RRCL Settlement **Draft** **Confidential**

Analysis to determine that amount of 1993 flood flows to remove from the compact computations

David Barfield August 2002

From Ann
Hardy Monthly.xls

From Bureau
Floodflows4.xls
HC releases
unused for irrigation
AF

Year	Month	Flow (cfs)	Monthly AF	2 month running, AF	
1993	6	327	19,463	47,939	0
1993	7	3,210	197,428	216,891	1,896
1993	8	848	52,155	249,583	9 32,562
1993	9	1,173	69,817	121,972	10 59,566
1993	10	1,251	76,942	146,758	11 59,504
1993	11	1,308	77,852	154,794	12 35,334
1993	12	928	57,076	134,928	1 ~~89,545~~ Total year
1994	1	474	29,153	86,229	1 14,021
1994	2	529	29,387	58,540	2 19,705
1994	3	1,133	69,684	99,071	3 36,188
1994	4	401	23,868	93,552	4 1,888
1994	5	357	21,957	45,824	5 10,076
					6 0

some due to additional in flow.

flood = July event

RRC computations (see VWS page)

	VWS	% of avera	Average	excess
1993 RR basin	1,035,820	167%	621,357	414,463
1993 MS only	678,900	286%	237,298	441,602
1993 MS w/o stora	403100	168%		

Monthly means, Hardy (cfs), period of record

note: these means go back to 1904; a large part of the record are pre-development and un-controled.

	means, cfs	conversior	AF
Jan	243	61.504	14,945
Feb	403	55.552	22,387
Mar	546	61.504	33,581
Apr	557	59.52	33,153
May	703	61.504	43,237
Jun	1,278	59.52	76,067
Jul	835	61.504	51,356
Aug	601	61.504	36,964
Sep	458	59.52	27,260
Oct	323	61.504	19,866
Nov	272	59.52	16,189
Dec	245	61.504	15,068

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David Barfield September 1, 2002

From Ann's spreadsheet
Hardy Monthly.xls

From the Bureau's spreac David's estimate of flood flows
Floodflows4.xls

Year	Month	Hardy Flow (cfs)	Hardy Monthly AF	Hardy 2 month running, AF	HC releases unused for irrigation AF	1981-2000 Upper quartile for month (AF)	Actual Hardy less monthly upper quartile	DWB Flood volume estimates	
1993	6	327	19,463	47,939	0	19,632	(169)		
1993	7	3,210	197,428	216,891	0	31,258	166,170	166,170	<--- note high runoff in this month, 3201 v ave
1993	8	848	52,155	249,583	1,896	18,736	33,419		
1993	9	1,173	69,817	121,972	32,562	12,845	56,972	56,972	<--- HC evacuating flood storage
1993	10	1,251	76,942	146,758	59,566	13,580	63,361	63,361	<--- HC evacuating flood storage
1993	11	1,308	77,852	154,794	59,504	11,761	66,091	66,091	<--- HC evacuating flood storage
1993	12	928	57,076	134,928	35,334	12,982	44,094	44,094	<--- HC evacuating flood storage
1994	1	474	29,153	86,229	14,021	14,946	14,207		<--- HC evacuating flood storage
1994	2	529	29,387	58,540	19,705	17,200	12,187		<--- HC evacuating flood storage
1994	3	1,133	69,684	99,071	36,188	19,672	50,012		<--- HC evacuating flood storage
1994	4	401	23,868	93,552	1,888	33,546	(9,679)		
1994	5	357	21,957	45,824	10,076	41,784	(19,828)		
							total	396,688	CY1993

Dec 93 23,000 in flow

Deducted

RRC computations (see VWS page)

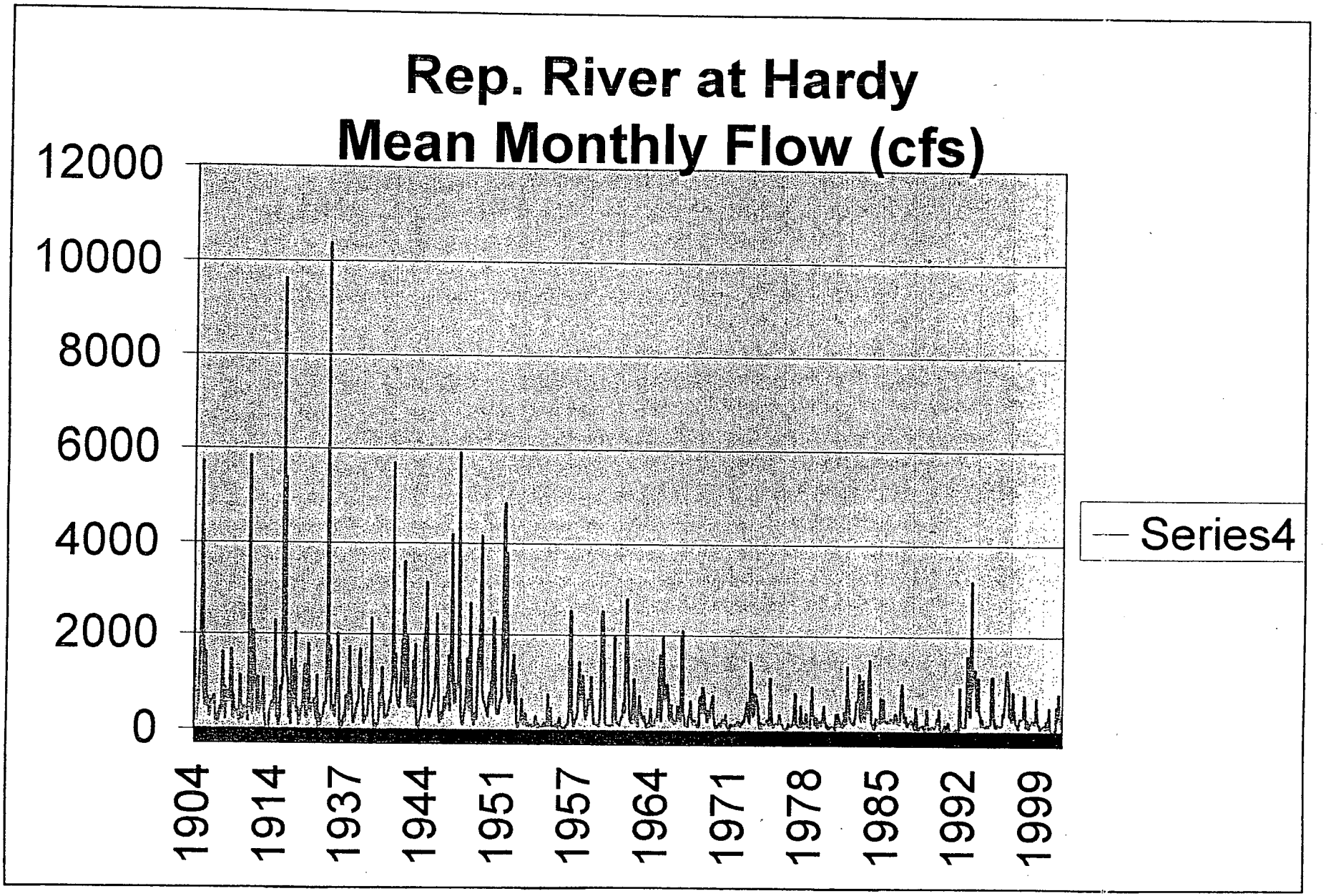
	1993 VWS	% of averag	Average VWS	1993 - average
1993 RR basin	1,035,820	167%	621,357	414,463
1993 MS only	678,900	286%	237,298	441,602

Monthly means, Hardy (cfs), period of record
note: these means go back to 1904; a large part of the record are pre-development and un-controled.

	means, cfs	conversion	AF	50th percentile	60th percentile	70th percentile	75th percentile	80th perce	90th percentile
Jan	243	61.504	14,945	150	181.8	204	243.5	255.2	331.8
Feb	403	55.552	22,387	204.5	256.8	276	310.25	362.8	446.7
Mar	546	61.504	33,581	194	214.2	270	320.5	453	830.6
Apr	557	59.52	33,153	212	272.8	443.6	564.75	659.6	852.2
May	703	61.504	43,237	431.5	476.4	631	680.75	706.6	1171.9
Jun	1,278	59.52	76,067	226	296.4	325.6	330.5	378.6	800.6
Jul	835	61.504	51,356	313.5	356.2	490.6	509.25	533.4	711.3
Aug	601	61.504	36,964	234.5	251.4	295	305.25	366	703.1
Sep	458	59.52	27,260	120.5	140	174.5	216.25	276	783.3
Oct	323	61.504	19,866	116	125.2	165.8	221.25	274.2	1086.6
Nov	272	59.52	16,189	154	163.8	182.3	198	210	329.2
Dec	245	61.504	15,068	169.5	194.8	202.1	211.5	239.4	302.2

6 → 7 500

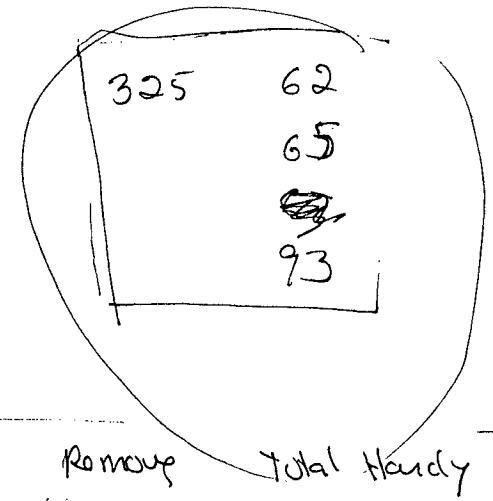
10


Rep. River at Hardy
Mean Monthly Flow (cfs)
12000
10000
8000
6000
4000
2000
0
1904
1914
1937
1944
1951
1957
1964
1971
1978
1985
1992
1999
Series4

Step 1

5 mo at 375 = 62

325 for 5 mon



Step 2 unuse water from

						Remove	Total Handy
425	1962 -	463,191	(Jul-Oct)	- 325	=	138	454
334	1965-	343	July-Nov			18	523
190 unused water	1993	474	July-Nov			149	594.
						350	
~~180~~	~~1986~~						

Harlan County Lake
Design Flood Evacuation

Edward Parker, P.E.
13-Aug-02

Assumptions:

Flood Storage (AF)	500,000
Pool evaporation	0
Additional lake inflow	0
Downstream inflow	0
Days in Month	30

Release — no additional inflow

Bottom half pool phase 0-30% varies by month
Phase II 50-90
3 >90%

Release Criteria:

	Phase I to II	Phase II to III
May,June,July,Aug	30%	80%
Other Months	50%	90%

Golochannel capacity

Phase I Release	1200 cfs	72000 AF
Phase II Release	2000 cfs	120,000
Phase III Release	2400 cfs	100,900

normal irr release 900

2000 cfs release channel cap

May,June,July,Aug

	Storage (AF)	Days to Release
Phase I Storage (AF)	150000	63
Phase II Storage (AF)	250000	63
Phase III Storage (AF)	100000	21

Monthly Release Totals (AF)

Month 1	**135467**
Month 2	**118800**
Month 3	**109573**
Month 4	**71280**
Month 5	**64880**
Total	**500000**

100 each ave

Other Months

	Storage (AF)	Days to Release
Phase I Storage (AF)	250000	105
Phase II Storage (AF)	200000	51
Phase III Storage (AF)	50000	11

Monthly Release Totals (AF)

Month 1	**127133**
Month 2	**118800**
Month 3	**72907**
Month 4	**71280**
Month 5	**71280**
Month 6	**38600**
Total	**500000**