54	6000.00	8700.00	12900.00	17700.00
3-day minimum	2633.33	3500.00	4433.33	6033.33	6600.00	.57	7290.00	9166.67	13466.67	19866.67
7-day minimum	2900.00	4120.00	4828.57	6542.86	7001.43	.50	9785.71	12658.57	14657.14	19857.14
30-day minimum	4364.67	5333.33	6884.67	8123.67	11104.00	.41	12146.67	14738.33	17678.33	23171.43
90-day minimum	6538.11	6918.56	8566.00	10819.78	12680.22	.46	14208.69	16483.67	20355.55	24273.33
1-day maximum	53100.00	84400.00	105000.00	128000.00	149000.00	.42	44200.00	51600.00	66800.00	99500.00
3-day maximum	48333.33	78300.00	102566.70	128666.70	147666.70	.49	40700.00	49900.00	60833.33	74400.00
7-day maximum	40100.00	73042.86	94857.14	117428.60	141428.60	.47	38700.00	46271.43	56928.57	69357.14
30-day maximum	33650.00	51866.67	65286.67	83380.00	99300.00	.48	37243.33	39686.67	54490.00	66686.66
90-day maximum	26588.89	37134.45	47360.00	62271.11	71247.78	.53	35024.45	36344.45	46710.00	55338.89
Parameter Group #3										
Date of minimum JD 1-366,	339.00	346.00	352.00	366.00	6.00	.05	350.00	362.00	10.00	28.00
Date of maximum JD 1-366,	75.00	87.00	157.00	171.00	183.00	.23	79.00	163.00	179.00	253.00
Date of minimum JD 122-305,	133.00	212.00	266.00	286.00	299.00	.20	124.00	143.00	173.00	279.00
Date of maximum JD 122-305,	150.00	161.00	169.00	175.00	183.00	.04	140.00	163.00	175.00	232.00
Parameter Group #4										
Low pulse count	2.00	4.00	8.00	9.00	10.00	.63	1.00	2.00	3.00	5.00
Low pulse duration	9.33	13.78	16.63	22.40	30.50	.52	7.20	17.75	42.50	109.00
High pulse count	2.00	4.00	6.00	7.00	7.00	.50	1.00	2.00	4.00	11.00
High pulse duration	2.00	6.25	8.86	13.33	19.75	.80	1.00	1.50	5.22	18.82
Parameter Group #5										
Rise rate	1521.21	2364.23	2847.97	3470.88	3603.28	.39	832.16	1015.71	1307.50	1704.27
Fall rate	-2818.07	-2613.40	-2115.81	-1822.01	-1489.30	-.37	-1719.79	-1394.35	-1231.25	-939.56
Number of reversals	74.00	80.00	90.00	99.00	99.00	.21	109.00	116.00	126.00	137.00

IHA Parametric RVA Scorecard

OMAHA, NEBRASKA

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA Targets				Rate of Non-Attainment	
		Std.		Range Limits		Std.		Range Limits		Low		High	
	Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High			
Parameter Group #1													
October	18429.7	.5	8293.9	35987.1	40988.9	.2	30293.5	64574.2	9654.1	27205.2	100.0%		
November	16643.1	.4	7671.3	29216.7	37976.8	.4	12733.3	66126.7	9610.1	23676.1	86.7%		
December	9110.0	.3	5157.7	16893.5	23967.6	.3	13364.0	42880.0	6290.9	11929.2	100.0%		
January	9349.7	.3	3706.5	15303.2	19908.9	.3	11056.5	33254.8	6263.4	12435.9	96.7%		
February	12628.8	.4	5679.3	25964.3	22124.6	.3	10182.9	36589.3	7529.4	17728.2	76.7%		
March	31264.6	.5	10080.6	65080.6	30778.4	.3	14116.1	53977.4	16370.3	46159.0	10.0%		
April	42398.2	.5	19976.7	93990.0	40297.4	.2	27113.3	66323.3	20123.4	64673.0	3.3%		
May	32919.0	.4	14380.6	80232.3	40728.4	.2	32074.2	60425.8	18286.1	47552.0	20.0%		
June	59979.5	.4	31640.0	113896.7	44117.6	.2	33106.7	75726.7	37080.3	82878.7	36.7%		
July	48092.7	.4	22903.2	84112.9	43560.7	.3	30969.7	78558.1	28227.5	67958.0	3.3%		
August	24552.4	.4	9980.6	43548.4	41985.4	.2	3012.9	66812.9	15002.8	34102.0	83.3%		
September	20792.7	.4	7349.7	34350.0	41914.9	.2	31936.7	65023.3	11779.3	29806.1	100.0%		
Parameter Group #2													
1-day minimum	4961.5	.5	2200.0	11100.0	13213.3	.5	4800.0	28800.0	2699.2	7223.8	83.3%		
3-day minimum	5144.8	.4	2273.3	11500.0	14440.7	.4	5366.7	29000.0	2851.3	7438.3	90.0%		
7-day minimum	5527.4	.4	2880.0	12142.9	16264.0	.3	7742.9	29300.0	3232.7	7822.0	96.7%		
30-day minimum	7338.1	.3	3663.3	13130.0	18682.1	.3	10257.3	30516.7	4829.0	9847.2	100.0%		
90-day minimum	9657.8	.3	5780.2	17968.9	21093.4	.3	11666.3	35900.0	6485.9	12829.6	96.7%		
1-day maximum	112290.0	.3	51700.0	198000.0	69023.3	.3	42200.0	116000.0	73724.9	150855.1	60.0%		
3-day maximum	106763.3	.4	44033.3	189333.3	65164.4	.3	40033.3	112333.3	66182.2	147344.4	56.7%		
7-day maximum	98115.7	.4	38571.4	168714.3	60431.4	.3	37271.4	108714.3	60663.8	135567.6	60.0%		
30-day maximum	71105.7	.4	32760.0	121933.3	53013.7	.2	35776.7	81740.0	46025.3	96186.0	36.7%		
90-day maximum	49987.1	.3	23344.4	77474.4	47440.1	.2	33681.1	66708.9	33931.5	66042.7	6.7%		

IHA Parametric RVA Scorecard, continued

OMAHA, NEBRASKA

Pre-impact period: 1929-1948 Std.				Post-impact period: 1967-1996 Range Limits Std.				RVA Targets				Rate of Non- Attainment
Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High			
Parameter Group #3												
Date of minimum JD 1-366,	.0	1.0	366.0	13.5	.1	3.0	362.0	341.6	366.0	76.7%		
357.7	.1	65.0	201.0	193.0	.2	68.0	326.0	121.3	155.2	93.3%		
Date of maximum JD 1-366,	.0											
138.3												
Date of minimum JD 122-305,	.2	123.0	304.0	206.0	.2	124.0	305.0	205.4	284.1	76.7%		
244.8	.0	136.0	201.0	193.7	.1	124.0	292.0	162.6	175.6	73.3%		
Date of maximum JD 122-305,	.0											
169.1												
Parameter Group #4												
Low pulse count	.6	.0	5.0	.3	.8	.0	4.0	.8	3.4	86.7%		
13.7	1.1	.0	68.0	.3	2.4	.0	2.3	5.0	28.5	100.0%		
Low pulse duration												
High pulse count	.7	.0	8.0	.7	1.5	.0	3.0	.9	4.9	66.7%		
2.9												
High pulse duration	6.0	1.0	.0	26.0	1.2	2.1	.0	10.5	.1	11.9	66.7%	
The low pulse threshold is												
7093.00												
The high pulse threshold is												
75593.00												
Parameter Group #5												
Rise rate	.3	1234.6	6095.6	1391.4	.3	807.3	2664.9	1932.9	3980.4	86.7%		
-2956.6	-.3	-3820.5	.0	-1198.6	-.3	-1970.9	.0	-2805.7	-1491.2	83.3%		
Fall rate												
Number of reversals	.1	71.0	107.0	124.9	.1	106.0	142.0	79.4	99.3	100.0%		

Note: Parameter numbers 13,15 and 16 use the 25th percentile level for RVA targets instead of -1SD
 Parameter number 22 uses the 75th percentile level for RVA targets instead of +1SD

IHA Non-Parametric RVA Scorecard

OMAHA, NEBRASKA

Pre-impact period: 1929-1948

Post-impact period: 1967-1996

RVA TARGETS
Range Limits

	Means	Var.	Low	High	Means	Var.	Low	High	Low	High
Parameter Group #1										
October	16496.8	.8	8293.9	35987.1	36329.0	.4	30293.5	64574.2	10425.5	23474.2
November	15379.0	.6	7671.3	29216.7	35056.7	.6	12733.3	66126.7	10533.3	20433.3
December	8413.5	.4	5157.7	16893.5	22258.1	.6	13364.5	42800.0	7092.9	10420.6
January	8943.5	.4	3706.5	15303.2	18461.3	.4	11056.5	33254.8	6816.1	10838.7
February	10510.7	.6	5679.3	25964.3	21903.6	.4	10182.9	36589.3	9137.9	15582.1
March	27051.6	.7	10080.6	65080.6	30529.0	.4	14116.1	53977.4	20603.2	39990.3
April	32160.0	1.1	19976.7	93990.0	36510.0	.4	27113.3	66323.3	24143.3	60560.0
May	29145.2	.5	14380.6	80232.3	38229.0	.3	32074.2	60425.8	22558.1	38435.5
June	55536.7	.6	31640.0	113896.7	40546.7	.3	33106.7	75726.7	41800.0	75593.3
July	43174.2	.7	22903.2	84112.9	40235.5	.4	30909.7	78558.7	27722.6	56241.9
August	22409.7	.5	9980.6	43548.4	36900.0	.4	30412.9	66812.9	19058.1	30232.3
September	20486.7	.8	7349.7	34350.0	37506.7	.4	31936.7	65023.3	11928.3	29116.7
Parameter Group #2										
1-day minimum	4200.0	.5	2200.0	11100.0	12900.0	.7	4800.0	28800.0	3500.0	5750.0
3-day minimum	4433.3	.6	2273.3	11500.0	13466.7	.7	5366.7	29000.0	3500.0	6033.3
7-day minimum	4828.6	.5	2880.0	12142.9	14657.1	.5	7742.9	29300.0	4120.0	6542.9
30-day minimum	6884.7	.4	3663.3	13130.0	17678.3	.4	10257.3	30516.7	5333.3	8123.7
90-day minimum	8566.0	.5	5780.2	17968.9	20355.6	.4	11666.3	35900.0	6918.6	10819.8
1-day maximum	10500.0	.4	51700.0	19800.0	66800.0	.4	42200.0	116000.0	84400.0	129000.0
3-day maximum	102566.7	.5	44033.3	189333.3	60833.3	.4	40033.3	112333.3	78300.0	128666.7
7-day maximum	94857.1	.5	38571.4	168714.3	56928.6	.4	37271.4	108714.3	73042.9	117428.6
30-day maximum	65286.7	.5	32760.0	121933.3	54490.0	.4	35776.7	81740.0	51866.7	83380.0
90-day maximum	47360.0	.5	23344.4	77474.4	46710.0	.4	33681.1	66708.9	37134.4	62271.1

RATE OF NON-ATTAINMENT

	Range Limits									
1-day minimum	4200.0	2200.0	11100.0	12900.0	.7	4800.0	28800.0	3500.0	5750.0	93.3%
3-day minimum	4433.3	2273.3	11500.0	13466.7	.7	5366.7	29000.0	3500.0	6033.3	96.7%
7-day minimum	4828.6	2880.0	12142.9	14657.1	.5	7742.9	29300.0	4120.0	6542.9	100.0%
30-day minimum	6884.7	3663.3	13130.0	17678.3	.4	10257.3	30516.7	5333.3	8123.7	100.0%
90-day minimum	8566.0	5780.2	17968.9	20355.6	.4	11666.3	35900.0	6918.6	10819.8	100.0%
1-day maximum	10500.0	51700.0	19800.0	66800.0	.4	42200.0	116000.0	84400.0	129000.0	86.7%
3-day maximum	102566.7	44033.3	189333.3	60833.3	.4	40033.3	112333.3	78300.0	128666.7	86.7%
7-day maximum	94857.1	38571.4	168714.3	56928.6	.4	37271.4	108714.3	73042.9	117428.6	80.0%
30-day maximum	65286.7	32760.0	121933.3	54490.0	.4	35776.7	81740.0	51866.7	83380.0	46.7%
90-day maximum	47360.0	23344.4	77474.4	46710.0	.4	33681.1	66708.9	37134.4	62271.1	43.3%

IIHA Non-Parametric RVA Scorecard, continued

OMAHA, NEBRASKA

Pre-impact period: 1929-1948				Range Limits				Post-impact period: 1967-1996 Range Limits				RVA Targets		Rate of Non-Attainment	
Means	Var.	Low	High	Means	Var.	Low	High	Low	High	Low	High	Low	High	Low	High
Parameter Group #3															
Date of minimum JD	.1	1.0	366.0	10.0	.1	3.0	362.0	43.0	352.0	80.0%					
Date of maximum JD	.2	65.0	201.0	179.0	.2	68.0	326.0	87.0	171.0	70.0%					
Date of minimum JD	.2	123.0	304.0	173.0	.4	124.0	305.0	212.0	286.0	73.3%					
Date of maximum JD	.0	136.0	201.0	175.0	.2	124.0	292.0	161.0	175.0	73.3%					
Parameter Group #4															
Low Pulse Count	.6	2.0	12.0	2.0	.1	1.0	.0	5.0	4.0	9.0	80.0%				
Low Pulse Duration	.5	3.4	105.5	42.5	2.1	.0	153.0	13.8	22.4	86.7%					
High Pulse Count	.5	2.0	8.0	4.0	1.8	.0	12.0	4.0	7.0	70.0%					
High Pulse Duration	.8	1.0	22.3	5.2	3.3	.0	82.5	6.3	13.3	86.7%					
The low pulse threshold is	7093.00														
The high pulse level is	75593.00														
Parameter Group #5															
Rise rate	.4	1234.6	6095.6	1307.5	.5	807.3	2664.9	2364.2	3470.9	96.7%					
Fall rate	-.4	-3820.5	.0	-1231.3	-.4	-1970.9	.0	-1822.0	-1822.0	100.0%					
Number of reversals	.2	71.0	107.0	126.0	.1	106.0	142.0	80.0	99.0	100.0%					

IHA Output - Missouri and Lower Yellowstone Rivers

Nebraska City, Nebraska
Channelized Section

Report Station ID: 905NC
USGS Station Number: 06807000

Missing Years: 1929

IHA Parametric Scorecard
NEBRASKA CITY, NEBRASKA

Pre-impact period: 1930-1948 (19 years)

Watershed Area	413959.00	
Mean Annual Flow	322263.76	
Mean Flow/Area	.08	
Annual C. V.	.78	
Flow Predictability	.59	
Flow Constancy	.41	
Constancy/Predictability	.69	
Flow Contingency	.18	

Post-impact period: 1967-1996 (30 years)

Parameter	Group #1	MEAN		COEFF. of VAR.	DEVIATION FACTOR	DEV. of C.V.				
		Pre	Post				Magnitude	%	Magnitude	%
October	21917.9	45398.9	.45	.24	23481.1	107.1	-.22	-47.6		
November	20719.7	42747.4	.37	.34	22027.7	106.3	-.03	-7.2		
December	12364.6	28713.3	.25	.33	16348.7	132.2	.08	30.7		
January	12548.0	23673.7	.32	.28	11125.7	88.7	-.04	-12.4		
February	18478.6	29053.5	.38	.29	10574.9	57.2	-.09	-24.5		
March	38767.6	41196.3	.41	.32	2428.8	6.3	-.10	-23.3		
April	47379.6	49207.6	.48	.29	1827.9	3.9	-.19	-39.5		
May	39825.0	50138.2	.43	.25	10313.2	25.9	-.18	-42.4		
June	67682.8	54863.7	.37	.33	-12819.1	-18.9	-.05	-12.2		
July	53102.4	49647.2	.43	.33	-3455.2	-6.5	-.09	-21.9		
August	28020.9	45297.6	.39	.22	17276.8	61.7	-.17	-42.5		
September	24586.0	45478.9	.40	.22	20892.9	85.0	-.18	-45.2		
Mean % change							58.3	29.1		

Post-impact period: 1967-1996 (30 years)

Parameter	Group #2	MEAN		COEFF. of VAR.	DEVIATION FACTOR	DEV. of C.V.				
		Pre	Post				Magnitude	%	Magnitude	%
1-day minimum	5774.2	15685.7	.47	.45	9911.5	171.7	-.02	-4.7		
3-day minimum	6119.1	16640.0	.43	.42	10520.9	171.9	.00	-.4		
7-day minimum	6635.9	18748.5	.37	.35	12112.5	182.5	-.02	-5.4		
30-day minimum	9249.7	22133.7	.26	.29	12884.0	139.3	.02	8.6		
90-day minimum	12869.7	25974.4	.27	.27	13104.6	101.8	-.01	-2.5		
1-day maximum	118773.7	97860.0	.32	.38	-20913.7	-17.6	.06	18.3		
3-day maximum	113884.2	91620.0	.35	.39	-22264.2	-19.5	-.04	11.2		
7-day maximum	105103.0	81829.0	.36	.38	-23274.0	-22.1	-.02	5.6		
30-day maximum	77904.0	65630.3	.35	.32	-12273.7	-15.8	-.03	-9.6		
90-day maximum	56916.8	55951.1	.33	.27	-965.7	-1.7	-.06	-19.1		
Mean % change							86.5	10.4		

IHA Parametric Scorecard, continued
 NEBRASKA CITY, NEBRASKA

Pre-impact period: 1930-1948 (19 years) Post-impact period: 1967-1996 (30 years)

	MEAN		COEFF. OF VAR.		DEVIATION FACTOR		DEV. OF C.V.	
	Pre	Post	Pre	Post	Magnitude	%	Magnitude	%
Parameter Group #3								
Date of minimum JD 1-366,	354.4	8.3	.08	.05	19.9	10.9	-.03	-33.7
Date of maximum JD 1-366,	145.1	164.6	.11	.19	19.6	10.7	.07	65.2
Mean % change					10.8		49.5	
Parameter Group #4								
Low pulse count	2.9	.3	.58	1.78	-2.6	-89.8	1.20	206.5
Low pulse duration	15.8	.9	1.22	1.86	-14.9	-94.1	.65	53.2
High pulse count	3.2	1.9	.76	.96	-1.3	-40.9	.21	27.3
High pulse duration	6.1	3.3	.82	1.22	-2.9	-47.1	.41	49.7
Mean % change					68.0		84.2	
The low pulse threshold is 10155.00 The high pulse level is 78257.00								
Parameter Group #5								
Rise rate	3446.4	2015.9	.31	.36	-1430.5	-41.5	.05	16.4
Fall rate	-2621.9	-1566.7	-.27	-.32	1055.2	-40.2	-.05	17.6
Number of reversals	91.7	119.2	.10	.09	27.4	29.9	-.01	-7.1
Mean % change					37.2		13.7	

Non-Parametric IHA Scorecard
NEBRASKA CITY, NEBRASKA

Pre-impact period: 1930-1948 (19 years)				Post-impact period: 1967-1996 (30 years)							
Watershed area				MEDIANs		COEFF. of VAR.		DEVIATION FACTOR		SIGNIFICANCE COUNT	
	Parameter	Group #1	Pre	Post	Pre	Post	Medians	C.V.	Medians	C.V.	C.V.
Mean annual flow		413959.00	413959.00	322633.76	322633.76	.08	.08	.42	.42	.23	.43
Mean flow/area										.10	
Annual C. V.										.26	
FFlow predictability										.67	
Flow Constancy										.58	
Constancy/predictability										.87	
Flow Contingency										.09	
October	Parameter	Group #1	23983.9	40016.1	.57	.36	.67	.36	.00	.00	.43
November			20400.0	40093.3	.57	.52	.97	.09	.00	.00	.80
December			12064.5	27554.8	.35	.50	1.28	.45	.00	.00	.16
January			12771.0	20764.5	.36	.42	.63	.17	.00	.00	.71
February			18486.2	28110.3	.55	.46	.52	.17	.00	.00	.67
March			33409.7	38248.4	.35	.61	.14	.73	.23	.23	.09
April			36950.0	45273.3	.63	.35	.23	.44	.03	.03	.24
May			34525.8	45612.9	.61	.42	.32	.32	.00	.00	.23
June			61973.3	50436.7	.50	.36	.19	.28	.01	.01	.58
July			50167.7	42467.7	.63	.46	.15	.27	.22	.22	.29
August			26000.0	40380.6	.48	.31	.55	.35	.00	.00	.39
September			26053.3	41343.3	.69	.41	.59	.41	.00	.00	.50
Parameter	Group #2										
1-day minimum	Parameter	Group #1	5000.0	13700.0	.66	.77	.74	.15	.00	.00	.75
3-day minimum			5233.3	14300.0	.65	.76	1.73	.18	.00	.00	.68
7-day minimum			5771.4	16514.3	.58	.56	1.86	.04	.00	.00	.91
30-day minimum			9190.3	20603.3	.40	.44	1.24	.10	.00	.00	.76
90-day minimum			12516.7	24960.0	.34	.37	.99	.08	.00	.00	.81
1-day maximum			109000.0	86600.0	.34	.48	.21	.39	.11	.11	.38
3-day maximum			107666.7	80233.3	.35	.54	.25	.54	.10	.10	.24
7-day maximum			100857.1	71514.3	.39	.59	.29	.52	.09	.09	.24
30-day maximum			71820.0	63060.0	.39	.47	.12	.19	.17	.17	.67
90-day maximum			56398.9	54472.2	.46	.40	.03	.13	.81	.81	.72

Non-Parametric IHA Scorecard, continued
 NEBRASKA CITY, NEBRASKA

	MEDIANs		COEFF. OF VAR.		DEVIATION FACTOR		SIGNIFICANCE	COUNT
	Pre	Post	Pre	Post	Medians	C.V.	Medians	C.V.
Pre-impact Period: 1930-1948 (19 years)								
Parameter Group #3								
Date of minimum JD 1-366,	354.0	10.0	.06	.05	.12	.14	.00	.74
Date of maximum JD 1-366,	166.0	167.0	.19	.22	.01	.14	1.00	.79
Date of minimum JD 122-305,	267.0	214.0	.13	.27	.29	1.06	.02	.77
Date of maximum JD 122-305,	169.0	171.0	.04	.20	.01	4.14	1.50	.79
Post-impact period: 1967-1996 (30 years)								
Parameter Group #4								
Low pulse count	9.0	2.0	.33	1.00	.78	2.00	.08	.03
Low pulse duration	16.4	33.0	.60	1.41	1.01	1.33	.01	.05
High pulse count	6.0	5.0	.50	1.20	.17	1.40	.46	.02
High pulse duration	8.8	6.1	.67	2.62	.30	2.92	.48	.00
The low pulse threshold is	10155.00							
The high pulse level is	78257.00							
Parameter Group #5								
Rise rate	3000.1	1894.8	.59	.63	.37	.6	.01	.89
Fall rate	-2423.3	-1518.7	-.56	-.56	.37	.02	.00	.97
Number of reversals	92.0	117.0	.14	.12	.27	.15	.00	.69

IHA Percentile Data
NEBRASKA CITY, NEBRASKA

Pre-impact period: 1930-1948 (19 years) Post-impact period: 1967-1996 (30 years)

		10%	25%	50%	Pre-Impact	75%	90%	(75-25)/50	Post-Impact	10%	25%	50%	Post-Impact	75%	90%	(75-25)/50
Parameter Group #1																
October	11070.97	12561.29	23983.87	26241.94	32558.06	.57	32712.90	38245.16	40016.13	52741.93	59454.84	.36				
November	12140.00	13393.33	20400.00	24930.00	31756.67	.57	17073.33	36266.67	40093.33	56970.00	61703.33	.52				
December	10154.52	12064.52	14351.61	15645.16	17251.61	.35	17270.52	27554.84	35722.58	40664.52	40664.52	.50				
January	6709.68	10264.52	12770.97	14835.48	17180.64	.36	16909.68	18441.94	20764.52	27138.71	31854.84	.42				
February	8520.49	12632.14	18486.21	22789.65	25335.71	.55	19746.43	22103.57	28110.35	34910.34	37610.34	.46				
March	20929.03	30132.26	33409.68	41980.64	62816.13	.35	25951.61	30003.23	38248.39	53406.45	56464.52	.61				
April	27350.00	36950.00	52966.67	85693.34	12540.00	.63	35140.00	39113.33	45273.33	55140.00	69853.34	.35				
May	24238.71	27032.26	34525.80	48100.00	56800.00	.61	36570.90	39970.97	45612.90	59003.23	63793.55	.42				
June	35953.33	47223.33	61973.33	78256.66	93396.66	.50	36923.33	42800.00	50436.67	60960.00	78650.00	.36				
July	24564.52	31187.10	50167.74	62777.42	84748.39	.63	36125.80	37812.90	42467.74	57283.87	68732.26	.46				
August	13090.32	21145.16	26000.00	33687.10	42409.68	.48	34700.00	37764.52	40380.64	50377.42	59141.93	.31				
September	11559.33	14223.33	26053.33	32263.33	34520.00	.69	35096.67	38313.33	41343.33	55140.00	60440.00	.41				
Parameter Group #2																
1-day minimum	3230.00	3800.00	5000.00	7120.00	9200.00	.66	8010.00	10000.00	13700.00	20500.00	22900.00	.77				
3-day minimum	3496.67	3900.00	5233.33	7293.33	9200.00	.65	8666.67	10666.67	14300.00	21566.67	24566.67	.76				
7-day minimum	3842.86	4814.29	5771.43	8168.57	9442.86	.58	10185.71	14071.43	16514.29	23257.14	26842.86	.56				
30-day minimum	6431.33	6996.00	9190.33	10656.67	11816.67	.40	11905.33	13731.33	17313.33	23636.67	26796.67	.44				
90-day minimum	8673.22	9890.44	12516.67	14182.00	16435.00	.34	16171.78	20281.11	24960.00	29505.55	35358.89	.37				
1-year maximum	61100.00	95400.00	109000.00	133000.00	171000.00	.34	55900.00	72600.00	86600.00	114000.00	154000.00	.48				
3-day maximum	57033.33	91900.00	107666.70	130000.00	169666.70	.35	52733.33	64333.33	80233.34	108000.00	142333.30	.54				
7-day maximum	50585.71	85200.57	10857.10	124428.60	159422.90	.39	46985.71	59985.71	71514.29	102214.30	114042.90	.59				
30-day maximum	39010.00	60723.33	71820.00	88860.00	101930.00	.39	41283.33	48536.67	63060.00	77923.34	82780.00	.47				
90-day maximum	29507.78	41653.33	56398.89	67707.78	78266.66	.46	39131.11	42868.89	54472.22	64782.22	72186.66	.40				
Parameter Group #3																
Date of minimum JD 1-366,	338.00	345.00	354.00	366.00	8.00	.06	351.00	.00	10.00	18.00	29.00	.05				
Date of maximum JD 1-366,	70.00	105.00	166.00	175.00	177.00	.19	79.00	116.00	167.00	196.00	253.00	.22				
Parameter Group #4																
Date of minimum JD 122-305,	212.00	238.00	267.00	286.00	297.00	.13	135.00	180.00	214.00	279.00	305.00	.27				
Date of maximum JD 122-305,	142.00	162.00	169.00	176.00	180.00	.04	137.00	148.00	171.00	220.00	284.00	.20				
Parameter Group #5																
Low pulse count	5.00	7.00	9.00	10.00	11.00	.33	1.00	1.00	2.00	3.00	5.00	1.00				
Low pulse duration	8.30	12.00	16.40	21.89	30.00	.60	11.33	20.55	33.00	67.00	106.00	1.41				
High pulse count	3.00	4.00	6.00	7.00	9.00	.50	1.00	2.00	5.00	8.00	11.00	1.20				
High pulse duration	1.67	5.75	8.83	11.67	15.20	.67	1.00	2.00	6.14	18.11	26.13	2.62				
Rise rate	2076.65	2590.76	3000.15	4367.86	4948.27	.59	1178.32	1388.32	1894.81	2583.31	2774.45	.63				
Fall rate	-3580.00	-3495.93	-2423.27	-2149.08	-1848.42	-.56	-2128.14	-2019.00	-1518.69	-1161.14	-1077.04	-.56				
Number of reversals	77.00	85.00	92.00	98.00	102.00	.14	108.00	113.00	117.00	127.00	131.00	.12				

IHA Parametric RVA Scorecard
NEBRASKA CITY, NEBRASKA

Pre-impact period: 1930-1948				Post-impact period: 1967-1996				RVA Targets				Rate of Non-Attainment	
		Std.	Range Limits			Std.	Range Limits			Low	High		
		Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High		
Parameter	Group #1												
October	21917.9	.5	11052.3	44061.3	45398.9	.2	31593.5	69438.7	12008.5	31827.2	96.7%		
November	20719.7	.4	11963.3	34393.3	42747.4	.3	16256.7	68476.7	13056.7	28382.7	86.7%		
December	12364.6	.3	7449.4	18380.6	28113.3	.3	14010.6	52412.9	9261.0	15468.2	93.3%		
January	12548.0	.3	5008.7	19209.7	23673.7	.3	13671.0	39974.2	8520.8	16575.2	93.3%		
February	18478.6	.4	8103.4	32035.7	29053.5	.3	15303.6	48632.1	11488.2	25469.1	60.0%		
March	38767.6	.4	16993.5	74858.1	41196.3	.3	18771.0	66732.3	22731.8	54803.4	26.7%		
April	47379.6	.5	26076.7	97823.3	49207.6	.3	29333.3	95660.0	29566.7	70328.8	13.3%		
May	39825.0	.4	21267.7	89374.2	50138.2	.2	35241.9	85164.5	22716.6	56933.3	26.7%		
June	67682.8	.4	35150.0	123546.7	54863.7	.3	35640.0	117463.3	42320.6	93045.1	26.7%		
July	53102.4	.4	34451.9	92380.6	49647.2	.3	33400.0	116671.0	30344.4	75860.4	3.3%		
August	28020.9	.4	11464.5	52474.2	45297.6	.2	31200.0	71538.7	17060.2	38981.6	66.7%		
September	24586.0	.4	10091.0	40413.3	45478.9	.2	33150.0	66506.7	14851.3	34320.7	93.3%		
Parameter	Group #2												
1-day minimum	5774.2	.5	1800.0	13000.0	15685.7	.4	5200.0	33200.0	3048.7	8499.8	90.0%		
3-day minimum	6119.1	.4	2933.3	13000.0	16640.0	.4	5620.0	33333.3	3514.6	8723.6	90.0%		
7-day minimum	6635.9	.4	3841.4	13000.0	18748.5	.4	8718.6	33785.7	4150.8	9121.1	96.7%		
30-day minimum	9249.7	.3	4975.7	14766.7	22133.7	.3	13543.3	37036.7	6801.7	11697.8	100.0%		
90-day minimum	12869.7	.3	8556.3	20970.0	25974.4	.3	15317.8	42874.4	9334.6	16404.9	90.0%		
1-day maximum	118773.7	.3	56200.0	207000.0	97860.0	.4	48100.0	188000.0	80393.8	157153.5	43.3%		
3-day maximum	113884.2	.3	52133.3	203333.3	91620.0	.4	46466.7	181666.7	74255.2	153513.3	40.0%		
7-day maximum	105103.0	.4	45785.7	182428.6	81829.0	.4	44371.4	167571.4	67575.3	142630.7	40.0%		
30-day maximum	77904.0	.4	36643.3	141833.3	65630.3	.3	38880.0	122950.0	50263.8	105544.3	33.3%		
90-day maximum	56916.8	.3	29066.7	96382.2	55951.1	.3	36896.7	100377.8	38267.6	75565.9	13.3%		

IHA Parametric RVA Scorecard, continued
 NEBRASKA CITY, NEBRASKA

Pre-impact period: 1930-1948				Post-impact period: 1967-1996				RVA TARGETS		RATE OF NON-ATTAINMENT		
	Std.	Range Limits			Std.	Range Limits		Low	High	Low	High	
Means	Dev.	Low	High	Means	Dev.	Low	High					
Parameter Group #3												
Date of minimum JD 1-366,	354.4	.1	4.0	366.0	8.3	.1	3.0	366.0	327.2	366.0	76.7%	
Date of maximum JD 1-366,	145.1	.1	65.0	194.0	164.6	.2	53.0	326.0	128.7	161.4	83.3%	
Date of minimum JD 122-305,	261.4	.1	151.0	304.0	220.1	.2	127.0	305.0	235.0	287.7	80.0%	
Date of maximum JD 122-305,	167.5	.0	132.0	194.0	189.2	.1	123.0	292.0	160.9	174.1	83.3%	
Parameter Group #4												
Low pulse count	2.9	.6	.0	7.0	.3	1.8	.0	2.0	1.2	4.7	96.7%	
Low pulse duration	15.8	1.2	.0	73.0	.9	1.9	.0	6.0	5.3	35.1	96.7%	
High pulse count	3.2	.8	.0	9.0	1.9	1.0	.0	6.0	.8	5.5	33.3%	
High pulse duration	6.1	.8	.0	19.0	3.3	1.2	.0	15.0	1.1	11.2	50.0%	
The low pulse threshold is	10155.00											
The high pulse threshold is	78257.00											
Parameter Group #5												
Rise rate	3446.4	.3	1817.9	5179.8	2015.9	.4	875.2	3847.7	2371.8	4521.0	66.7%	
Fall rate	-2621.9	-.3	-3688.5	.0	-1566.7	-.3	-2846.5	.0	-3334.9	-1908.9	70.0%	
Number of reversals	91.7	.1	77.0	107.0	119.2	.1	88.0	142.0	82.4	101.1	93.3%	

Note: Parameter numbers 7, 13 and 15 use the 25th percentile level for RVA targets instead of -1SD
 Parameter number 22 uses the 75th percentile level for RVA targets instead of +1SD

IHA Non-Parametric RVA Scorecard
 NEBRASKA CITY, NEBRASKA

Pre-impact period: 1930-1948			Range Limits			Post-impact period: 1967-1996 Range Limits			RVA Targets			Rate of Non- Attainment	
	Means	Var.	Low	High	Means	Var.	Low	High	Low	High			
Parameter Group #1													
October	23983.9	.6	11052.3	44061.3	40016.1	.4	31593.5	69438.7	12561.3	26241.9	100.0%		
November	20400.0	.6	11963.3	34393.3	40093.3	.5	16256.7	68476.7	13393.3	24930.0	86.7%		
December	12064.5	.3	7449.4	18380.6	27554.8	.5	14010.6	52412.9	10154.5	14351.6	96.7%		
January	12771.0	.4	5008.7	19209.7	20764.5	.4	13671.0	39974.2	10264.5	14835.5	96.7%		
February	18486.2	.5	8103.4	32035.7	28110.3	.5	15303.6	48632.1	12632.1	22789.7	73.3%		
March	33409.7	.4	16993.5	74858.1	38248.4	.6	18771.0	66732.3	30132.3	41980.6	70.0%		
April	36950.0	.6	26076.7	97823.3	45273.3	.4	29333.3	95660.0	29566.7	52926.7	33.3%		
May	34525.8	.6	21267.7	89374.2	45612.9	.4	35241.9	85164.5	27032.3	48100.0	46.7%		
June	61973.3	.5	35150.0	123546.7	50436.7	.4	35640.0	117463.3	47223.3	78256.7	50.0%		
July	50167.7	.6	24541.9	92380.6	42467.7	.5	33400.0	116671.0	31187.1	62277.4	13.3%		
August	26000.0	.5	11464.5	52474.2	40380.6	.3	31200.0	71538.7	21145.2	33687.1	93.3%		
September	26053.3	.7	10091.0	40413.3	41343.3	.4	33150.0	66506.7	14223.3	32263.3	100.0%		
Parameter Group #2													
1-day minimum	5000.0	.7	1800.0	13000.0	13700.0	.8	5200.0	33200.0	3800.0	7120.0	93.3%		
3-day minimum	5233.3	.6	2933.3	13000.0	14300.0	.8	5620.0	33333.3	3900.0	7293.3	96.7%		
7-day minimum	5771.4	.6	3841.4	13000.0	16514.3	.6	8718.6	33785.7	4814.3	8168.6	100.0%		
30-day minimum	9190.3	.4	4975.7	14766.7	20603.3	.4	13543.3	37036.7	6996.0	10656.7	100.0%		
90-day minimum	12516.7	.3	8556.3	20970.0	24960.0	.4	15317.8	42874.4	9890.4	14182.0	100.0%		
1-day maximum	109000.0	.3	56200.0	207000.0	86600.0	.5	48100.0	18800.0	95400.0	133000.0	73.3%		
3-day maximum	107666.7	.4	52133.3	203333.3	80233.3	.5	46466.7	181666.7	91900.0	130000.0	73.3%		
7-day maximum	100857.1	.4	45785.7	182428.6	71514.3	.6	44371.4	167571.4	85257.1	124428.6	70.0%		
30-day maximum	71820.0	.4	366643.3	141833.3	63060.0	.5	38880.0	122950.0	60723.3	88860.0	50.0%		
90-day maximum	56398.9	.5	29066.7	96382.2	54472.2	.4	36896.7	100377.8	41653.3	67707.8	40.0%		

IHA Non-Parametric RVA Scorecard, continued

NEBRASKA CITY / NEBRASKA

Pre-impact period: 1930-1948		Range Limits				Post-impact period: 1967-1996 Range Limits				RVA Targets		Rate of Non-Attainment	
Means	Var.	Low	High	Means	Var.	Low	High	Low	High				
Parameter Group #3													
Date of minimum JD	1-366,	354.0	.1	4.0	366.0	10.0	.0	3.0	366.0	42.0	353.0	83.3%	
Date of maximum JD	1-366,	166.0	.2	65.0	194.0	167.0	.2	53.0	326.0	105.0	175.0	63.3%	
Date of minimum JD	122-305,	267.0	.1	151.0	304.0	214.0	.3	127.0	305.0	238.0	286.0	83.3%	
Date of maximum JD	122-305,	169.0	.0	132.0	194.0	171.0	.2	123.0	292.0	162.0	176.0	73.3%	
Parameter Group #4													
Low Pulse Count	9.0	.3	4.0	15.0	2.0	1.0	.0	11.0	7.0	10.0	10.0	93.3%	
Low Pulse Duration	16.4	.6	8.1	35.3	33.0	1.4	.0	115.0	12.0	21.9	21.9	80.0%	
High Pulse Count	6.0	.5	2.0	10.0	5.0	1.2	.0	12.0	4.0	7.0	7.0	80.0%	
High Pulse Duration	8.8	.7	1.3	20.2	6.1	2.6	.0	83.5	5.8	11.7	11.7	86.7%	
The low pulse threshold is	10155.00												
The high pulse level is	78257.00												
Parameter Group #5													
Rise rate	3000.1	.6	1817.9	5179.8	1894.8	.6	875.2	3847.7	2590.8	4367.9	4367.9	76.7%	
Fall rate	-2423.3	-.6	-3688.5	51.0	-1518.7	-.6	-2846.5	.0	0.0	-2149.1	-2149.1	100.0%	
Number of reversals	92.0	-.1	77.0	107.0	117.0	-.1	88.0	142.0	85.0	98.0	98.0	96.7%	

IHA Output - Missouri and Lower Yellowstone Rivers

St. Joseph, Missouri
Channelized Section

Report Station ID: 721SJ
USGS Station Number: 06818000

Missing Years: None

IHA Parametric Scorecard

ST. JOSEPH, MISSOURI

Pre-impact period: 1929-1948 (20 years)

Watershed Area
Mean Annual Flow
Mean Flow/AreaAnnual C. V.
Flow PredictabilityFlow Constancy
Constancy/PredictabilityFlow Contingency
Flow Contingency420300.00
35573.14
.08.79
.58.40
.69.18
.18

Post-impact period: 1967-1996 (30 years)

Watershed Area
Mean Annual Flow
Mean Flow/AreaAnnual C. V.
Flow PredictabilityFlow Constancy
Constancy/PredictabilityFlow Contingency
Flow Contingency420300.00
35573.14
.08.79
.58.40
.69.18
.18

MEAN COEFF. OF VAR.

DEVIATION FACTOR

DEV. OF C.V.

Parameter Group #1

Parameter Group #2

Parameter Group #3

Parameter Group #4

Parameter Group #5

Parameter Group #6

Parameter Group #7

Parameter Group #8

Parameter Group #9

Parameter Group #10

Parameter Group #11

Parameter Group #12

Parameter Group #13

Parameter Group #14

Parameter Group #15

Parameter Group #16

Parameter Group #17

Parameter Group #18

Parameter Group #19

Parameter Group #20

Parameter Group #21

Parameter Group #22

Parameter Group #23

Parameter Group #24

Parameter Group #25

Parameter Group #26

Parameter Group #27

Parameter Group #28

Parameter Group #29

Parameter Group #30

October
November
December
January
February
March
April
May
June
July
August
September48953.46
.12
.48
.65
.56
.86
.09.19
-.04
.06
-.01
-.01
-.03
-.03
-.05
-.15
-.10
-.06
-.07
-.16
-.16
-.16-42.2
-.11.2
23.8
-.3.4
-.7.6
-.10.9
-.31.1
-.24.9
-.14.4
.16.6
-.41.5
-.41.0

63.6

22.4

Mean |%| change

.02

-2.5

-.02

-5.5

6.8

4.9

40.9

38.6

25.9

2.9

-.04

7.8

IHA Parametric Scorecard, continued

ST. JOSEPH, MISSOURI

Pre-impact period: 1929-1948 (20 years)

Post-impact period: 1967-1996 (30 years)

	MEAN		COEFF. OF VAR.		DEVIATION FACTOR		DEV. OF C.V.	
	Pre	Post	Pre	Post	Magnitude	%	Magnitude	%
Parameter Group #3								
Date of minimum JD 1-366,	361.2	22.4	.07	.12	27.2	14.9	.05	74.0
Date of maximum JD 1-366,	147.9	170.2	.10	.17	22.4	12.2	.07	71.7
Mean % change					13.6		72.9	

Parameter Group #3

Date of minimum JD 122-305, 261.8

Date of maximum JD 122-305, 167.4

Mean |%| change

	Pre	Post	Pre	Post	Magnitude	%	Magnitude	%
Parameter Group #4								
Low pulse count	2.4	.3	.80	1.69	-2.1	-88.9	.88	109.7
Low pulse duration	12.7	.7	1.37	2.17	-12.1	-94.8	.80	58.4
High pulse count	3.1	3.5	.85	.96	.4	14.0	.11	12.6
High pulse duration	4.9	3.5	.97	1.32	-1.4	-27.9	.35	35.7
Mean % change					56.4		54.1	

Parameter Group #4

Low pulse count

Low pulse duration

High pulse count

High pulse duration

Mean |%| change

	Pre	Post	Pre	Post	Magnitude	%	Magnitude	%
Parameter Group #5								
Rise rate	4209.3	3665.1	.40	.53	-544.2	-12.9	.13	34.0
Fall rate	-3038.4	-2529.7	-.36	-.39	508.8	-16.7	-.03	7.0
Number of reversals	93.6	115.9	.10	.10	22.3	23.8	-.01	-7.9
Mean % change					17.8		16.3	

The low pulse threshold is 9978.00
The high pulse level is 94823.00

Non-Parametric IHA Scorecard
 ST. JOSEPH, MISSOURI

Pre-impact period: 1929-1948 (20 years)			Post-impact period: 1967-1996 (30 years)		
	Parameter	Group #1	Parameter	Group #2	
Watershed area	420300.00		48953.46		
Mean annual flow	35573.14		.12		
Mean flow/area	.08		.28		
Annual C. V.	.43		.65		
Flow predictability	.58		.56		
Flow Constancy	.40		.86		
Constancy/predictability	.69		.09		
Flow Contingency	.18				
		MEDIANS	DEVIATION FACTOR	SIGNIFICANCE COUNT	
		Pre Post	Medians	Medians	
		COEFF. OF VAR.	C. V.	C. V.	
October	25387.1	.71	.75	.53	.19
November	22063.3	.62	.53	.14	.69
December	13776.5	.48	.44	.23	.81
January	14203.2	.37	.52	.40	.34
February	19767.9	.57	.52	.08	.80
March	36480.6	.45	.57	.22	.46
April	39286.7	.87	.47	.32	.15
May	39419.4	.60	.49	.47	.52
June	65253.3	.72	.39	.07	.35
July	55316.1	.74	.40	.02	.46
August	29522.6	.48	.37	.63	.83
September	26863.3	.73	.38	.90	.00
Parameter	Group #2				
1-day minimum	4490.0	14000.0	1.14	.82	.28
3-day minimum	4973.3	18100.0	1.03	.64	.38
7-day minimum	5715.7	19985.7	.98	.54	.50
30-day minimum	9668.0	23233.3	.54	.52	1.40
90-day minimum	14873.4	28158.0	.48	.41	.89
1-day maximum	116000.0	123000.0	.40	.50	.06
3-day maximum	114333.3	120333.3	.42	.51	.05
7-day maximum	108857.1	100371.4	.35	.52	.08
30-day maximum	72666.7	71686.7	.47	.50	.01
90-day maximum	58071.1	63565.6	.48	.40	.09

Non-Parametric IHA Scorecard, continued

ST. JOSEPH, MISSOURI

Pre-impact period: 1929-1948 (20 years)
 MEDIANs COEFF. of VAR.
 Pre Post Post

	Parameter Group #3	Post-impact period: 1967-1996 (30 years)					
	COEFF. of VAR.	DEVIATION FACTOR					
	Pre	Post					
	Medians	C.V.					
Date of minimum JD 1-366,	12.0	.05	.09	.17	.01	.65	
362.0	168.0	.17	.20	.03	.20	.28	
Date of maximum JD 1-366,	162.0						
270.0							
Date of minimum JD 122-305,	218.0	.11	.32	.28	.97	.02	.65
270.0	176.0	.03	.23	.04	.92	.31	.74
Date of maximum JD 122-305,	168.0						

	Parameter Group #4	Post-impact period: 1967-1996 (30 years)					
	COEFF. of VAR.	DEVIATION FACTOR					
	Pre	Post					
	Medians	C.V.					
Low pulse count	8.0	.50	.67	.63	.33	.12	.60
14.9	21.7	.59	1.21	.46	1.07	.02	.05
High pulse count	5.0	7.0	.80	1.00	.40	.25	.04
High pulse duration	6.6	6.9	1.13	1.60	.05	.42	.89
The low pulse threshold is	9978.00						
The high pulse level is	94823.00						

	Parameter Group #5	Post-impact period: 1967-1996 (30 years)						
	COEFF. of VAR.	DEVIATION FACTOR						
	Pre	Post						
	Medians	C.V.						
Rise rate	3693.0	2993.5	.58	.78	.19	.34	.27	.19
-2840.4	-2390.7	-.49	-.56	.16	.14	.20	.55	
Number of reversals	91.0	114.0	.14	.11	.25	.26	.00	.34

IHA Percentile Data
ST. JOSEPH, MISSOURI

Pre-impact period: 1929-1948 (20 years) Post-impact period: 1967-1996 (30 years)

		10%	25%	50%	Pre-Impact	75%	90%	(75-25)/50	Post-Impact	75%	90%	(75-25)/50
	Parameter Group #1											
October	12080.65	12477.42	25387.10	30416.13	35516.13	.71	35687.10	42258.07	44503.23	56912.90	68019.35	.33
November	12935.33	13906.67	22063.33	27496.67	32880.00	.62	20176.67	37670.00	44696.67	61413.33	68270.00	.53
December	8893.87	9978.06	13776.45	16531.29	18245.16	.48	19129.81	25019.36	30709.68	38538.71	44545.07	.44
January	6720.32	10677.74	14203.23	15948.06	18980.32	.37	17338.71	20583.87	24238.71	33180.64	36235.48	.52
February	10420.69	14596.79	19767.86	25814.29	26451.72	.57	21603.57	24682.14	31778.57	41246.43	47900.00	.52
March	21516.13	29845.16	36480.64	46193.55	72141.94	.45	25825.81	34803.23	44519.36	60193.55	69719.35	.57
April	27510.00	32803.33	39286.67	66856.66	93113.34	.87	38870.00	45110.00	51820.00	69463.34	82390.00	.47
May	24612.90	28138.71	39419.36	51783.87	66448.39	.60	38909.68	43735.48	58035.48	71922.58	85593.55	.49
June	38923.33	47646.67	65253.33	94823.34	123310.00	.72	40426.67	49376.67	60713.33	72870.00	95940.00	.39
July	26348.39	33358.07	55316.13	74493.55	86445.16	.74	39006.45	42122.58	56400.00	64900.00	80161.29	.40
August	13867.74	22874.19	29522.58	43377.42	48454.16	.48	36812.90	41564.52	48232.26	59190.32	64174.20	.37
September	12993.33	15843.33	26863.33	35553.33	36806.67	.73	36493.33	41496.67	50970.00	67990.00	.38	

		Parameter Group #2										
1-day minimum	2980.00	3700.00	4490.00	8800.00	10500.00	1.14	8300.00	9520.00	14000.00	21000.00	24000.00	.82
3-day minimum	3393.33	3766.67	4973.33	8900.00	10633.33	1.03	8466.67	11833.33	18100.00	23466.67	26633.33	.64
7-day minimum	3641.43	4228.57	5715.71	9828.57	10971.43	.98	10000.00	19851.29	24971.43	29747.14	.54	
30-day minimum	5997.67	7378.67	9668.00	12576.67	13500.00	.54	15030.00	17926.67	23233.33	30050.00	32846.67	.52
90-day minimum	9158.44	10083.11	14873.44	17209.45	17742.22	.48	18147.33	23132.22	28158.00	34696.67	41332.22	.41
1-day maximum	64200.00	103000.00	116000.00	149000.00	161000.00	.40	64000.00	96500.00	123000.00	158000.00	195000.00	.50
10-day maximum	61400.00	87714.29	114333.34	145333.30	159666.70	.42	60233.33	86966.66	120333.30	148666.70	186000.00	.51
7-day maximum	53842.86	88714.29	108857.10	126600.00	157571.40	.35	59185.71	80271.43	100371.40	132728.60	156000.00	.52
30-day maximum	41970.00	67420.00	72666.66	101933.30	140146.70	.47	48170.00	62850.00	71686.66	98490.00	109390.00	.50
90-day maximum	31198.89	45501.11	58071.11	73153.34	93307.78	.48	44158.89	52208.89	63565.55	77560.00	91093.34	.40

Parameter Group #3

Date of minimum JD 1-366,	346.00	351.00	362.00	3.00	21.00	.05	357.00	5.00	12.00	26.00	39.00	.06
Date of maximum JD 1-366,	80.00	110.00	162.00	171.00	180.00	.17	84.00	135.00	168.00	208.00	254.00	.20
Date of minimum JD 122-305,	153.00	249.00	270.00	288.00	299.00	.11	140.00	159.00	218.00	275.00	302.00	.32
Date of maximum JD 122-305,	144.00	162.00	168.00	174.00	181.00	.03	141.00	166.00	176.00	249.00	284.00	.23

Parameter Group #4

Low pulse count	6.00	7.00	8.00	11.00	14.00	.50	1.00	2.00	3.00	4.00	9.00	.67
Low pulse duration	7.64	13.00	14.86	21.71	29.00	.59	8.50	11.75	21.67	38.00	80.00	1.21
High pulse count	2.00	4.00	5.00	8.00	9.00	.80	1.00	4.00	7.00	11.00	14.00	1.00
High pulse duration	1.50	4.67	6.57	12.11	19.75	1.13	2.00	3.00	6.91	14.08	26.00	1.60

Parameter Group #5

Rise rate	2568.11	2798.47	3692.99	4945.03	5627.82	.58	1659.40	2261.99	2993.46	4588.81	6204.51	.78
Fall rate	-4840.10	-3792.83	-2840.40	-2392.32	-1888.30	-.49	-3730.08	-3255.33	-2390.74	-1915.60	-1371.19	-.56
Number of reversals	79.00	87.00	91.00	100.00	104.00	.14	101.00	110.00	114.00	122.00	128.00	.11

IHA Parametric RVA Scorecard
ST. JOSEPH, MISSOURI

Pre-impact period: 1929-1948						Post-impact period: 1967-1996						RATE OF NON-ATTAINMENT					
			Std.			Range Limits			Std.			Range Limits			RVA Targets		
	Means	Dev.	Low	High	Means	Dev.	Low	High	Dev.	Low	High	Dev.	Low	High	Dev.	Low	High
Parameter Group #1																	
October	23651.4	.4	11835.5	46712.9	50465.1	.3	33822.6	87654.8	13250.9	34052.0	96.7%						
November	23018.2	.4	12506.7	37573.3	47410.3	.3	18510.0	70980.0	14751.2	31285.1	90.0%						
December	13881.2	.3	7600.0	20464.5	33101.1	.3	15221.3	61819.4	10098.2	17664.1	93.3%						
January	13776.1	.3	5025.8	21887.1	27094.5	.3	15361.3	45741.9	9293.6	18258.6	90.0%						
February	20293.4	.4	8400.0	35371.4	34053.7	.3	16635.7	60571.4	13079.0	27507.8	63.3%						
March	43079.8	.4	18522.6	81458.1	48989.4	.4	22741.9	96796.8	24405.9	61753.8	30.0%						
April	51708.5	.5	26290.0	99163.3	57276.3	.3	32916.7	113583.3	27410.0	76007.0	13.3%						
May	44056.9	.4	21909.7	95135.5	60844.1	.3	36980.6	104754.8	25747.9	62366.0	40.0%						
June	75900.0	.4	35536.7	139100.0	64750.0	.4	40000.0	144726.7	44031.5	237768.5	23.3%						
July	58357.1	.4	26251.6	101387.1	59995.1	.5	36400.0	195387.1	33905.0	82809.2	6.7%						
August	30798.4	.4	11683.9	57903.2	51120.9	.2	33516.1	83045.2	18666.7	42930.1	70.0%						
September	26666.5	.4	11040.0	42843.3	51839.9	.2	34400.0	70680.0	16515.2	36817.8	90.0%						
Parameter Group #2																	
1-day minimum	6087.0	.5	2300.0	11900.0	16165.0	.5	4600.0	39900.0	3136.5	9037.5	83.3%						
3-day minimum	6357.5	.5	2500.0	12000.0	18466.2	.4	6290.0	40266.7	3444.5	9270.5	86.7%						
7-day minimum	7067.1	.4	3328.6	12814.3	20323.0	.4	8894.3	40671.4	4076.0	10058.3	90.0%						
30-day minimum	10300.1	.3	4980.0	15663.3	24740.7	.3	14775.3	43853.3	7257.0	13343.2	100.0%						
90-day minimum	14192.0	.3	8881.9	22676.7	29680.6	.3	16835.6	48085.6	10336.6	18047.4	93.3%						
1-day maximum	124225.0	.3	62900.0	196000.0	133716.7	.4	60300.0	328000.0	88320.1	160129.9	40.0%						
3-day maximum	119478.3	.3	58333.3	187000.0	124450.0	.4	54033.3	311333.3	83171.7	155785.0	40.0%						
7-day maximum	111298.6	.3	50285.7	184857.1	109494.3	.4	49014.3	273428.6	74358.8	148238.3	30.0%						
30-day maximum	85844.3	.4	37140.0	154300.0	83306.3	.4	42993.3	198200.0	53466.3	118222.3	16.7%						
90-day maximum	62756.5	.4	29752.0	104121.1	67672.0	.3	40944.4	123680.0	40740.9	84772.1	16.7%						

IHA Parametric RVA Scorecard, continued

ST. JOSEPH, MISSOURI

Pre-impact period: 1929-1948 Std.				Post-impact period: 1967-1996 Std.				RVA Targets				Rate of Non- Attainment	
	Means	Dev.	Range Limits		Means	Dev.	Range Limits		Low	High			
Parameter Group #3													
Date of minimum JD 1-366,	361.2	.1	3.0	366.0	22.4	.1	1.0	366.0	336.1	3.0	100.0%		
Date of maximum JD 1-366,	147.9	.1	72.0	197.0	170.2	.2	52.0	306.0	133.6	162.1	86.7%		
Date of minimum JD 122-305,	261.8	.1	152.0	305.0	220.0	.2	127.0	305.0	231.0	292.5	70.0%		
Date of maximum JD 122-305,	167.4	.0	135.0	197.0	198.1	.1	125.0	292.0	161.1	173.7	73.3%		
Parameter Group #4													
Low pulse count	2.4	.8	.0	7.0	.3	1.7	.0	1.0	.5	4.3	73.3%		
Low pulse duration	12.7	1.4	.0	64.0	.7	2.2	.0	6.0	3.0	30.2	86.7%		
High pulse count	3.1	.8	.0	9.0	3.5	1.0	.0	12.0	.5	5.7	50.0%		
High pulse duration	4.9	1.0	.0	15.3	3.5	1.3	.0	20.8	.1	9.6	30.0%		
The low pulse threshold is The high pulse threshold is													
Rise rate	4209.3	.4	1976.7	8910.7	3665.1	.5	1158.9	9023.1	2540.8	5877.8	46.7%		
Fall rate	-3038.4	-.4	-6124.9	.0	-2529.7	-.4	-4954.0	.0	-4142.8	-1934.1	33.3%		
Number of reversals	93.6	.1	79.0	118.0	115.9	.1	94.0	142.0	83.9	103.3	86.7%		

Note: Parameter numbers 13,15, 16 use the 25th percentile for RVA targets instead of -1SD
 Parameter number 22 uses the 75th percentile for RVA target instead of +1SD

THA Non-Parametric RVA Scorecard

ST. JOSEPH, MISSOURI

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA TARGETS				RATE OF NON-ATTAINMENT	
		Range Limits		Range Limits		Range Limits		Low		High			
		Means	Var.	Low	High	Means	Var.	Low	High	Low	High		
Parameter Group #1													
October	25387.1	.7	11835.5	46712.9	44503.2	.3	33892.6	87654.8	12477.4	30416.1	100.0%		
November	22063.3	.6	12506.7	37573.3	44696.7	.5	18510.0	70980.0	13906.7	27496.7	90.0%		
December	13776.5	.5	7600.0	20464.5	30709.7	.4	15221.3	61819.4	9978.1	16531.3	93.3%		
January	14203.2	.4	5025.8	21887.1	24238.7	.5	15361.3	45741.9	10677.7	15948.1	96.7%		
February	19767.9	.6	8400.0	35371.4	31778.6	.5	16635.7	60571.4	14596.8	25814.3	70.0%		
March	36480.6	.4	18522.6	81458.1	44519.4	.6	22741.9	96796.8	29845.2	46193.5	63.3%		
April	39286.7	.9	26290.0	99163.3	51820.0	.5	32916.7	113583.3	32803.3	66856.7	26.7%		
May	39419.4	.6	21909.7	95135.5	58035.5	.5	36980.6	104754.8	28138.7	51783.9	56.7%		
June	65253.3	.7	35536.7	139100.0	60713.3	.4	40000.0	144726.7	47646.7	94823.3	36.7%		
July	55316.1	.7	26251.6	101387.1	56400.0	.4	36400.0	195387.1	33358.1	74493.5	16.7%		
August	29522.6	.5	11683.9	57903.2	48232.3	.4	33516.1	83045.2	22874.2	36945.2	90.0%		
September	26863.3	.7	11040.0	42843.3	50970.0	.4	34400.0	70680.0	15843.3	35553.3	93.3%		
Parameter Group #2													
1-day minimum	4490.0	1.1	2300.0	11900.0	14000.0	.8	4600.0	39900.0	3700.0	8800.0	86.7%		
3-day minimum	4973.3	1.0	2500.0	12000.0	18100.0	.6	6290.0	40266.7	3766.7	8900.0	86.7%		
7-day minimum	5715.7	1.0	3328.6	12814.3	19985.7	.5	8894.3	40671.4	4228.6	9828.6	93.3%		
30-day minimum	9668.0	.5	4980.0	15663.3	23353.3	.5	14775.3	43853.3	7378.7	12576.7	100.0%		
90-day minimum	14873.4	.5	8881.9	22676.7	28158.0	.4	16835.6	48085.6	10083.1	17209.4	96.7%		
1-day maximum	116000.0	.4	62900.0	196000.0	123000.0	.5	60300.0	328000.0	103000.0	149000.0	66.7%		
3-day maximum	114333.3	.4	58333.3	187000.0	120333.3	.5	54033.3	311333.3	97233.3	145333.3	56.7%		
7-day maximum	108857.1	.3	50285.7	184857.1	100311.4	.5	49014.3	273428.6	88714.3	126600.0	63.3%		
30-day maximum	72666.7	.5	37140.0	154300.0	71666.7	.5	42993.3	198200.0	67420.0	101933.3	50.0%		
90-day maximum	58071.1	.5	29752.2	104121.1	63565.6	.4	40944.4	123680.0	45501.1	73153.3	43.3%		

IHA Non-Parametric RVA Scorecard, continued

ST. JOSEPH, MISSOURI

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA Targets		Rate of Non-Attainment	
		Range Limits		Range Limits				Low	High	Low	High
Means	Var.	Low	High	Means	Var.	Low	High				
Parameter Group #3											
Date of minimum JD 1-366, 362.0	.0	3.0	366.0	12.0	.1	1.0	366.0	21.0	358.0	56.7%	
Date of maximum JD 1-366, 162.0	.2	72.0	197.0	168.0	.2	52.0	306.0	110.0	171.0	60.0%	
Date of minimum JD 122-305, 270.0	.1	152.0	305.0	218.0	.3	127.0	305.0	249.0	288.0	83.3%	
Date of maximum JD 122-305, 168.0	.0	135.0	197.0	176.0	.2	125.0	292.0	162.0	174.0	73.3%	
Parameter Group #4											
Low Pulse Count	.5	6.0	16.0	3.0	.7	.0	11.0	7.0	11.0	76.7%	
Low Pulse Duration	.6	6.1	34.2	21.7	1.2	.0	110.0	13.0	21.7	76.7%	
High Pulse Count	.8	1.0	14.0	7.0	1.0	1.0	22.0	4.0	8.0	60.0%	
High Pulse Duration	1.1	1.5	22.2	6.9	1.6	1.0	45.3	4.7	12.1	70.0%	
The low pulse threshold is		9978.00									
The high pulse level is		94823.00									
Parameter Group #5											
Rise rate	.6	1976.7	8910.7	2993.5	.8	1158.9	9023.1	2798.5	4945.0	63.3%	
Fall rate	-.5	-6124.9	.0	-2390.7	-.6	-4954.0	.0	.0	-2392.3	100.0%	
Number of reversals	.1	79.0	118.0	114.0	.1	94.0	142.0	87.0	100.0	93.3%	

IHA Output - Missouri and Lower Yellowstone Rivers

Kansas City, Missouri
Channelized Section

Report Station ID: 589KC
USGS Station Number: 06893000

Missing Years: None

IIHA Parametric Scorecard
KANSAS CITY, MISSOURI

Pre-impact period: 1929-1948 (20 years)			Post-impact period: 1967-1996 (30 years)		
Watershed Area	485200.00		MEAN	COEFF. OF VAR.	DEVIATION FACTOR
Mean Annual Flow	43816.31		Pre	Post	Magnitude %
Mean Flow/Area	.09				DEV. OF C.V.
Annual C. V.	.85				
Flow Predictability	.56				
Flow Constancy	.39				
Constancy/Predictability	.70				
Flow Contingency	.17				
Parameter Group #1	Pre	Post	Pre	Post	Magnitude %
October	29158.9	59010.1	.56	.40	29851.2 102.4 -1.15 -27.5
November	28932.9	54287.4	.45	.34	25354.5 87.6 -.11 -.24.4
December	18180.0	39467.6	.40	.37	21287.6 117.1 -.03 -.7.5
January	16864.6	31148.6	.37	.37	14284.1 84.7 .00 -.6
February	24254.7	40384.5	.34	.38	16129.9 66.5 .04 11.2
March	5086.8	59471.7	.48	.48	9384.9 18.7 .00 .1
April	62918.0	71651.5	.55	.43	8733.5 13.9 -.12 -.21.7
May	57695.5	76533.4	.47	.39	18838.0 32.7 -.08 -.16.8
June	97013.0	81622.2	.48	.41	-15390.8 -15.9 -.07 -.15.2
July	69053.7	73812.8	.44	.62	4759.1 6.9 .18 42.4
August	37159.7	60363.9	.42	.34	23204.2 62.4 -.09 -.20.4
September	32985.7	60527.4	.40	.32	27541.8 83.5 -.08 -.19.8
Mean % change					57.7 17.3
Parameter Group #2	Pre	Post	Pre	Post	Magnitude %
1-day minimum	7721.0	19786.0	.56	.50	12065.0 156.3 -.06 -.11.0
3-day minimum	8048.0	20954.6	.55	.46	12906.6 160.4 -.08 -.15.3
7-day minimum	8840.6	22785.5	.50	.42	13944.8 157.7 -.08 -.15.8
30-day minimum	12962.1	28024.5	.37	.35	15062.5 116.2 -.03 -.7.0
90-day minimum	17249.1	33908.9	.31	.31	16659.8 96.6 .00 .9
1-day maximum	171645.0	179773.3	.46	.48	8128.3 4.7 .02 4.7
3-day maximum	163695.0	167225.6	.45	.49	3530.6 2.2 .04 8.5
7-day maximum	14800.7	146321.5	.44	.49	-1679.3 -1.1 .05 12.4
30-day maximum	108962.5	115005.3	.44	.44	6042.9 5.5 .00 -.1.1
90-day maximum	79243.7	88439.1	.41	.36	9195.4 11.6 -.06 -.13.9
Mean % change					72.8 10.5

THA Parametric Scorecard, continued
 KANSAS CITY, MISSOURI

Pre-impact period: 1929-1948 (20 years) Post-impact period: 1967-1996 (30 years)

	MEAN	COEFF. OF VAR.	DEVIATION FACTOR	DEV. OF C.V.
	Pre	Post	Post	Magnitude %
Parameter Group #3				
Date of minimum JD 1-366,	364.6	11.6	.09	.05
Date of maximum JD 1-366,	153.3	172.1	.10	.19
Mean % change				8.7
Date of minimum JD 122-305,	276.3	218.4	.06	.16
Date of maximum JD 122-305,	165.1	183.7	.05	.12
Mean % change				20.9
Parameter Group #4				
Low pulse count	2.3	.3	.84	1.99
Low pulse duration	9.6	.6	1.34	2.53
High pulse count	2.3	2.5	1.15	1.14
High pulse duration	3.6	3.4	1.24	1.44
Mean % change				48.7
The low pulse threshold is	11397.00			
The high pulse level is	134243.00			
Parameter Group #5				
Rise rate	5131.0	4844.7	.45	.52
Fall rate	-3627.6	-3237.3	-.39	-.43
Number of reversals	91.6	108.8	.09	.10
Mean % change				11.7
				11.4

Non-Parametric IHA Scorecard
KANSAS CITY, MISSOURI

Pre-impact period: 1929-1948 (20 years)			Post-impact period: 1967-1996 (30 years)		
Watershed area	485200.00		59074.84		
Mean annual flow	43816.31		.12		
Mean flow/area	.09		.31		
Annual C. V.	.44		.63		
Flow predictability	.56		.17		
Flow Constancy	.39		.84		
Constancy/predictability	.70		.10		
Flow Contingency	.17				
	MEDIANs		COEFF. of VAR.	DEVIATION FACTOR	SIGNIFICANCE COUNT
	Parameter	Group #1	Pre Post	Medians	C.V.
October	27316.1	54129.0	.67	.98	.44
November	28283.3	55053.3	.73	.45	.39
December	15798.7	36112.9	.63	.54	.15
January	17380.6	26877.4	.50	.63	.55
February	23653.6	35469.0	.52	.69	.50
March	44190.3	48609.7	.46	.67	.10
April	47326.7	57503.3	.79	.72	.22
May	50793.5	73064.5	.78	.62	.44
June	73393.3	71036.7	1.01	.40	.03
July	69767.7	66716.1	.76	.54	.04
August	34871.0	58696.8	.44	.32	.68
September	30536.7	57520.0	.57	.51	.88
	Parameter	Group #2	Pre Post	Medians	C.V.
1-day minimum	6380.0	16800.0	.75	.87	.63
3-day minimum	6673.3	18333.3	.90	.81	.75
7-day minimum	7412.9	20657.1	.83	.68	.79
30-day minimum	11643.0	26310.0	.65	.55	.26
90-day minimum	16828.2	32262.2	.50	.46	.92
1-day maximum	144000.0	165000.0	.76	.49	.15
3-day maximum	133666.7	155333.3	.79	.49	.16
7-day maximum	129142.9	130785.7	.71	.60	.01
30-day maximum	96723.3	101263.3	.64	.59	.05
90-day maximum	70776.7	78721.1	.68	.50	.11

Non-Parametric THA Scorecard, continued

KANSAS CITY, MISSOURI

Pre-impact period: 1929-1948 (20 years)						Post-impact period: 1967-1996 (30 years)					
Parameter Group #3						Parameter Group #3					
	Medians	Coeff. of Var.		Medians	Deviation Factor		Medians	Coef. of Var.		Medians	Significance Count
Pre	Post	Pre	Post	Pre	Post	Medians	C.V.	Medians	C.V.	Medians	C.V.
Date of minimum JD	1-366,	365.0	12.0	.06	.05	.07	.14	.00	.77		
Date of maximum JD	1-366,	165.0	163.0	.12	.29	.01	1.49	.82	.07		
Date of minimum JD	122-305,	278.0	223.0	.08	.28	.30	2.52	.00	.77		
Date of maximum JD	122-305,	170.0	168.0	.05	.16	.01	2.33	1.53	.08		

Parameter	Group #4	
Low pulse count	8.0	3.0
Low pulse duration	15.9	18.5
High pulse count	6.0	6.0
High pulse duration	6.5	7.6
The low pulse threshold is		11397.00
The high pulse level is		134243.00

	Parameter	Group #5			
Rise rate	4169.7	3790.6	.81	.84	.09
Fall rate	-3518.4	-2779.1	-.64	-.67	.21
Number of reversals	92.0	106.0	.13	.13	.15

THA Percentile Data
KANSAS CITY, MISSOURI

Pre-impact period: 1929-1948 (20 years)						Post-impact period: 1967-1996 (30 years)						
	10%	25%	50%	75%	90%	(75-25) / 50	10%	25%	50%	75%	90%	(75-25) / 50
Parameter Group #1												
October	13229.03	16158.06	27316.13	34493.55	40225.80	.67	38880.64	43296.77	54129.03	63538.71	72709.68	.37
November	10960.00	18023.33	28283.33	38683.33	40250.00	.73	22976.67	42713.33	55053.33	67223.34	73083.34	.45
December	10952.90	11397.10	15798.71	21396.77	25606.45	.63	20109.68	28587.10	36112.90	47993.55	58474.20	.54
January	7610.97	11460.32	17380.64	20199.36	22129.03	.50	20028.06	21445.16	26877.42	38283.87	48783.87	.63
February	14350.36	16021.43	23653.57	28421.43	34510.71	.52	22653.57	27610.35	35468.96	52092.86	60610.71	.69
March	23974.19	31100.00	44190.52	51564.52	89738.71	.46	28767.74	40893.55	48609.68	73390.68	94019.35	.67
April	28473.33	37450.00	47326.67	74813.34	109673.30	.79	42943.33	50543.33	57503.33	91733.34	121500.00	.72
May	28096.77	33193.55	50793.55	72945.16	100100.00	.78	42648.39	51461.29	73064.52	97016.13	117603.70	.62
June	43116.67	60140.00	73393.34	134243.30	153760.00	1.01	44926.67	62820.00	71036.66	91160.00	124166.70	.40
July	28551.81	39758.07	69767.74	92783.87	100425.80	.76	40696.77	48016.13	66716.13	84096.77	93067.74	.54
August	14948.39	28529.03	34870.97	43996.77	52132.26	.44	38380.64	47380.64	58696.77	66345.16	70770.97	.32
September	15366.67	22813.33	30536.67	40236.67	51606.67	.57	40500.00	42960.00	57520.00	72396.66	77140.00	.51
Parameter Group #2												
1-day minimum	1700.00	4700.00	6380.00	9500.00	14300.00	.75	8020.00	11800.00	16800.00	26400.00	31800.00	.87
3-day minimum	1866.67	4943.33	6673.33	10933.33	14400.00	.79	8886.67	12090.00	18380.00	26933.33	32440.00	.81
7-day minimum	2714.29	5451.43	7412.86	11600.00	15485.71	.83	11000.00	13880.00	20657.14	27928.57	34228.57	.68
30-day minimum	7188.00	8702.00	11643.00	16230.00	19386.67	.65	17546.67	19510.00	26310.00	33913.33	40956.67	.55
90-day minimum	10493.89	12132.00	16828.22	20500.00	23356.67	.50	20458.89	25620.00	32262.22	40605.55	49025.55	.46
1-day maximum	64800.00	106000.00	144000.00	216000.00	260000.00	.76	108000.00	120000.00	160000.00	210000.00	247000.00	.49
3-day maximum	61300.00	10866.70	133666.70	205333.30	258666.70	.79	102400.00	110000.00	155333.30	186333.30	228666.70	.49
7-day maximum	57157.14	95028.57	129142.90	187142.90	238285.70	.71	83085.71	99157.14	130785.70	177428.60	214571.40	.60
30-day maximum	46133.33	73376.66	96723.34	133496.70	174200.00	.64	68550.00	76443.34	101263.30	136550.00	159243.30	.59
90-day maximum	36493.33	56102.22	70776.66	104036.70	124240.00	.68	52378.89	65123.33	78721.11	104667.80	117221.10	.50
Parameter Group #3												
Date of minimum JD 1-366,	346.00	352.00	365.00	376.00	24.00	.06	357.00	6.00	12.00	24.00	31.00	.05
Date of maximum JD 1-366,	81.00	130.00	165.00	173.00	179.00	.12	85.00	117.00	163.00	224.00	272.00	.29
Date of minimum JD 122-305,	237.00	263.00	278.00	292.00	299.00	.08	126.00	160.00	223.00	262.00	301.00	.28
Date of maximum JD 122-305,	126.00	157.00	170.00	175.00	182.00	.05	139.00	150.00	168.00	210.00	257.00	.16
Parameter Group #4												
Low pulse count	5.00	6.00	8.00	10.00	12.00	.50	1.00	2.00	3.00	5.00	8.00	1.00
Low pulse duration	8.13	12.75	15.86	22.33	28.43	.60	2.00	11.00	18.50	31.25	70.00	1.09
High pulse count	.00	3.00	6.00	7.00	10.00	.67	2.00	5.00	6.00	10.00	13.00	.83
High pulse duration	.00	4.00	6.50	17.33	22.40	2.05	3.75	5.40	7.60	11.93	26.00	.86
Parameter Group #5												
Rise rate	2550.57	3293.77	4169.74	6664.87	7133.09	.81	2500.00	3202.68	3790.60	6398.58	8632.81	.84
Fall rate	-5623.74	-4759.62	-3518.44	-2505.34	-2301.65	-.64	-4916.59	-4215.46	-2779.08	-2359.07	-1986.92	-.67
Number of reversals	82.00	85.00	92.00	97.00	101.00	.13	97.00	101.00	106.00	115.00	123.00	.13

IHA Parametric RVA Scorecard
KANSAS CITY, MISSOURI

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA Targets				Rate of Non-Attainment	
		Std.		Range Limits		Std.		Range Limits		Low		High	
	Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High	Low	High	
Parameter Group #1													
October	29158.9	.6	12361.3	78293.5	59010.1	.4	34651.6	135245.2	12912.7	45405.1	66.7%		
November	28932.9	.4	13230.0	57816.7	54287.4	.3	20556.7	93343.3	16052.5	41813.4	76.7%		
December	18180.0	.4	7906.5	35112.9	39467.6	.4	16095.2	75371.0	10927.2	25432.7	83.3%		
January	16864.6	.4	5010.0	29609.7	31148.6	.4	15841.9	60977.4	10653.8	23075.4	70.0%		
February	24254.7	.3	9308.3	41792.9	40384.5	.4	17932.1	77692.9	15953.5	32555.8	63.3%		
March	50086.8	.5	21051.6	101200.0	59471.7	.5	24738.7	133674.2	26109.7	74063.8	30.0%		
April	62918.0	.6	28023.3	143326.7	71651.5	.4	36366.7	148926.7	28075.8	97760.2	23.3%		
May	57695.5	.5	26419.4	115764.5	76533.4	.4	37232.3	145793.5	30500.3	84890.7	33.3%		
June	97013.0	.5	38240.0	192963.3	81622.2	.4	40413.3	173850.0	50101.1	143924.9	26.7%		
July	69053.7	.4	28212.9	120796.8	73812.8	.6	39225.8	288258.1	39001.5	99105.9	10.0%		
August	37159.7	.4	12477.4	73103.2	60363.9	.3	33854.8	144312.9	21507.1	52812.3	66.7%		
September	32985.7	.4	13203.3	55780.0	60527.4	.3	34513.3	115573.3	19878.1	46093.3	70.0%		
Parameter Group #2													
1-day minimum	7721.0	.6	1500.0	16200.0	19786.0	.5	6690.0	43400.0	3376.2	12065.8	70.0%		
3-day minimum	8048.0	.5	1820.0	16200.0	20954.6	.5	7616.7	43733.3	3646.7	12449.3	70.0%		
7-day minimum	8840.6	.5	2142.9	16242.9	22785.5	.4	9167.1	44842.9	4385.3	13296.0	76.7%		
30-day minimum	12962.1	.4	4899.7	21443.3	28024.5	.3	15060.0	48680.0	8153.4	17770.8	86.7%		
90-day minimum	17249.1	.3	9637.4	27207.8	33908.9	.3	17527.8	58374.4	11912.7	22585.5	86.7%		
1-day maximum	171645.0	.5	63100.0	32600.0	179773.3	.5	65200.0	52900.0	93439.6	249850.4	13.3%		
3-day maximum	163695.0	.5	60866.7	302333.3	167225.6	.5	62800.0	511000.0	89286.3	238103.7	10.0%		
7-day maximum	148000.7	.4	52371.4	256142.9	146321.5	.5	58985.7	447714.3	82912.7	213088.8	20.0%		
30-day maximum	108962.5	.4	40770.0	210400.0	115005.3	.4	52096.7	305000.0	60996.5	156928.5	16.7%		
90-day maximum	79243.7	.4	31954.4	138851.1	88439.1	.4	49050.0	185110.0	46459.8	112027.6	16.7%		

IHA Parametric RVA Scorecard, continued

KANSAS CITY, MISSOURI

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA TARGETS				RATE OF NON-ATTAINMENT	
		Std.		Range Limits		Std.		Range Limits					
Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High				
Parameter Group #3													
Date of minimum JD 1-366,	.1	3.0	365.0	11.6	.0	4.0	366.0	332.0	7.0	100.0%			
Date of maximum JD 1-366,	.1	72.0	201.0	172.1	.2	54.0	287.0	138.6	167.9	80.0%			
Parameter Group #4													
Low pulse count	2.3	.8	.0	7.0	.3	2.0	.0	2.0	.4	4.3	76.7%		
Low pulse duration	9.6	1.3	.0	58.0	.6	2.5	.0	8.0	1.5	22.6	86.7%		
High pulse count	2.3	1.1	.0	9.0	2.5	1.1	.0	10.0	.0	4.9	26.7%		
High pulse duration	3.6	1.2	.0	13.8	3.4	1.4	.0	18.0	.0	8.0	13.3%		
The low pulse threshold is	11397.00												
The high pulse threshold is	134243.00												
Parameter Group #5													
Rise rate	5131.0	.5	2156.7	10249.3	4844.7	.5	1424.6	10977.2	2804.3	7457.8	33.3%		
Fall rate	-3627.6	-.4	-6772.5	.0	-3237.3	-.4	-7256.4	.0	-5049.6	-2205.6	30.0%		
Number of reversals	91.6	.1	71.0	107.0	108.8	.1	87.0	137.0	83.2	99.9	83.3%		

Note: Parameter numbers 13, 14, 15 and 16 use the 25th percentile level for RVA targets instead of -1SD
 Parameter number 22 uses the 75th percentile level for RVA target instead of +1SD

IHA Non-Parametric RVA Scorecard

KANSAS CITY, MISSOURI

Pre-impact period: 1929-1948			Post-impact period: 1967-1996			RVA Targets			Rate of Non-Attainment	
			Range Limits			Range Limits				
			Means	Var.		Means	Var.		Low	High
Parameter	Group #1									
October	27316.1	.7	12361.3	78293.5	54129.0	.4	34651.6	135245.2	16158.1	34493.5
November	28283.3	.7	13230.0	57816.7	55053.3	.4	20556.7	93343.3	18023.3	38683.3
December	15798.7	.6	7906.5	35112.9	36112.9	.5	16095.2	75371.0	11397.1	21396.8
January	17380.6	.5	5010.0	29609.7	26877.4	.6	15841.9	60977.4	11460.3	20199.4
February	23653.6	.5	9308.3	41792.9	35469.0	.7	17932.1	77692.9	16021.4	28421.4
March	44190.3	.5	21051.6	101200.0	48609.7	.7	24738.7	133674.2	31100.0	51564.5
April	47326.7	.8	28023.3	143326.7	57503.3	.7	36366.7	148926.7	37450.0	74813.3
May	50793.5	.8	26419.4	115764.5	73064.5	.6	37232.3	145793.5	33193.5	72945.2
June	73393.3	1.0	38240.0	192963.3	71036.7	.4	40413.3	173850.0	60140.0	134243.3
July	69767.7	.8	28212.9	120796.8	66716.1	.5	39225.8	288258.1	39758.1	92783.9
August	34871.0	.4	12477.4	73103.2	58696.8	.3	33854.8	144312.9	28529.0	43996.8
September	30536.7	.6	13203.3	55780.0	57520.0	.5	34513.3	115573.3	22813.3	40236.7
Parameter	Group #2									
1-day minimum	6380.0	.8	1500.0	16200.0	16800.0	.9	6690.0	43400.0	4700.0	9500.0
3-day minimum	6673.3	.9	1820.0	16200.0	18333.3	.8	7616.7	43733.3	4943.3	10933.3
7-day minimum	7412.9	.8	2142.9	16242.9	20657.1	.7	9167.1	44842.9	5451.4	11600.0
30-day minimum	11643.0	.6	4899.7	21443.3	26310.0	.5	15060.0	48680.0	8702.0	16230.0
90-day minimum	16828.2	.5	9637.4	27207.8	32262.2	.5	17527.8	58374.4	12132.0	20500.0
1-day maximum	14400.0	.8	63100.0	32600.0	165000.0	.5	65200.0	529000.0	106000.0	216000.0
3-day maximum	13366.7	.8	60866.7	302333.3	155333.3	.5	62800.0	511000.0	10866.7	206333.3
7-day maximum	129142.9	.7	52371.4	256142.9	130785.7	.6	58985.7	447714.3	95028.6	187142.9
30-day maximum	96723.3	.6	40770.0	210400.0	101263.3	.6	52096.7	305000.0	73376.7	135496.7
90-day maximum	70776.7	.7	31954.4	138851.1	78721.1	.5	49050.0	185110.0	56102.2	104036.7

IHA Non-Parametric RVA Scorecard, continued

KANSAS CITY, MISSOURI

Pre-impact period: 1929-1948

	Range Limits			Post-impact period: 1967-1996 Range Limits			RVA TARGETS			RATE OF NON-ATTAINMENT	
	Means	Var.	Low	High	Means	Var.	Low	High	Low	High	
Parameter Group #3											

Date of minimum JD 1-366, 365.0 .1 3.0 365.0 12.0 .0 4.0 366.0 8.0 354.0 26.7%
Date of maximum JD 1-366, 165.0 .1 72.0 201.0 163.0 .3 54.0 287.0 130.0 173.0 73.3%

Date of minimum JD 122-305, 278.0 .1 214.0 305.0 223.0 .3 124.0 305.0 263.0 292.0 90.0%
Date of maximum JD 122-305, 170.0 .0 124.0 201.0 168.0 .2 125.0 287.0 157.0 175.0 66.7%

Parameter Group #4

Low Pulse Count 8.0 .5 4.0 13.0 3.0 1.0 .0 14.0 6.0 10.0 83.3%
Low Pulse Duration 15.9 .6 8.0 40.3 18.5 1.1 .0 109.0 12.8 22.3 73.3%
High Pulse Count 6.0 .7 .0 12.0 6.0 .8 .0 16.0 3.0 7.0 60.0%
High Pulse Duration 6.5 2.1 .0 31.8 7.6 .9 .0 48.8 4.0 17.3 26.7%

The low pulse threshold is 11397.00
The high pulse level is 134243.00

Parameter Group #5

Rise rate 4169.7 .8 2156.7 10249.3 3790.6 .8 1424.6 10977.2 3293.8 6664.9 50.0%
Fall rate -3518.4 -.6 -6772.5 .0 -2779.1 -.7 -7256.4 .0 .0 -2505.3 100.0%
Number of reversals 92.0 .1 71.0 107.0 106.0 .1 87.0 137.0 85.0 97.0 90.0%

IHA Output - Missouri and Lower Yellowstone Rivers

Boonville, Missouri
Channelized Section

Report Station ID: 317BV
USGS Station Number: 06909000

Missing Years: None

IHA Parametric Scorecard
BOONVILLE, MISSOURI

Pre-impact period: 1929-1948 (20 years)		Post-impact period: 1967-1996 (30 years)	
Watershed Area	501700.00		
Mean Annual Flow	52506.18		
Mean Flow/Area	.10		
Annual C. V.	.93		
Flow Predictability	.54		
Flow Constancy	.39		
Constancy/Predictability	.72		
Flow Contingency	.15		

Parameter	Group #1	MEAN		COEFF. OF VAR.		DEVIATION FACTOR		DEV. OF C.V.
		Pre	Post	Pre	Post	Magnitude	%	
October	33425.3	68449.9	.57	.55	35024.6	104.8	-.03	-4.8
November	37927.0	63304.3	.71	.34	25377.3	66.9	-.37	-52.4
December	24214.2	49122.0	.47	.44	24907.8	102.9	-.03	-5.6
January	21900.4	37778.7	.54	.44	15878.3	72.5	-.10	-17.9
February	30936.0	50651.2	.42	.45	19715.2	63.7	.03	6.8
March	61116.9	73547.9	.53	.55	12430.9	20.3	.02	3.8
April	78603.8	91414.2	.65	.50	12810.4	16.3	-.15	-23.1
May	71781.8	98330.7	.48	.45	26548.9	37.0	-.03	-6.5
June	114327.0	98360.3	.58	.46	-15966.6	-14.0	-.12	-20.6
July	77068.0	88123.4	.45	.70	11055.4	14.3	.25	55.5
August	41149.4	67864.0	.41	.46	26714.6	64.9	.06	13.5
September	35841.5	68569.0	.36	.40	32277.5	91.3	.04	9.8
Mean % change					55.7	18.4		
Parameter	Group #2	MEAN		COEFF. OF VAR.		DEVIATION FACTOR		DEV. OF C.V.
1-day minimum	8987.0	22853.3	.48	.43	13866.3	154.3	-.04	-8.6
3-day minimum	9384.3	23704.4	.46	.41	14320.1	152.6	-.05	-11.3
7-day minimum	10120.8	25519.5	.45	.38	15398.7	152.1	-.07	-14.6
30-day minimum	15341.1	31398.7	.37	.33	16057.6	104.7	-.04	-11.2
90-day minimum	21012.3	39565.5	.34	.32	18553.2	88.3	-.02	-4.8
1-day maximum	218450.0	251500.0	.57	.43	33050.0	15.1	-.14	-23.8
3-day maximum	210966.7	240593.3	.57	.45	29626.7	14.0	-.12	-20.8
7-day maximum	192012.9	215576.7	.56	.46	23563.8	12.3	-.10	-17.9
30-day maximum	133029.0	153697.5	.55	.46	20668.5	15.5	-.08	-15.2
90-day maximum	96334.2	113214.1	.47	.40	16879.9	17.5	-.07	-15.4
Mean % change					73.3	15.7		

THA Parametric Scorecard, continued
 BOONVILLE, MISSOURI

Pre-impact period: 1929-1948 (20 years)				Post-impact period: 1967-1996 (30 years)			
MEAN		COEFF. OF VAR.		DEVIATION FACTOR		DEV. OF C.V.	
Pre	Post	Pre	Post	Pre	Post	Magnitude	%
Parameter Group #3							
Date of minimum JD 1-366, 15.0	10.8	.17	.06	4.2	2.3	-.11	-63.3
Date of maximum JD 1-366, 142.9	177.8	.19	.22	34.9	19.0	.02	12.7
Mean % change				10.7		38.0	
Date of minimum JD 122-305, 277.3	237.3	.06	.14	40.0	21.8	.08	133.7
Date of maximum JD 122-305, 169.8	185.5	.07	.15	15.8	8.6	.08	119.5
Mean % change				15.2		126.6	
Parameter Group #4							
Low pulse count	2.7	.2	.76	2.42	-2.5	-92.5	1.66
Low pulse duration	9.0	.4	.81	2.59	-8.6	-95.5	1.78
High pulse count	2.2	3.7	1.30	.90	1.5	70.5	-40
High pulse duration	4.4	4.8	1.44	.99	.4	9.8	-44
Mean % change				67.1		125.3	
The low pulse threshold is	13677.00						
The high pulse level is	156940.00						
Parameter Group #5							
Rise rate	6641.9	7518.9	.48	.43	877.1	13.2	-.05
Fall rate	-4360.2	-4828.6	-.41	-.40	-468.4	10.7	.01
Number of reversals	82.4	95.4	.11	.10	12.9	15.7	.00
Mean % change				13.2		5.6	

Non-Parametric TIA Scorecard
BOONVILLE, MISSOURI

Pre-impact period: 1929-1948 (20 years)			Post-impact period: 1967-1996 (30 years)		
	Parameter	Group #1	Parameter	Group #2	Parameter
Watershed area	Mean annual flow	501700.00	52506.18	71342.91	
Mean Flow/area	Annual C. V.	.10	.47	.14	
Flow predictability	Flow Constancy	.54	*	.34	
Constancy/predictability	Flow Contingency	.72	.39	.61	
		.15		.51	
				.83	
				.10	

		MEDIANS	COEFF. of VAR.	DEVIATION FACTOR	SIGNIFICANCE COUNT
	Parameter	Pre	Post	Medians	Medians
October	31054.8	56035.5	.69	.53	.24
November	30436.7	63053.3	.76	.48	.00
December	20417.1	44271.0	.64	.53	.37
January	19153.9	32638.7	.62	.53	.17
February	27653.6	45042.9	.49	.71	.15
March	57296.8	57490.3	.58	.72	.00
April	58066.7	73843.3	.80	.82	.25
May	60067.7	90388.7	1.00	.57	.27
June	87196.7	83853.3	1.10	.41	.02
July	78380.6	73645.2	.76	.64	.00
August	39809.7	65196.8	.45	.33	.94
September	35250.0	63230.0	.43	.52	.27
				.79	.00
				.20	.00
				.63	.00

	Parameter	Group #2			
1-day minimum	8150.0	17700.0	.73	.86	.17
3-day minimum	8816.7	19033.3	.66	.80	.16
7-day minimum	9564.3	22557.1	.62	.68	.36
30-day minimum	14141.0	27790.0	.33	.57	.97
90-day minimum	20714.9	37936.7	.50	.43	.83
1-day maximum	162000.0	242000.0	1.15	.38	.49
3-day maximum	156666.7	232333.3	1.17	.41	.48
7-day maximum	146285.7	189857.1	1.28	.64	.30
30-day maximum	100516.7	125330.0	1.04	.71	.25
90-day maximum	78008.9	98383.3	.92	.52	.26
				.44	.17
				.26	.14

Non-Parametric IHA Scorecard, continued
BOONVILLE, MISSOURI

Pre-impact period: 1929-1948 (20 years)				Post-impact Period: 1967-1996 (30 years)			
MEDIAN		COEFF.		DEVIATION FACTOR		SIGNIFICANCE	COUNT
Pre	Post	Pre	Post	Post	Medians	C.V.	Medians
Parameter Group #3							
Date of minimum JD 1-366,	4.0	13.0	.05	.05	.00	.03	.96
Date of maximum JD 1-366,	156.0	163.0	.25	.38	.04	.74	.15
Parameter Group #4							
Low pulse count	9.0	4.0	.56	1.00	.56	.80	.06
Low pulse duration	19.7	13.0	.56	.79	.34	.43	.07
High pulse count	6.0	9.0	.67	.78	.50	.17	.01
High pulse duration	7.0	8.3	1.46	.75	.18	.49	.64
The low pulse threshold is	13677.00						
The high pulse level is	156940.00						
Parameter Group #5							
Rise rate	5695.8	6738.8	.68	.62	.18	.08	.30
Fall rate	-3947.8	-4617.1	-.70	-.56	.17	.20	.33
Number of reversals	84.0	97.0	.18	.15	.15	.13	.00

IHA Percentile Data
BOONVILLE, MISSOURI

	Pre-impact period: 1929-1948 (20 years)				Post-impact period: 1967-1996 (30 years)							
	10%	25%	50%	75%	90%	(75-25)/50	10%	25%	50%	75%	90%	(75-25)/50
Parameter Group #1												
October	13574.19	18825.81	31054.84	40361.29	43329.03	.69	40080.64	44590.32	56035.48	74177.42	99487.09	.53
November	14736.67	17773.33	30436.67	40940.00	43793.33	.76	46516.67	63053.33	76800.00	91703.34	.48	
December	12610.00	15558.06	20417.10	28625.81	44006.45	.64	23287.10	34577.42	44270.97	58193.35	85164.52	.53
January	10082.26	13677.42	19153.10	25646.45	27170.97	.62	22567.74	26116.13	32638.71	43419.36	56016.13	.53
February	14938.57	21982.14	27653.57	35482.76	49132.14	.49	24735.71	35071.43	45042.86	67046.43	80703.57	.71
March	26806.45	33293.55	57296.77	66258.06	121487.10	.58	31245.16	57490.32	90561.29	123177.40	.72	
April	31330.00	44303.33	58066.67	90590.00	164680.00	.80	45920.00	61253.33	73843.34	121523.30	161900.00	.82
May	33425.80	39100.00	60067.74	99054.84	125735.50	1.00	48148.39	66993.55	90338.71	118859.10	149680.60	.57
June	45923.33	60786.67	87196.66	156940.00	198500.00	1.10	49120.00	71100.00	83853.34	105533.30	174980.00	.41
July	30645.16	43145.16	78380.65	102658.10	106951.60	.76	43483.87	50245.16	73645.16	97454.16	120751.60	.64
August	15974.19	30141.94	39809.68	48129.03	60261.29	.45	41851.61	50880.64	65196.77	72245.16	86551.61	.33
September	17476.67	25840.00	35250.00	41070.00	51163.33	.43	41906.67	48573.33	63230.00	81360.00	88770.00	.52
Parameter Group #2												
1-day minimum	4100.00	5640.00	8150.00	11600.00	12900.00	.73	12500.00	15000.00	17700.00	30200.00	36800.00	.86
3-day minimum	4233.33	6016.67	88166.67	118666.67	143666.67	.66	13166.67	16033.34	19033.34	30200.00	36800.00	.80
7-day minimum	4571.43	6675.71	9564.29	12571.43	16057.14	.62	13900.00	17128.57	22557.14	32542.86	37271.43	.68
30-day minimum	7883.33	12273.67	14141.00	16883.33	22060.00	.33	19596.67	22913.33	27790.00	38853.33	45020.00	.57
90-day minimum	11201.56	14176.67	20714.89	24596.67	30623.89	.50	23801.11	30296.67	37936.67	46535.55	55965.55	.43
1-day maximum	74000.00	115000.00	162000.00	201000.00	240000.00	1.15	130000.00	188000.00	242000.00	320000.00	380000.00	.38
3-day maximum	70400.00	113333.30	156666.70	296333.30	339000.00	1.17	125000.00	179000.00	232333.30	274000.00	311000.00	.41
7-day maximum	62942.86	99200.00	146285.70	286285.70	314285.70	1.28	113542.90	146571.40	189857.10	267285.70	295285.70	.64
30-day maximum	49133.33	79663.34	100516.70	183966.70	207766.70	1.04	87760.00	102183.30	125330.00	190566.70	223600.00	.71
90-day maximum	42065.55	61718.89	78008.89	133555.60	162642.20	.92	58451.11	83184.45	98383.34	134297.80	181212.20	.52
Parameter Group #3												
Date of minimum JD 1-366	348.00	359.00	4.00	13.00	26.00	.05	351.00	6.00	13.00	26.00	34.00	.05
Date of maximum JD 1-366	53.00	83.00	156.00	174.00	201.00	.25	86.00	117.00	163.00	256.00	279.00	.38
Date of minimum JD 122-305	238.00	264.00	278.00	294.00	302.00	.08	146.00	202.00	245.00	274.00	304.00	.20
Date of maximum JD 122-305	125.00	157.00	173.00	176.00	201.00	.05	124.00	138.00	165.00	225.00	268.00	.24
Parameter Group #4												
Low pulse count	5.00	6.00	9.00	11.00	12.00	.56	1.00	4.00	8.00	11.00	1.00	
Low pulse duration	7.43	12.56	19.71	23.50	28.00	.56	4.20	8.33	13.00	18.63	22.38	.79
High pulse count	.00	3.00	6.00	7.00	9.00	.67	2.00	5.00	9.00	12.00	14.00	.78
High pulse duration	.00	4.29	7.00	14.50	20.67	1.46	3.73	4.73	8.25	10.92	21.00	.75
Parameter Group #5												
Rise rate	2768.68	4153.71	5695.80	8016.44	9351.56	.68	3872.66	5080.31	6738.81	9280.00	11476.92	.62
Fall rate	-7192.27	-5813.30	-3947.85	-3049.77	-2287.10	-.70	-7009.17	-6129.28	-4617.07	-3536.17	-2835.27	-.56
Number of reversals	72.00	74.00	84.00	89.00	91.00	.18	83.00	86.00	97.00	101.00	112.00	.15

IHA Parametric RVA Scorecard
BOONVILLE, MISSOURI

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA Targets				Rate of Non-Attainment	
		Std.		Range Limits		Std.		Range Limits		Low		High	
	Means	Dev.	Low	High	Means	Dev.	Low	High	Targets	Low	High	Targets	Low
Parameter	Group #1												
October	33425.3	.6	12919.4	97583.9	68449.9	.5	37122.6	187838.7	14222.1	52628.6	56.7%		
November	37927.0	.7	14273.3	124466.7	63304.3	.3	24600.0	103886.7	17773.3	64897.0	50.0%		
December	24214.2	.5	8050.3	46574.2	49122.0	.4	20238.7	106225.8	12850.1	35578.3	73.3%		
January	21900.4	.5	4919.0	53948.4	37778.7	.4	18090.3	90151.6	10157.4	33643.5	46.7%		
February	30936.0	.4	9693.1	61300.0	50651.2	.5	20532.1	106354.0	17888.4	43983.6	53.3%		
March	61116.9	.5	25519.4	131729.0	73547.9	.5	27825.8	183900.0	28894.9	93339.0	30.0%		
April	78603.8	.6	31316.7	197386.7	91414.2	.5	39056.7	212733.3	44303.3	129409.5	26.7%		
May	71781.8	.5	26945.2	129867.7	98330.7	.4	40774.2	23471.9	37584.7	105978.9	40.0%		
June	114327.0	.6	37210.0	283700.0	98360.3	.5	41993.3	201076.7	47655.4	180998.6	16.7%		
July	77068.0	.4	30219.4	155058.1	88123.4	.7	41558.1	375161.3	42472.6	111663.5	23.3%		
August	41149.4	.4	14316.1	79329.0	67864.0	.5	36574.2	213645.2	24410.8	57887.9	60.0%		
September	35841.5	.4	17443.3	61586.7	68569.0	.4	36730.0	165933.3	22881.3	48801.7	70.0%		
Parameter	Group #2												
1-day minimum	8987.0	.5	1800.0	19400.0	22853.3	.4	11000.0	46000.0	4715.4	13258.6	83.3%		
3-day minimum	9384.3	.5	1933.3	19566.7	23704.4	.4	12366.7	46100.0	5047.9	13720.8	86.7%		
7-day minimum	10120.8	.4	2142.9	20871.4	25519.5	.4	13185.7	47214.3	5597.9	14643.7	86.7%		
30-day minimum	15341.1	.4	4806.3	26673.3	31398.7	.3	17570.0	53340.0	9691.1	20991.1	83.3%		
90-day minimum	21012.3	.3	10005.4	34530.0	39565.5	.3	19786.7	70896.7	13850.3	28174.3	80.0%		
1-day maximum	218450.0	.6	73000.0	490000.0	251500.0	.4	121000.0	721000.0	94259.8	342640.2	6.7%		
3-day maximum	210966.7	.6	64800.0	465000.0	240593.3	.4	106200.0	696333.3	91708.1	330225.2	6.7%		
7-day maximum	192012.9	.6	51742.9	396714.3	215576.7	.5	85085.7	609142.9	84631.5	29394.3	6.7%		
30-day maximum	133029.0	.5	40800.0	311333.3	153697.5	.5	60710.0	408600.0	60182.6	205875.3	16.7%		
90-day maximum	96334.2	.5	32368.9	187145.6	113214.1	.4	55400.0	253544.4	51217.0	141451.4	20.0%		

IHA Parametric RVA Scorecard, continued
 BOONVILLE, MISSOURI

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA TARGETS				RATE OF NON-ATTAINMENT	
		Std.		Range Limits		Std.		Range Limits		Low		High	
	Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High	Low	High	
Parameter Group #3													
Date of minimum JD 1-366,	15.0	.2	2.0	366.0	10.8	.1	6.0	366.0	12.5	17.5	73.3%		
Date of maximum JD 1-366,	142.9	.2	10.0	333.0	177.8	.2	54.0	356.0	115.3	170.6	70.0%		
Date of minimum JD 122-305,	277.3	.1	232.0	305.0	237.3	.1	122.0	305.0	260.3	294.2	83.3%		
Date of maximum JD 122-305,	169.8	.1	122.0	230.0	185.5	.2	122.0	292.0	157.8	181.7	83.3%		
Parameter Group #4													
Low pulse count	2.7	.8	.0	7.0	.2	2.4	.0	2.0	.6	4.7	83.3%		
Low pulse duration	9.0	.8	.0	30.0	.4	2.6	.0	4.0	1.7	16.3	90.0%		
High pulse count	2.2	1.3	.0	9.0	3.7	.9	.0	13.0	.0	4.9	40.0%		
High pulse duration	4.4	1.4	.0	26.5	4.8	1.0	.0	21.0	.0	10.6	6.7%		
The low pulse threshold is	13677.00												
The high pulse threshold is	156940.00												

Parameter Group #5	Parameter	6641.9	.5	2537.4	16086.7	7518.9	.4	2825.5	16999.3	34465.0	9818.7	26.7%
Rise rate		-4360.2	-.4	-8600.0	.0	-4828.6	-.4	-10956.5	.0	-6165.9	-2554.4	26.7%
Fall rate		82.4	.1	63.0	98.0	95.4	.1	81.0	115.0	73.6	91.3	56.7%

Note: Parameter numbers 2, 7, 13, 14, 15 and 16 use the 25th percentile for RVA targets instead of -1SD

THA Non-Parametric RVA Scorecard

BOONVILLE, MISSOURI

Pre-impact period: 1929-1948

	Range Limits			Post-impact period: 1967-1996			RVA Targets			Rate of Non-Attainment	
	Means	Var.	Low	High	Means	Var.	Low	High			
October	Parameter Group #1	.7	12919.4	97583.9	56035.5	.5	37122.6	18825.8	40361.3	86.7%	
November		.8	14273.3	124466.7	63053.3	.5	24600.0	103866.7	17773.3	83.3%	
December		.6	8050.3	46574.2	44271.0	.5	20238.7	106225.8	15558.1	86.7%	
January		.6	4919.0	53948.4	32638.7	.7	20532.1	106325.0	90151.6	83.3%	
February		.5	9693.1	61300.0	45042.9	.7	21982.1	13677.4	25646.5	76.7%	
March		.6	25519.4	131729.0	57490.3	.7	27825.8	183900.0	33293.5	56.7%	
April		.8	31316.7	197386.7	73843.3	.8	39056.7	21273.3	44303.3	33.3%	
May		1.0	26945.2	129867.7	90338.7	.6	40774.2	234741.9	39100.0	99054.8	
June		1.1	37210.0	283700.0	83853.3	.4	41993.3	201076.7	60786.7	156940.0	
July		.8	30219.4	155058.1	73645.2	.6	41558.1	43145.2	102658.1	30.0%	
August		.5	14316.1	79329.0	65196.8	.3	36574.2	213645.2	30141.9	48129.0	
September		35250.0	.4	17443.3	61586.7	63230.0	.5	36730.0	165933.3	25840.0	83.3%
											93.3%

Parameter Group #2

1-day minimum	8150.0	.7	1800.0	19400.0	17700.0	.9	11000.0	46000.0	5640.0	11600.0
3-day minimum	8816.7	.7	1933.3	19566.7	19033.3	.8	12366.7	46100.0	6016.7	11866.7
7-day minimum	9564.3	.6	2142.9	20871.4	22557.1	.7	13185.7	47244.3	6675.7	12571.4
30-day minimum	14141.0	.3	4806.3	26673.3	27790.0	.6	17570.0	53340.0	12273.7	16883.3
90-day minimum	20714.9	.5	10005.4	34530.0	37936.7	.4	19786.7	70896.7	14176.7	24596.7
1-day maximum	162000.0	1.1	73000.0	490000.0	242000.0	.4	121000.0	721000.0	115000.0	301000.0
3-day maximum	156666.7	1.2	64800.0	465000.0	232333.3	.4	106200.0	696333.3	113333.3	296333.3
7-day maximum	146285.7	1.3	51742.9	396714.3	189857.1	.6	85085.7	609142.9	99200.0	286285.7
30-day maximum	100516.7	1.0	40800.0	311333.3	125330.0	.7	60710.0	408600.0	79663.3	183966.7
90-day maximum	78008.9	.9	32368.9	187145.6	98383.3	.5	55400.0	253544.4	61718.9	133555.6

1-day minimum	8150.0	.7	1800.0	19400.0	17700.0	.9	11000.0	46000.0	5640.0	11600.0
3-day minimum	8816.7	.7	1933.3	19566.7	19033.3	.8	12366.7	46100.0	6016.7	11866.7
7-day minimum	9564.3	.6	2142.9	20871.4	22557.1	.7	13185.7	47244.3	6675.7	12571.4
30-day minimum	14141.0	.3	4806.3	26673.3	27790.0	.6	17570.0	53340.0	12273.7	16883.3
90-day minimum	20714.9	.5	10005.4	34530.0	37936.7	.4	19786.7	70896.7	14176.7	24596.7
1-day maximum	162000.0	1.1	73000.0	490000.0	242000.0	.4	121000.0	721000.0	115000.0	301000.0
3-day maximum	156666.7	1.2	64800.0	465000.0	232333.3	.4	106200.0	696333.3	113333.3	296333.3
7-day maximum	146285.7	1.3	51742.9	396714.3	189857.1	.6	85085.7	609142.9	99200.0	286285.7
30-day maximum	100516.7	1.0	40800.0	311333.3	125330.0	.7	60710.0	408600.0	79663.3	183966.7
90-day maximum	78008.9	.9	32368.9	187145.6	98383.3	.5	55400.0	253544.4	61718.9	133555.6

IHA Non-Parametric RVA Scorecard, continued

BOONVILLE, MISSOURI

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA TARGETS			
		Range Limits		Range Limits				Low	High		
Means	Var.	Low	High	Means	Var.	Low	High				
Parameter Group #3											
Date of minimum JD 1-366,	4.0	.1	2.0	366.0	13.0	.1	6.0	366.0	7.0	353.0	16.7%
Date of maximum JD 1-366,	156.0	.2	10.0	333.0	163.0	.4	54.0	356.0	83.0	174.0	53.3%
Parameter Group #4											
Date of minimum JD 122-305,	278.0	.1	232.0	305.0	245.0	.2	122.0	305.0	264.0	294.0	86.7%
Date of maximum JD 122-305,	173.0	.1	122.0	230.0	165.0	.2	122.0	292.0	157.0	176.0	86.7%

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA TARGETS			
		Range Limits		Range Limits				Low	High		
Means	Var.	Low	High	Means	Var.	Low	High				
Parameter Group #5											
Rise rate	5695.8	.7	2537.4	16086.7	6738.8	.6	2825.5	16999.3	4153.7	8016.4	46.7%
Fall rate	-3947.8	-.7	-8600.0	.0	-4637.1	-.6	-10956.5	.0	.0	-3049.8	100.0%
Number of reversals	84.0	.2	63.0	98.0	97.0	.2	81.0	115.0	74.0	89.0	56.7%

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA TARGETS			
		Range Limits		Range Limits				Low	High		
Means	Var.	Low	High	Means	Var.	Low	High				
Parameter Group #5											
Rise rate	5695.8	.7	2537.4	16086.7	6738.8	.6	2825.5	16999.3	4153.7	8016.4	46.7%
Fall rate	-3947.8	-.7	-8600.0	.0	-4637.1	-.6	-10956.5	.0	.0	-3049.8	100.0%
Number of reversals	84.0	.2	63.0	98.0	97.0	.2	81.0	115.0	74.0	89.0	56.7%

The low pulse threshold is 13677.00
 The high pulse level is 156940.00

IHA Output - Missouri and Lower Yellowstone Rivers

Hermann, Missouri
Channelized Section

Report Station ID: *158HM*
USGS Station Number: 06934500

Missing Years: None

IHA Parametric Scorecard
HERMANN, MISSOURI

Pre-impact period: 1929-1948 (20 years)			Post-impact period: 1967-1996 (30 years)		
	MEAN	COEFF. of VAR.		MEAN	COEFF. of VAR.
	Pre	Post	Pre	Post	Magnitude %
Watershed Area	524200.00				
Mean Annual Flow	69051.92				
Mean Flow/Area	.13				
Annual C. V.	.95				
Flow Predictability	.52				
Flow Constancy	.40				
Constancy/Predictability	.76				
Flow Contingency	.12				
Parameter Group #1					
October	43739.7	83403.1	.79	.69	39663.5
November	50440.3	84241.2	.68	.41	33800.9
December	35668.7	71159.5	.50	.53	35490.8
January	35619.6	55117.8	.53	.50	19498.3
February	44294.9	71441.8	.43	.45	27146.9
March	79694.2	101100.6	.51	.54	21406.4
April	107618.7	125716.1	.66	.52	18097.4
May	106741.6	129507.6	.57	.46	22766.0
June	142206.5	127308.0	.61	.46	-14898.5
July	91341.0	105536.1	.49	.62	14195.2
August	49139.7	79981.5	.43	.59	30841.8
September	43722.3	79389.2	.37	.49	35666.9
Mean % change					50.7
Parameter Group #2					
1-day minimum	14615.0	29386.7	.37	.43	14771.7
3-day minimum	15291.7	31455.6	.36	.39	16163.9
7-day minimum	16207.9	33331.4	.34	.37	17123.6
30-day minimum	21169.6	40645.3	.37	.32	19475.8
90-day minimum	27564.7	51372.8	.35	.35	23808.0
1-day maximum	288700.0	319966.7	.52	.40	31266.7
3-day maximum	276971.7	307866.7	.54	.40	30895.0
7-day maximum	253165.0	277795.3	.55	.40	24630.3
30-day maximum	175210.8	205159.7	.55	.40	29948.8
90-day maximum	129906.5	153104.7	.50	.39	23198.3
Mean % change					55.0

IHA Parametric Scorecard, continued
 HERMANN, MISSOURI

Pre-impact period: 1929-1948 (20 years) Post-impact period: 1967-1996 (30 years)

MEAN COEFF. OF VAR.

Pre Post Pre Post

Parameter Group #3

Date of minimum JD 1-366,	12.4	40.5	.18	.23	28.1	15.3	.04	24.0
Date of maximum JD 1-366,	141.9	176.1	.17	.24	34.2	18.7	.07	38.0

Mean |%| change

Date of minimum JD 122-305,	280.3	229.6	.07	.15	50.6	27.7	.08	125.8
Date of maximum JD 122-305,	169.2	177.9	.10	.16	8.7	4.8	.07	67.3

Mean |%| change

Parameter Group #4

Low pulse count	3.0	.7	1.00	2.02	-2.3	-77.4	1.02	102.4
Low pulse duration	5.7	1.0	.85	1.96	-4.7	-82.7	1.11	129.4
High pulse count	2.0	3.8	1.35	.85	1.7	83.7	-.49	-36.7
High pulse duration	6.8	5.4	1.39	1.07	-1.5	-21.4	-.32	-22.8

Mean |%| change

The low pulse threshold is 20365.00
 The high pulse level is 201933.00

Parameter Group #5

Rise rate	8393.8	9545.1	.48	.39	1151.3	13.7	-.09	-19.6
Fall rate	-5448.5	-6136.2	-.41	-.33	-687.6	12.6	.08	-20.1
Number of reversals	93.3	106.2	.12	.11	12.8	13.7	-.01	-6.3

Mean |%| change

13.4

72.8

96.6

31.0

38.0

Non-Parametric IHA Scorecard
HERMANN, MISSOURI

Pre-impact period: 1929-1948 (20 years)				Post-impact period: 1967-1996 (30 years)			
		MedianS		Coeff.	of Var.	Deviation Factor	Significance Count
		Pre	Post	Pre	Post	Medians	C.V.
Watershed area	524200.00						
Mean annual flow	69051.92	.13					
Mean flow/area							
Annual C.V.	.47						
Flow predictability	.52						
Flow Constancy	.40						
Constancy/predictability	.76						
Flow Contingency	.12						
Parameter Group #1							
October	34841.9	61358.1	.61	.50	.76	.19	.00
November	39346.7	78976.7	.65	.65	1.01	.00	.00
December	30116.1	58129.0	.84	.67	.93	.20	.00
January	32603.2	47780.6	.76	.71	.47	.06	.52
February	36648.3	66507.1	.61	.66	.81	.08	.00
March	74574.2	88883.9	.41	.79	.19	.93	.89
April	77436.7	105803.3	.84	.83	.37	.00	.00
May	79064.5	116648.4	.98	.74	.48	.25	.00
June	112840.0	112513.3	1.17	.64	.00	.45	.49
July	85722.6	89712.9	.91	.81	.05	.10	.95
August	46319.4	71993.5	.51	.34	.55	.34	.72
September	40963.3	68533.3	.47	.55	.67	.18	.25
Parameter Group #2							
1-day minimum	12800.0	24500.0	.56	.75	.91	.34	.00
3-day minimum	14966.7	26966.7	.47	.78	.80	.68	.32
7-day minimum	15585.7	30257.1	.45	.66	.94	.46	.00
30-day minimum	19096.7	38236.7	.55	.55	1.00	.01	.40
90-day minimum	26815.6	48376.7	.56	.50	.80	.11	.99
1-day maximum	244000.0	295000.0	1.00	.54	.21	.46	.00
3-day maximum	232333.3	292333.3	1.08	.56	.26	.48	.76
7-day maximum	200571.4	276428.6	1.10	.59	.38	.47	.11
30-day maximum	135476.7	207100.0	1.11	.54	.53	.04	.14
90-day maximum	97852.2	153940.0	1.20	.52	.57	.01	.07

Non-Parametric IHA Scorecard, continued

HERMANN, MISSOURI

Pre-impact period: 1929-1948 (20 years)

Post-impact period: 1967-1996 (30 years)

	MEDIAN S		COEFF. OF VAR.		DEVIATION FACTOR		SIGNIFICANCE	COUNT
	Pre	Post	Pre	Post	Medians	C.V.	Medians	C.V.
Parameter Group #3								
Date of minimum JD 1-366,	3.0	15.0	.04	.10	.07	1.25	.11	.01
Date of maximum JD 1-366,	142.0	141.0	.14	.39	.01	1.68	.85	.02
Parameter Group #4								
Low pulse count	9.0	6.0	.33	1.00	.33	2.00	.05	.01
Low pulse duration	16.3	10.7	.58	.93	.35	.60	.03	.13
High pulse count	5.0	8.0	.80	.63	.60	.22	.01	.63
High pulse duration	8.8	10.6	1.16	.64	.20	.45	.48	.25
The low pulse threshold is	20365.00							
The high pulse level is	201933.00							

Rise rate

Fall rate

Number of reversals

Parameter Group #5	Pre	Post	COEFF. OF VAR.	Deviation Factor	Significance	Count
7997.1	8991.7	.60	.65	.12	.08	.40
-5516.8	-5981.7	-.68	-.50	.08	.26	.69
93.0	104.0	.15	.15	.12	.02	.00

IHA Percentile Data
HERMANN, MISSOURI

Pre-impact period: 1929-1948 (20 years) Post-impact period: 1967-1996 (30 years)

		Pre-Impact			Post-Impact		
		10%	25%	50%	75%	90%	(75-25) / 50
	Parameter Group #1						
October	15483.87	25245.16	34841.93	46561.29	61761.29	.61	44858.07
November	18040.00	39436.67	51160.00	61551.34	66096.77	.65	49164.52
December	16770.97	20364.52	30116.13	45551.61	61941.93	.84	59133.97
January	15145.16	19190.32	32603.23	43954.84	53996.43	.76	58129.03
February	28471.43	31534.48	36648.28	42422.58	59060.71	.61	66507.14
March	36480.64	42306.67	54783.33	74574.20	83038.71	.41	48728.57
April	42306.67	42825.80	55451.61	79064.52	133293.50	.84	42306.45
May	56056.67	69926.66	112840.00	201933.30	255733.30	.98	58967.74
June	33600.00	46932.26	85722.58	124554.80	132219.40	1.17	59603.33
July	19177.42	32512.90	46319.36	56254.84	64619.36	.51	48900.00
August	22543.33	30930.00	40963.33	50050.00	68313.34	.47	59467.74
September							45283.33

		Parameter Group #2			Parameter Group #3		
		10%	25%	50%	75%	90%	(75-25) / 50
1-day minimum	8300.00	10700.00	12800.00	17900.00	22900.00	.56	14300.00
3-day minimum	8433.00	11100.00	14966.67	24300.00	24000.00	.47	16933.33
7-day minimum	8928.57	11785.71	15585.71	18842.86	24900.00	.45	17785.71
30-day minimum	12086.67	15273.33	19096.67	25686.67	30720.00	.55	21686.67
90-day minimum	15080.00	17915.55	26815.55	33031.11	37860.00	.56	28365.55
1-day maximum	10700.00	16400.00	24400.00	407000.00	484000.00	1.00	181000.00
3-day maximum	94700.00	150666.70	232333.30	401000.00	478000.00	1.08	169000.00
7-day maximum	77528.57	148857.10	200571.40	363571.40	459714.30	1.10	150714.30
30-day maximum	56290.00	96766.66	135476.70	246866.70	321633.30	1.11	109400.00
90-day maximum	50885.55	77197.78	97852.22	194474.40	217214.40	1.20	90343.34

		Parameter Group #4			Parameter Group #5		
		10%	25%	50%	75%	90%	(75-25) / 50
Date of minimum JD 1-366,	315.00	360.00	3.00	10.00	27.00	.04	330.00
Date of maximum JD 1-366,	59.00	111.00	142.00	164.00	180.00	.14	86.00
Date of minimum JD 122-305,	239.00	259.00	283.00	299.00	305.00	.11	138.00
Date of maximum JD 122-305,	126.00	142.00	164.00	180.00	191.00	.10	124.00

		Low pulse count			High pulse count		
		10%	25%	50%	75%	90%	(75-25) / 50
Low pulse duration	8.71	11.00	16.33	20.44	28.75	.58	3.00
High pulse count	.00	2.00	5.00	6.00	8.00	4.00	5.00
High pulse duration	.00	3.57	8.80	13.80	20.20	1.16	4.50

		Rise rate			Fall rate		
		10%	25%	50%	75%	90%	(75-25) / 50
Parameter Group #4	3256.74	5323.48	7997.12	10121.21	12258.50	.60	5096.38
Parameter Group #5	-8903.88	-7603.83	-5516.83	-3860.00	-2685.71	-.68	-7486.51
Number of reversals	73.00	86.00	93.00	100.00	108.00	.15	90.00

IHA Parametric RVA Scorecard
HERMANN, MISSOURI

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA Targets				Rate of Non-Attainment	
		Std.		Range Limits		Std.		Range Limits		Low		High	
	Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High			
Parameter Group #1													
October	43739.7	.8	15174.2	177032.3	83403.1	.7	40809.7	286741.9	25245.2	78210.0	30.0%		
November	50440.3	.7	16633.3	134123.3	84241.2	.4	29400.0	152743.3	25470.0	84731.9	36.7%		
December	35668.7	.5	12109.7	67683.9	71159.5	.5	21738.7	178903.2	17737.6	53599.9	63.3%		
January	35619.6	.5	6827.1	75922.6	55117.8	.5	21558.1	129029.0	16901.7	54337.4	40.0%		
February	44294.9	.4	12275.9	92253.6	71441.8	.4	26714.3	136817.9	25221.5	63368.2	53.3%		
March	79694.2	.5	28287.1	176603.2	101100.6	.5	29909.7	267516.1	39296.0	120092.4	33.3%		
April	107618.7	.7	39436.7	246916.7	125716.1	.5	50656.7	333433.3	54783.3	178730.1	20.0%		
May	106741.6	.6	31929.0	231441.9	129507.6	.5	47706.5	313000.0	45558.2	167925.0	26.7%		
June	142206.5	.6	38773.3	320633.3	127308.0	.5	46150.0	282300.0	55495.5	228917.5	6.7%		
July	91341.0	.5	33558.1	195129.0	105336.1	.6	44009.7	376290.3	46429.8	136252.2	20.0%		
August	49139.7	.4	18196.8	95758.1	79981.5	.6	39538.7	306580.7	279963.0	70316.3	56.7%		
September	43722.3	.4	21833.3	77546.7	79389.2	.5	40716.7	243533.3	27464.2	59980.5	63.3%		
Parameter Group #2													
1-day minimum	14615.0	.4	4200.0	25500.0	29386.7	.4	10500.0	55100.0	9210.0	20020.0	73.3%		
3-day minimum	15291.7	.4	4200.0	25700.0	31455.6	.4	13933.3	55233.3	9746.4	20837.0	80.0%		
7-day minimum	16207.9	.3	4314.3	25371.4	33331.4	.4	14800.0	56657.1	10683.0	21732.7	80.0%		
30-day minimum	21169.6	.4	6551.3	38136.7	40645.3	.3	20250.0	62193.3	13260.2	29079.0	76.7%		
90-day minimum	27564.7	.3	11799.3	47142.2	51372.8	.3	24271.1	99999.0	17932.6	37196.8	76.7%		
1-day maximum	288700.0	.5	82000.0	565000.0	319966.7	.4	15800.0	739000.0	137850.1	439549.9	13.3%		
3-day maximum	276971.7	.5	70633.3	525000.0	307866.7	.4	155333.3	703333.3	128638.9	425304.4	13.3%		
7-day maximum	253165.0	.6	58042.9	470142.8	277795.3	.4	142428.6	621857.1	113457.3	392872.7	13.3%		
30-day maximum	175210.8	.6	46783.3	351566.7	205159.7	.4	96113.3	434666.7	78377.2	272044.5	16.7%		
90-day maximum	129906.5	.5	37998.9	238986.7	153104.7	.4	68176.7	314133.3	64903.8	194909.1	20.0%		

IHA Parametric RVA Scorecard, continued

HERMANN, MISSOURI

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA TARGETS				RATE OF NON-ATTAINMENT	
		Range Limits		Std.		Range Limits		Std.		Range Limits			
	Means	Dev.	Low	High	Means	Dev.	Low	High	Low	High	Low	High	
Parameter Group #3													
Date of minimum JD 1-366,	12.4	.2	3.0	366.0	40.5	.2	2.0	366.0	10.2	14.7	86.7%		
Date of maximum JD 1-366,	141.9	.2	10.0	334.0	176.1	.2	54.0	363.0	117.4	166.5	73.3%		
Parameter Group #4													
Low pulse count	3.0	1.0	.0	12.0	.7	2.0	.0	5.0	.0	5.9	70.0%		
Low pulse duration	5.7	.9	.0	19.0	1.0	2.0	.0	8.0	.8	10.5	70.0%		
High pulse count	2.0	1.3	.0	10.0	3.8	.9	.0	13.0	.0	4.8	43.3%		
High pulse duration	6.8	1.4	.0	38.0	5.4	1.1	.0	22.3	.0	16.3	6.7%		
The low pulse threshold is	20365.00												
The high pulse threshold is	201933.00												
Parameter Group #5													
Rise rate	8393.8	-5	3072.3	20874.1	9545.1	.4	4841.6	20325.4	4372.6	12415.0	23.3%		
Fall rate	-5448.5	-4	-9823.9	.0	-6136.2	-.3	-10989.5	.0	-7677.2	-3219.9	20.0%		
Number of reversals	93.3	-1	70.0	108.0	106.2	.1	83.0	126.0	82.2	104.5	50.0%		

Note: Parameter numbers 1, 2, 7, 13, 14, 15, and 16 use the 25th percentile for RVA targets instead of -1SD

IHA Non-Parametric RVA Scorecard

HERMANN, MISSOURI

Pre-impact period: 1929-1948				Post-impact period: 1967-1996				RVA Targets			
		Means	Var.	Range	Limits	Means	Var.	Range	Limits	Low	High
Parameter	Group #1										

October	34841.9	.6	15174.2	177032.3	61358.1	.5	40809.7	286741.9	25245.2	46561.3	83.3%
November	39346.7	.7	16633.3	134123.3	78976.7	.7	29400.0	15273.3	25470.0	51160.0	76.7%
December	30116.1	.8	12109.7	67683.9	58129.0	.7	21738.7	17893.2	20364.5	45551.6	76.7%
January	32603.2	.8	6827.1	75922.6	47780.6	.7	21558.1	129029.0	19190.3	43954.8	56.7%
February	36648.3	.6	12275.9	92253.6	66507.1	.7	26714.3	136817.9	31534.5	53996.4	66.7%
March	74574.2	.4	28287.1	176603.2	88883.9	.8	29809.7	267516.1	52422.6	83038.7	73.3%
April	77436.7	.8	39436.7	246916.7	105803.3	.8	50656.7	333433.3	54783.3	119596.7	46.7%
May	79064.5	1.0	31929.0	231441.9	116648.4	.7	47706.5	313000.0	55451.6	133293.5	46.7%
June	112840.0	1.2	38773.3	320633.3	112513.3	.6	46150.0	282300.0	69926.7	201933.3	26.7%
July	85722.6	.9	33558.1	195129.0	89712.9	.8	44009.7	376200.3	46932.3	124554.8	30.0%
August	46319.4	.5	18196.8	95758.1	71993.5	.3	39538.7	306580.7	32512.9	56254.8	83.3%
September	40963.3	.5	21833.3	77546.7	68533.3	.6	40716.7	243533.3	30930.0	50050.0	83.3%
Parameter	Group #2										
1-day minimum	12800.0	.6	4200.0	25500.0	24500.0	.8	10500.0	55100.0	10700.0	17900.0	86.7%
3-day minimum	14966.7	.5	4200.0	25700.0	26966.7	.8	13933.3	55233.3	11100.0	18066.7	86.7%
7-day minimum	15585.7	.5	4314.3	25371.4	30257.1	.7	14800.0	56657.1	11785.7	18842.9	86.7%
30-day minimum	19096.7	.5	6551.3	38136.7	38236.7	.5	20250.0	62193.3	15273.3	25686.7	86.7%
90-day minimum	26815.6	.6	11799.3	47142.2	48376.7	.5	24271.1	99999.0	17915.6	33031.1	86.7%
1-day maximum	244000.0	1.0	82000.0	565000.0	295000.0	.5	158000.0	739000.0	164000.0	407000.0	20.0%
3-day maximum	232333.3	1.1	70633.3	523000.0	292333.3	.6	155333.3	703333.3	150666.7	401000.0	16.7%
7-day maximum	200571.4	1.1	58042.9	470142.8	276428.6	.6	142428.6	621857.1	148857.1	369571.4	23.3%
30-day maximum	135476.7	1.1	46783.3	351566.7	207100.0	.5	96113.3	434466.7	96766.7	246866.7	26.7%
90-day maximum	97852.2	1.2	37998.9	238986.7	153940.0	.5	68176.7	314133.3	77197.8	194474.4	23.3%