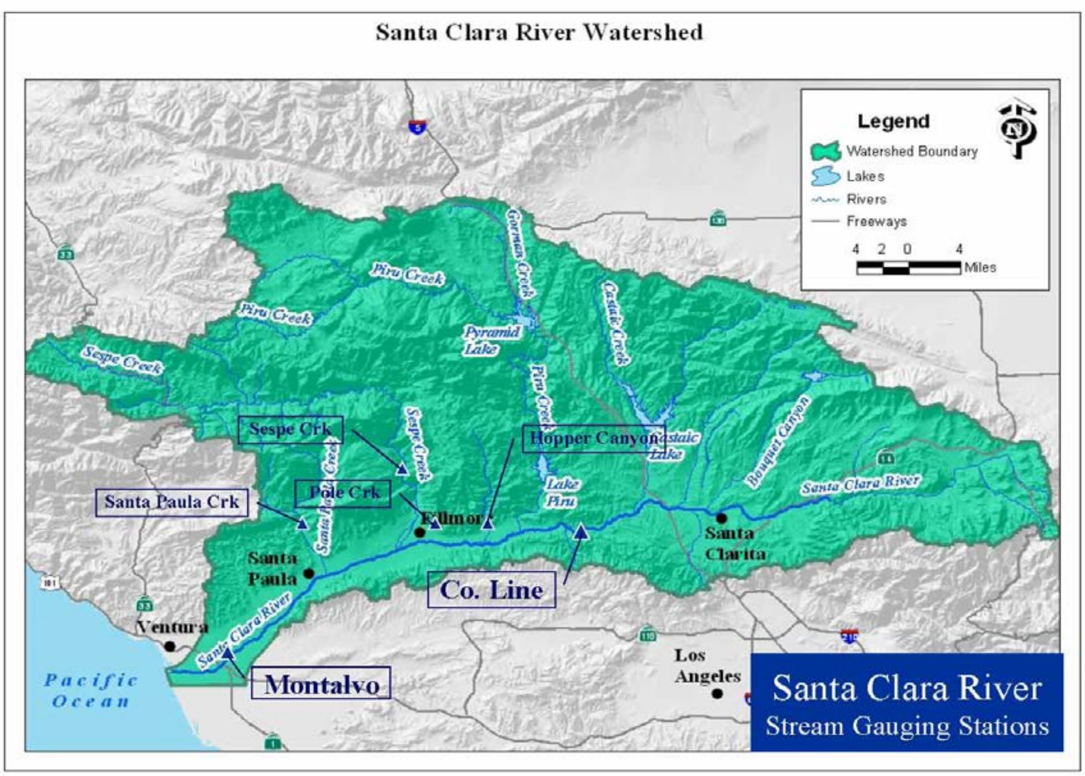
ADDENDUM

Report Addendum Final: Hydrologic Modeling of the Santa Clara River with U.S. EPA Hydrologic Simulation Program – FORTRAN (HSPF) December, 2009

Santa Clara River

Feasibility Study

June, 2011



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Ac.	Acres
ASCE	American Society of Civil Engineers
ATR	Agency Technical Review
cfs	Cubic feet per second
Corps	US Army Corps of Engineers
District	Ventura County Watershed Protection District, formerly Flood Control District (VCFCD)
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Study
Fps	Feet per second
Ft	Feet
HSPF	Hydrologic Simulation Program - FORTRAN
In.	Inches
LACDPW	Los Angeles County Department of Public Works
Mi.	Miles
NRCS	Natural Resources Conservation Service
Q100	100-yr peak discharge
PMP	Project Management Plan
SCS	Soil Conservation Service
Sq. Mi.	Square miles
Tc	Time of Concentration
VCWPD	Ventura County Watershed Protection District
Yr	Year

SECTION 1 INTRODUCTION

The Santa Clara River Feasibility Study is a joint project undertaken by Federal and Local Agencies to evaluate the watershed and identify opportunities for projects to resolve any problems. The activities in the Feasibility study are outlined in the Project Management Plan (PMP) and include creation of hydrologic, hydraulic, and sediment transport models of the watershed to evaluate natural, existing, and future conditions. The study partners are the Ventura County Watershed Protection District (VCWPD), the Los Angeles County Department of Public Works (LACDPW), and the Los Angeles District of the U. S. Army Corps of Engineers (Corps).

A hydrology model of the watershed was the first product specified in the PMP to be completed. A hydrology report describing the creation and use of the Hydrologic Simulation Program – FORTRAN (HSPF) model finalized in December, 2009 was prepared by AQUA TERRA Consultants (AQUA TERRA) hired by VCWPD. This continuous model simulates surface water runoff in the streams included in the model for the period from October, 1959 to September, 2005 for natural (pre-European) and existing (2005) baseline land use conditions. The continuous model was also used to provide design storm 100-yr peaks (Q100) for the study tributaries to be included in the hydraulic modeling effort of the PMP as described in Appendices L and M of the 2009 AQUA TERRA Report. The peak discharges for the other design storm levels to be evaluated using the hydraulic model were provided through the use of design storm ratios developed with stream gage flow frequency analysis data.

In January, 2010, the Corps instituted a new Agency Technical Review (ATR) process for all ongoing feasibility studies where the decision-making process about potential projects in the watershed had not been finalized. The requirements of the ATR led the Corps to ask for additional technical information to be supplied in support of the hydrology data provided by the study partners to the Corps and their consultant for the hydraulic modeling project, CDM. This request has led to the preparation of this addendum to provide the requested information to the Corps' ATR reviewers.

1.1 PURPOSE AND SCOPE

The information requested by the Corps includes the following data that were either not included in the AQUA TERRA (2009) Report or require updating as follows:

1. Appendices L and M of the AQUA TERRA Report did not provide a comparison of the stream gage frequency curves used in the HSPF model calibration and the resultant HSPF model results.

2. The Appendices did not provide all of the stream gage frequency analysis data used in the model calibration.

3. The design storm peaks provided in the Appendices were only provided at the outlet of each tributary subarea included in the HSPF model. Subsequently, the Corps requested that each County furnish intermediate discharges along each tributary for use by CDM in the hydraulic modeling. The intermediate discharges were calculated using USGS regression equations developed for coastal Southern California watersheds.

4. LACDPW provided the 20-yr discharges in their tributary summary table but labeled them as 25-yr discharges. Because CDM requires the 25-yr discharges, LACDPW has provided the 25-yr discharges in their summary table included in this report.

5. The HSPF report did not provide any design peak data for the Santa Clara River Mainstem. This was because the intention of the study was to use the mainstem peak flows from the Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) to prevent confusion over the existence of two mainstem peak flow data sets. Because FEMA developed their own hydrology model of the LA County portion of the watershed, their peaks are not necessarily consistent with the HSPF model results, and are generally lower than the HSPF model results. For the Ventura County portion of the watershed, VCWPD supplied mainstem peak flows to FEMA based on a 2006 report presenting the stream gage flow frequency analysis results and intermediate discharges. The 2006 report data was used to calibrate the HSPF model and resulted in mainstem peaks that match to within 5% or less. This addendum provides the mainstem flows for use by CDM in their hydraulic modeling.

Therefore, the purpose of this addendum is to document the methodologies used in generating the above additional information for use in this study and provide the peak flow data.

1.2 SUPPORTING DOCUMENTS

The following documents provide information that was used for the HSPF model:

1. VCFCD, 1994. Santa Clara River 1994 Hydrology Study. Ventura County Public Works Agency. October 27, 1994. This report published by VCFCD (now VCWPD) was a collaborative effort between VCFCD and the Corps. VCFCD supplied the available gage data and supporting calculations, while the Corps generated a watershed model to adjust reported annual peaks for the presence or absence of several major reservoirs and did a multiple linear regression analysis to supply missing peaks for the analysis. The resultant peak flow set showed the estimated effects of the two reservoirs built in 1973 by reducing a 1969 annual peak of 165,000 cfs to 147,000 cfs for use in the frequency analysis. The Corps did a graphical analysis of the revised flow data to provide the 2- through 500-yr peak discharges at the stream gage locations and then used historic hydrology model ratios to provide peak flows for intermediate locations along the mainstem in Ventura County.

2. VCWPD, 2006. Santa Clara River 2006 Hydrology Update. Ventura County Watershed Protection District, Advanced Planning Section. December, 2006. VCWPD updated the 1994 analysis by extending the dataset used in the 1994 analysis though Water Year 2005 (ending September 30, 2005). The report used standard Bulletin 17B (USGS, 1982) methods to provide design flow peak discharges and applied the same design storm ratios used in the 1994 Report to provide discharges at intermediate locations between the stream gages. These data were provided to FEMA for their use in the on-going Santa Clara River FIS. These data were also used to calibrate the Santa Clara River HSPF model for this study.

1.3 INTERMEDIATE DISCHARGE CALCULATIONS

The Corps requested that the study partners working with the HSPF model to produce the 100-yr peak discharges and other design storm peaks and also calculate intermediate discharges for use by the hydraulic modelers. The criterion was to provide discharges for reaches so that no reach was longer than about 1.5 mi without having another discharge available.

The standard method for calculating discharges for upstream areas is provided by the USGS (1993). The Santa Clara Watershed is in the South Coast Region as defined by the report. The regression equation used to estimate the Q100 for ungaged watersheds is the following: $Q100 = 1.95\ A^{0.83}\ p^{1.87}$ where Q100 is in cfs, A is area in sq. mi., and p is annual precipitation in inches. If Q100 is available from a hydrology model, then the equation can be used to calculate a Q100 for an upstream tributary location based on a reduced tributary area. Because the tributaries included in the study had relatively small watersheds, the annual precipitation can be assumed to be constant. The calculation to obtain an upstream Q100 then becomes: $Q100_{us} = Q100_{ds}\ (A_{us}/A_{ds})^{0.83}$ where us indicates the upstream location for the intermediate discharge and ds indicates the downstream location providing the Q100 from the HSPF model. The tables in Sections 2 and 3 show the intermediate discharges.

1.4 CONTINUOUS HSPF MODEL CREATION AND USE

The AQUA TERRA (2009) report describes in detail how the model was prepared using available soil, land use, groundwater, surface water, and rain data. The report describes the calibration and validation efforts and data sets used to match the historic runoff data during those periods. Then the model presents the results of running the model for the entire simulation period from October 1959 to September 2005. For more information about the model preparation and calibration efforts, please see that document.

1.5 HSPF MODEL DESIGN STORM PEAKS

Because AQUA TERRA did not have enough staff to develop design storm peaks for the project in August 2008, VCWPD and LACDPW provided staff to do the modeling efforts described in Appendices L and M of the AQUA TERRA (2009) Report. The development of the 100-yr design storm hyetographs, use of areal reduction (AR) factors from the HEC-HMS model, and calibration of the model to tributary stream gage frequency results is described in detail in Appendices L and M. The appendices also discuss the methods to calculate design storm ratios used to provide peaks for the other design storms.

1.6 FUTURE CONDITION FLOWS

The Project Management Plan (PMP) developed for the study has a specific task for the development of a future conditions HSPF model. There has been extensive discussion between the project participants about the assumptions to be used in this effort, including sources of future land use data, and whether new development is expected to construct detention basins to mitigate any increase in peak flow. When the assumptions are finalized and funds are available for this portion of the study, the HSPF model will be revised in order to provide the necessary hydrologic data.

1.7 CALIBRATED RAINFALL FACTORS

Aqua Terra's (2009) report on the continuous HSPF model presented maps showing the locations of the precipitation gages available for use in the model, average annual precipitation isohyetals, and Thiessen polygons. Aqua Terra's approach was to use the Thiessen polygons to assign the rain gage data sets to subareas. Then the average annual rainfall at the gage location was compared to the average annual rainfall for the subarea based on the isohyetal map. If rainfall depths were different, the rainfall data were adjusted by the ratio of the two averages using the MFACT parameter in the HSPF input file. This procedure accounted for orographic differences between the rain gage locations and the average subarea elevations in the model. For the Ventura County portion of the continuous model, the MFACT values ranged from 0.84 to 1.12.

For the design storm model, the MFACT parameter was used in the calibration to add two additional factors. The first factor accounted for areal reduction of the point rainfall used in the design storm model due to the size of the watershed tributary to the stream gage location or watershed outlet. The second factor was used to calibrate the Design Storm HSPF model to match the stream gage flow frequency results. The final MFACTs applied to the subareas in the Design Storm Model had three components: the Continuous Model Mfact x AR factor x Calibration Factor. The various factors used at the stream gage calibration sites for Ventura County are shown in Table 2 of Appendix L. The Continuous Model MFACTs were 0.9 or 1.07. The AR factors were 0.96 or 0.975. The calibration factors were 0.94, 1.0, and 1.14.

SECTION 2 VENTURA COUNTY MODELING AND RESULTS

This section provides additional information on the hydrology results presented in Appendix L of the AQUA TERRA Report (2009).

2.1 VENTURA COUNTY STREAM GAGE FREQUENCY ANALYSES

As presented in Appendix L, there were four tributary stream gages in Ventura County with relatively long records that were used to calibrate the HSPF Design Storm Model to provide tributary design storm peaks for the hydraulic modeling effort. Other tributary stream gages in Ventura County have short records that are not considered suitable for use in frequency analysis studies to provide design storm peaks.

The HEC-FFA flow frequency analysis (FFA) output for the four gages is provided in Appendix A along with HEC-SSP probability plots of the annual peak data and the log Pearson III fit. The data sets only include data through 2005 as it is VCWPD's policy to only update frequency analyses after a relatively big storm has occurred that could make the 100-yr FFA peaks increase. A relatively big storm is defined as an approximately 10-yr storm or larger based on the current FFA. It is our experience that additional peaks from relatively dry years added to the record cause the FFA results to decrease slightly. This policy prevents the FFA result from changing every year and facilitates channel design using the FFA information.

In addition, there are two stream gages on the mainstem in Ventura County that were the basis for the work presented in VCWPD's 2006 report. The FFA results and plots are also provided in Appendix A.

2.2 FREQUENCY CURVES AND HSPF DATA COMPARISON

The 100-yr peak frequency data presented in Appendix A was used to calibrate the design storm HSPF model. The average design storm ratios developed for Ventura County stream gages were used to provide the other design storm peak flows from the calibrated 100-yr design storm model. This resulted in two sets of ratios, one set for mostly undeveloped watersheds and one set for urbanized watersheds as presented in Appendix L. An additional set of multipliers was developed for the peak flows from Piru Lake by fitting a curve through the points provided in the FEMA 1997 FIS for Unincorporated Ventura County and interpolating for the other storm peaks.

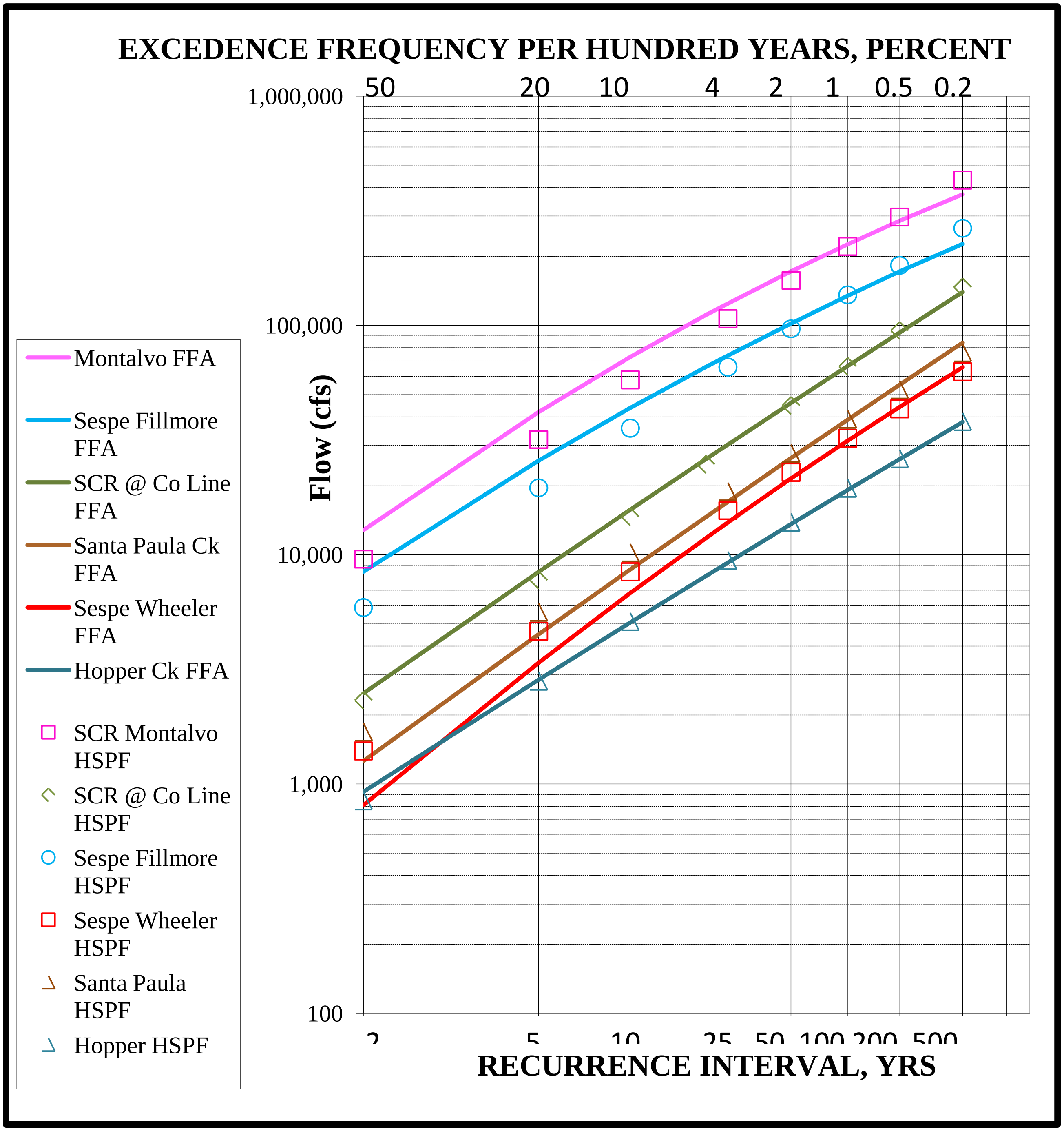
Table 2-1. Piru Lake Peak Outflow Design Storm Multipliers

Year	2	5	10	25	50	100	200	*500*
Flow	1,260	1,705	*2,500*	5,570	*33,000*	*41,000*	48,500	*60,000*
Design Storm Ratio	0.031	0.042	0.061	0.136	0.805	1.000	1.183	1.463

Note: *Data in Italics from 1997 FIS*

Figure 2-1 shows the frequency curves from Appendix B plotted against the HSPF model and design storm ratio results.

Figure 2-1. Gage Frequency Curves and HSPF Design Storm Peaks



Note: Solid Lines are from frequency analyses; Points are from HSPF Model with Design Storm Ratios applied.

The figure indicates that the adopted values for events more common/frequent than the 1 in 50 chance event are lower than the 2006 FFA frequency results for the SCR at Montalvo and Sespe Creek at

Fillmore and higher for the Sespe Creek at Wheeler gages. The stream gages for these locations all have more than 50 years of data, so the FFA results for these frequencies could be more accurate than applying a ratio to the HSPF model 1 in 100 chance peak flow, as was done in this study. If design data for events more frequent than the 1 in 50 chance event are needed such as for ecosystem restoration studies, then more specific hydrology will be prepared as part of that detailed study, possibly using the stream gage data to generate the design flows.

2.3 MAINSTEM SANTA CLARA RIVER FLOWS

The Santa Clara River 2006 Hydrology Report performs a statistical analysis of regulated flows for the mainstem of the river. The 1 in 200 and 1 in 500 chance peak flow frequencies (as derived from 2006 Study FFA output) for mainstem locations downstream of Piru Creek are potentially flawed. The 1994 Hydrology Study (pg 1) states that historically speaking, Piru Lake has been able to capture all floods (not passed flows downstream) for all but the 1969 flood. This means that 441 square miles of potential runoff (38% of the drainage area for the SCR at Fillmore and 27% of the drainage area for the SCR at Montalvo) are not included in the peak flows at the Montalvo gage (except the 1969 flood) since 1956.

Extrapolation of the FFA results for Montalvo for the 1 in 200 and 1 in 500 chance floods could be questioned, given that Lake Piru will most likely be spilling during these rare events. However, for this study the adopted peak flow frequency for mainstem locations downstream of the Sespe Creek confluence should be acceptable for the following reasons. First, an analysis of the 1978 flood peak data indicates that 71% of the peak flow at Montalvo was due to Sespe Crk runoff (1994 Report). This indicates that Sespe Crk is a huge factor historically at this location. Secondly, the 1 in 200 and 1 in 500 chance peaks adopted for this study are higher than the 2006 FFA results. This is due to the fact that ratios applied to the 1 in 100 chance peak flows in HSPF to achieve other frequencies were based on an analysis of frequency curves at multiple stream gages.

For the SCR at Montalvo, the ratio applied was 1.345 and 1.952, respectively, to obtain the 1 in 200 and and 1 in 500 events, which is more than the 1.265 and 1.650 ratios found in the 2006 FFA frequency curve for Montalvo. Furthermore, the results for locations downstream of Piru Crk and upstream of Sespe Crk such as the SCR at Fillmore are acceptable because those results are based on applying a ratio to the 2006 SCR at County Line FFA frequency curve, which is based on a relationship found in the modeling of the SPF flood (1994 Study) using a rainfall-runoff model. Modeling the SPF (approximately a 1 in 200 chance event in the 1994 report) would presumably provide a reasonable estimate of the relationship between the SCR at County Line and SCR at Fillmore for rare floods when Piru Lake (Santa Felicia Dam) is spilling

2.4 . MAINSTEM PEAK FLOW MODELING

As discussed above, the mainstem peak flows were calibrated against the gage data provided in the VCWPD (2006) Report. The modeling effort followed the procedure described in Appendix L of determining an AR factor for the Ventura County mainstem run. The AR curve is relatively flat for watersheds ranging from 1,000 to 1,600 sq. mi. and therefore it was not necessary to vary the AR factor for different points along the mainstem comparable to the flow locations provided in the 2006 Report. The AR factor was applied to the rainfall factor used in the HSPF model (MFACT). Reservoirs such as

Lake Pyramid, Lake Piru, and Lake Castaic were set to be full at the start of the design storm run to be consistent with FEMA requirements for floodplain mapping of watersheds with water storage reservoirs. Table 2-2 shows that the HSPF model results are within 5% or less of the 2006 Report peaks.

Table 2-2. Mainstem 100-Yr Flow Comparison Table

HSPF Reach Number	Mainstem Location	SCR HSPF Model Results (cfs)	SCR 2006 Freq Study (cfs)	Percent Diff. (2006 vs HSPF)	SCR 1994 Q100 (cfs)
320	SCR County Line Gage	66,260	66,600	0.5%	60,000
529	Piru Ck @ SCR confluence	41,100	NA	NA	41,000
610	SCR downstream of Piru Ck	101,000	NA	NA	98,000
620	SCR downstream of Hopper Ck	108,000	NA	NA	NA
630	SCR tributaries between Hopper and Pole Cks	109,000	NA	NA	NA
640	SCR upstream of Pole Ck	111,000	NA	NA	NA
650	SCR upstream of Sespe Ck	111,000	108,400	-2.4%	NA
810	SCR downstream of Sespe Ck	210,000	221,000	5.0%	196,000
820	SCR tributaries between Sespe and Sta Paula Cks	210,000	NA	NA	NA
830	SCR upstream of Sta Paula	216,000	NA	NA	NA
840	SCR downstream of Sta Paula	226,000	NA	NA	200,000
850	SCR nr Adams, Fagan	226,000	NA	NA	NA
860	SCR nr Ellsworth Barranca	226,000	NA	NA	NA
870	SCR nr Franklin/Wasson Barrancas	226,000	NA	NA	NA
880	SCR nr Harmon Barranca	227,000	226,000	-0.4%	200,000

2.5 Design Storm Peak Summary Table

Table 2-3 shows the HSPF design storm peak flows for the mainstem and tributaries for use in the hydraulic modeling, including any intermediate discharges calculated with the USGS regression equation discussed above (name shown in red). The “Study” column indicates whether the HSPF results were provided to FEMA for their floodplain mapping study, will be used by CDM for the Feasibility Study, or will be used for design studies by the District (WPD).

Table 2-3. HSPF Model Peak Flow Results for Ventura County

Name	HSPF Sub-Area	Study	Area (ac.)	Cum. Area (sq. mi)	**2-yr**	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**	**200-yr**	**500-yr**	**Multiplier**
Santa Clara River	400	FEMA	1,274	641.0	2,320	7,750	14,640	24,780	44,730	66,260	95,020	146,960	LA App M
SCR Nr Piru	410	FEMA	1,716	643.6	2,320	7,750	14,640	24,780	44,730	66,260	95,020	146,960	LA App M
Santa Clara River	420	FEMA	3,060	648.4	2,320	7,750	14,640	24,780	44,730	66,260	95,020	146,960	LA App M
Piru Creek	527	CDM	32,073	-	1,263	1,709	2,506	5,584	33,080	41,100	48,603	60,146	Piru
Piru Creek	528	CDM	7,412	-	1,263	1,709	2,506	5,584	33,080	41,100	48,603	60,146	Piru
Piru Creek	529	FEMA	2,617	435.9	1,263	1,709	2,506	5,584	33,080	41,100	48,603	60,146	Piru
Warring Cyn DB	601	WPD	681	1.1	101	337	613	1,133	1,664	2,340	3,147	4,568	Undeveloped
Real Wash DB	602	WPD E	166	0.3	25	82	149	275	405	569	765	1,111	Undeveloped
Warring Downstream	604	CDM	136	1.3	105	348	634	1,171	1,721	2,420	3,255	4,724	Undeveloped
Warring and Real	605	CDM	384	2.1	128	426	776	1,433	2,105	2,960	3,981	5,778	Undeveloped
Edwards Upper (1)	1603	CDM	390	-	26	87	158	292	429	604	812	1,179	Undeveloped
Edwards	603	CDM	1,292	2.8	94	311	566	1,045	1,536	2,160	2,905	4,216	Undeveloped
Santa Clara River	610	FEMA	7,087	1,100.4	4,373	14,544	26,462	48,884	71,811	101,000	135,845	197,152	Undeveloped
Hopper Cyn	611	FEMA	4,664	-	393	1,308	2,379	4,395	6,456	9,080	12,213	17,724	Undeveloped
Hopper Cyn	612	FEMA	6,367	-	749	2,491	4,533	8,373	12,300	17,300	23,269	33,770	Undeveloped
Hopper Cyn	613	FEMA	4,197	-	840	2,794	5,083	9,390	13,793	19,400	26,093	37,869	Undeveloped
Hopper Cyn	614	FEMA	744	25.0	844	2,808	5,109	9,438	13,865	19,500	26,228	38,064	Undeveloped
Fairview Cyn	619	CDM	556	0.9	58	192	348	644	946	1,330	1,789	2,596	Undeveloped
Santa Clara River	620	FEMA	3,113	1,131.1	4,676	15,552	28,296	52,272	76,788	108,000	145,260	210,816	Undeveloped
Santa Clara River	630	FEMA	2,017	1,134.2	4,719	15,696	28,558	52,756	77,499	109,000	146,605	212,768	Undeveloped
Basolo Ditch	631	FEMA	1,288	1.7	70	234	426	787	1,155	1,625	2,186	3,172	Undeveloped
Pole Creek	632	FEMA	2,298	-	343	1,140	2,075	3,833	5,631	7,920	10,652	15,460	Undeveloped
Pole Creek	633	FEMA	2,928	-	330	1,097	1,996	3,688	5,418	7,620	10,249	14,874	Undeveloped
Pole Creek	634	FEMA	347	8.7	320	1,064	1,936	3,577	5,254	7,390	9,940	14,425	Undeveloped
Santa Clara River	640	FEMA	2,284	1,148.2	4,806	15,984	29,082	53,724	78,921	111,000	149,295	216,672	Undeveloped
Grimes Canyon	641	FEMA	3,525	4.7	194	644	1,171	2,163	3,178	4,470	6,012	8,725	Undeveloped

Name	HSPF Sub-Area	Study	Area (ac.)	Cum. Area (sq. mi)	**2-yr**	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**	**200-yr**	**500-yr**	**Multiplier**
Bardsdale Wash	1650	WPD	390	-	20	67	123	226	332	468	629	913	Undeveloped
Santa Clara River	650	FEMA	1,902	1,155.9	4,806	15,984	29,082	53,724	78,921	111,000	149,295	216,672	Undeveloped
Sespe Creek	701	FEMA	9,474	-	558	1,858	3,380	6,244	9,172	12,900	17,351	25,181	Undeveloped
Sespe Creek	702	FEMA	7,985	-	870	2,894	5,266	9,728	14,291	20,100	27,035	39,235	Undeveloped
Sespe Creek	703	FEMA	5,792	-	1,108	3,686	6,707	12,390	18,202	25,600	34,432	49,971	Undeveloped
Sespe Creek @ Wheeler Sprgs	704	FEMA	8,489	49.6	1,394	4,637	8,436	15,585	22,894	32,200	43,309	62,854	Undeveloped
Sespe Creek	705	FEMA	20,596	-	2,117	7,042	12,812	23,668	34,768	48,900	65,771	95,453	Undeveloped
Sespe Creek	706	FEMA	21,963	-	2,758	9,173	16,689	30,831	45,291	63,700	85,677	124,342	Undeveloped
Sespe Creek	707	FEMA	15,063	-	3,182	10,584	19,257	35,574	52,259	73,500	98,858	143,472	Undeveloped
Sespe Creek	708	FEMA	16,813	-	3,632	12,082	21,982	40,608	59,653	83,900	112,846	163,773	Undeveloped
Sespe Creek	709	FEMA	10,944	-	3,935	13,090	23,816	43,996	64,630	90,900	122,261	177,437	Undeveloped
Sespe Creek	711	FEMA	8,622	-	4,169	13,867	25,231	46,609	68,469	96,300	129,524	187,978	Undeveloped
Sespe Creek	712	FEMA	23,928	-	5,845	19,440	35,370	65,340	95,985	135,000	181,575	263,520	Undeveloped
Sespe Creek nr Fillmore	713	FEMA	11,051	251.1	5,888	19,584	35,632	65,824	96,696	136,000	182,920	265,472	Undeveloped
Sespe Creek nr Fillmore	722	FEMA	386	-	5,888	19,584	35,632	65,824	96,696	136,000	182,920	265,472	Undeveloped
Sespe Creek nr Fillmore	723	FEMA	2,003	-	6,018	20,016	36,418	67,276	98,829	139,000	186,955	271,328	Undeveloped
Sespe Creek nr Fillmore	724	FEMA	1,735	-	6,018	20,016	36,418	67,276	98,829	139,000	186,955	271,328	Undeveloped
Sespe Creek nr Fillmore	725	FEMA	334	-	6,061	20,160	36,680	67,760	99,540	140,000	188,300	273,280	Undeveloped
Sespe Creek nr Fillmore	726	FEMA	1,656	-	6,061	20,160	36,680	67,760	99,540	140,000	188,300	273,280	Undeveloped
Sespe Creek nr Fillmore	727	FEMA	2,485	-	5,888	19,584	35,632	65,824	96,696	136,000	182,920	265,472	Undeveloped
Sespe Creek nr Fillmore	728	FEMA	378	265.2	5,801	19,296	35,108	64,856	95,274	134,000	180,230	261,568	Undeveloped
Boulder Creek	801	WPD	3,983	6.2	204	678	1,234	2,280	3,349	4,710	6,335	9,194	Undeveloped
Reimer Upstream	2806	CDM	721	-	49	164	299	552	810	1,140	1,533	2,225	Undeveloped
Reimer Intermediate	1806	CDM	1,415	-	86	287	523	966	1,418	1,995	2,683	3,894	Undeveloped
Reimer Ditch	806	CDM	3,670	5.7	190	634	1,153	2,130	3,128	4,400	5,918	8,589	Undeveloped
Bear U/S	2807	CDM	614	-	65	218	396	731	1,074	1,511	2,032	2,949	Undeveloped

Name	HSPF Sub-Area	Study	Area (ac.)	Cum. Area (sq. mi)	**2-yr**	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**	**200-yr**	**500-yr**	**Multiplier**
Bear Intermediate	1807	CDM	835	-	84	281	511	944	1,386	1,950	2,623	3,806	Undeveloped
Bear Ck	807	CDM	1,420	2.2	131	436	794	1,467	2,154	3,030	4,075	5,915	Undeveloped
O'Leary Foothills	808	CDM	1,258	-	139	464	844	1,558	2,289	3,220	4,331	6,285	Undeveloped
O'Leary Intermediate	1809	CDM	369	-	148	492	895	1,653	2,429	3,416	4,594	6,668	Undeveloped
O'Leary Ck	809	CDM	1,018	3.6	163	541	985	1,820	2,673	3,760	5,057	7,340	Undeveloped
Santa Clara River	810	FEMA	529	1,440	9,308	30,960	56,330	104,060	1152,865	215,000	289,175	419,680	Undeveloped
Balcom Upstream	2812	CDM	1,365	-	99	331	601	1,111	1,632	2,295	3,087	4,480	Undeveloped
Balcom Intermediate	1812	CDM	1,602	-	113	377	687	1,269	1,864	2,621	3,526	5,117	Undeveloped
Balcom Ck	812	CDM	3,146	4.9	199	661	1,203	2,222	3,263	4,590	6,174	8,960	Undeveloped
Santa Clara River	820	FEMA	2,042	1,447.7	9,308	30,960	56,330	104,060	1152,865	215,000	289,175	419,680	Undeveloped
Orcutt Canyon	821	FEMA	3,087	3.7	229	763	1,389	2,565	3,768	5,300	7,129	10,346	Undeveloped
Timber Upstream	3822	CDM	723	-	76	254	461	852	1,252	1,761	2,368	3,437	Undeveloped
Timber Intermediate 1	2822	CDM	1,070	-	106	351	639	1,180	1,733	2,438	3,279	4,758	Undeveloped
Timber Intermediate 2	1822	CDM	1,398	-	132	438	797	1,473	2,164	3,043	4,093	5,941	Undeveloped
Timber Cyn	822	CDM	2,561	4.0	218	724	1,318	2,435	3,576	5,030	6,765	9,819	Undeveloped
SCR abv Sta Paula	830	CDM	3,698	1,461.2	9,351	31,104	56,592	104,544	153,576	216,000	290,520	421,632	Undeveloped
Santa Paula Creek	831	CDM	11,154	-	926	3,082	5,607	10,358	15,215	21,400	28,783	41,773	Undeveloped
Santa Paula Creek	832	CDM	3,882	-	1,095	3,643	6,629	12,245	17,988	25,300	34,029	49,386	Undeveloped
Sisar Creek	833	WPD	7,375	11.5	494	1,642	2,987	5,518	8,105	11,400	15,333	22,253	Undeveloped
Santa Paula Creek	834	CDM	3,136	39.9	1,688	5,616	10,218	18,876	27,729	39,000	52,455	76,128	Undeveloped
Santa Paula Creek	835	CDM	3,779	45.8	1,706	5,674	10,323	19,070	28,013	39,400	52,993	76,909	Undeveloped
Fagan DB Upstream	2836	CDM	235	-	20	67	122	226	332	466	627	910	Undeveloped
Fagan DB intermed.	1836	CDM	1,045	-	70	232	422	779	1,144	1,609	2,164	3,141	Undeveloped
Fagan Cyn DB	836	CDM	1,880	-	113	377	686	1,268	1,863	2,620	3,524	5,114	Undeveloped
Fagan Cyn	837	CDM	1,363	5.1	197	655	1,192	2,202	3,235	4,550	6,120	8,882	Undeveloped
Peck Upstream	1838	CDM	70	-	11	35	64	118	173	243	327	474	Undeveloped
Peck Rd Drn	838	CDM	797	1.2	304	604	849	1,208	1,504	1,830	2,180	2,749	Developed
Santa Clara River	840	FEMA	3,173	1,569.7	9,784	32,544	59,212	109,384	160,686	226,000	303,970	441,152	Undeveloped

Name	HSPF Sub-Area	Study	Area (ac.)	Cum. Area (sq. mi)	**2-yr**	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**	**200-yr**	**500-yr**	**Multiplier**
Adams Upstream	3841	CDM	1,122	-	81	270	491	907	1,332	1,873	2,519	3,657	Undeveloped
Adams Intermediate 1	2841	CDM	3,552	-	211	702	1,277	2,360	3,466	4,875	6,557	9,516	Undeveloped
Adams Intermediate 2	1841	CDM	4,717	-	267	888	1,616	2,986	4,386	6,169	8,298	12,043	Undeveloped
Adams Barranca	841	CDM	5,398	-	299	994	1,808	3,340	4,906	6,900	9,281	13,469	Undeveloped
Adams Barranca	842	CDM	412	9.1	298	991	1,803	3,330	4,892	6,880	9,254	13,430	Undeveloped
O'Hara Canyon	843	CDM	2,006	-	144	480	872	1,612	2,368	3,330	4,479	6,500	Undeveloped
Haines Barranca	844	CDM	227	3.5	128	425	773	1,428	2,097	2,950	3,968	5,758	Undeveloped
SCR @ Freeman Div	850	FEMA	1,722	1,584.9	9,784	32,544	59,212	109,384	160,686	226,000	303,970	441,152	Undeveloped
Wheeler Upstream	2851	CDM	819	-	69	229	417	770	1,131	1,591	2,140	3,106	Undeveloped
Wheeler Intermediate	1851	CDM	2,907	-	197	656	1,193	2,204	3,238	4,554	6,125	8,889	Undeveloped
Wheeler Canyon	851	CDM	4,788	7.5	298	992	1,805	3,335	4,899	6,890	9,267	13,449	Undeveloped
Todd Barranca	852	CDM	1,246	9.4	288	958	1,742	3,219	4,728	6,650	8,944	12,981	Undeveloped
Briggs Road Drain	853	CDM	800	1.3	53	177	322	595	875	1,230	1,654	2,401	Undeveloped
Cummings Road Drain	854	WPD	1,223	1.9	78	259	472	871	1,280	1,800	2,421	3,514	Undeveloped
Santa Clara River	860	FEMA	2,287	1,608.6	9,784	32,544	59,212	109,384	160,686	226,000	303,970	441,152	Undeveloped
Aliso Canyon	861	CDM	6,538	-	420	1,395	2,539	4,690	6,890	9,690	13,033	18,915	Undeveloped
Ellsworth Bar.	862	CDM	2,765	14.5	412	1,371	2,494	4,608	6,769	9,520	12,804	18,583	Undeveloped
SCR @ Saticoy	870	FEMA	745	1,624.3	9,784	32,544	59,212	109,384	160,686	226,000	303,970	441,152	Undeveloped
Franklin Bar. DB	871	FEMA	323	-	36	120	219	404	594	835	1,123	1,630	Undeveloped
Franklin Barranca	872	FEMA	603	-	60	199	362	668	981	1,380	1,856	2,694	Undeveloped
Wason Barranca	873	WPD	1,996	-	110	364	663	1,225	1,799	2,530	3,403	4,939	Undeveloped
Frank/Wason Barranca	874	WPD	244	4.9	171	569	1,035	1,912	2,808	3,950	5,313	7,710	Undeveloped
SCR @ Montalvo	880	FEMA	5,137	1,637.3	9,828	32,688	59,474	109,868	161,397	227,000	305,315	443,104	Undeveloped
El Rio Drain	881	FEMA	864	2.6	174	347	487	693	863	1,050	1,251	1,577	Developed
Brown Upstream	3882	CDM	383	-	27	89	163	301	442	621	836	1,213	Undeveloped
Brown Foothills	2882	CDM	1,162	-	68	225	409	755	1,110	1,561	2,099	3,047	Undeveloped
Brown Intermediate	1882	CDM	1,861	-	100	332	605	1,117	1,641	2,307	3,103	4,504	Undeveloped

Name	HSPF Sub-Area	Study	Area (ac.)	Cum. Area (sq. mi)	**2-yr**	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**	**200-yr**	**500-yr**	**Multiplier**
Brown Barranca	882	CDM	2,269	3.2	118	392	713	1,316	1,934	2,720	3,658	5,309	Undeveloped
Harmon Upstream	3883	CDM	2,090	-	125	415	756	1,396	2,051	2,885	3,881	5,632	Undeveloped
Harmon Foothill	2883	CDM	2,734	-	156	519	945	1,745	2,564	3,606	4,850	7,039	Undeveloped
Harmon Intermediate	1883	CDM	3,110	-	174	578	1,051	1,942	2,853	4,013	5,397	7,833	Undeveloped
Harmon Barranca	883	CDM	3,695	5.8	200	667	1,213	2,241	3,292	4,630	6,227	9,038	Undeveloped
Sudden Upstream	884	CDM	292	-	25	82	149	276	405	570	767	1,113	Undeveloped
Sudden Barr	885	CDM	465	1.2	227	452	636	904	1,126	1,370	1,632	2,058	Developed
Clarke Barr	886	CDM	809	1.3	256	508	715	1,016	1,266	1,540	1,834	2,313	Developed
Santa Clara River	890	FEMA	2,020	1,654.5	9,700	32,260	58,690	108,420	159,260	224,000	301,280	437,250	Undeveloped
Patterson Rd Drain	891	FEMA	893	1.8	241	479	673	957	1,192	1,450	1,727	2,178	Developed
Santa Clara River	900	FEMA	2,504	1,660.2	9,570	31,820	57,900	106,960	157,131	221,000	297,250	431,390	Undeveloped
Santa Clara River	910	FEMA	256	1,660.6	9,570	31,820	57,900	106,960	157,131	221,000	297,250	431,390	Undeveloped

Note (1): Calculated 100-yr Discharges for Intermediate Reaches Have Names in Red Font and 4 digit Subarea Numbers.

SECTION 3 LOS ANGELES COUNTY MODELING AND RESULTS

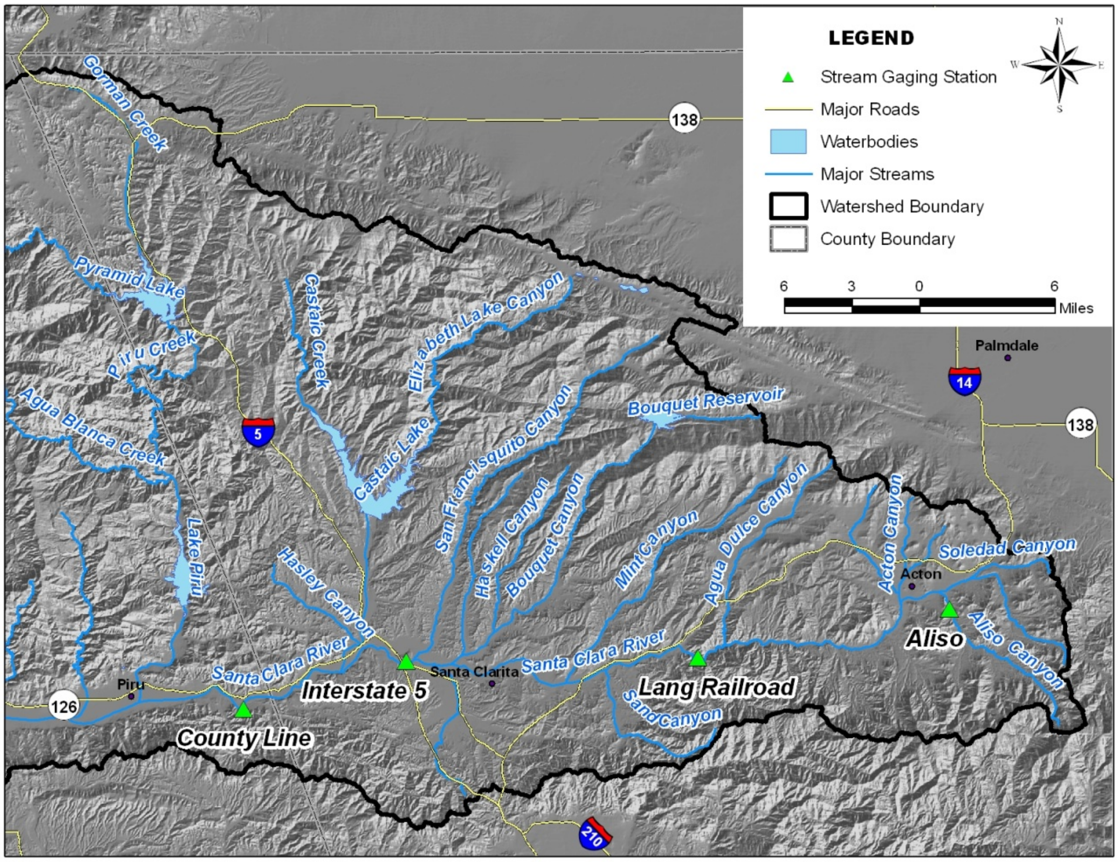
This section provides additional information on the hydrology results presented in Appendix M of the AQUA TERRA Report (2009).

3.1 LOS ANGELES COUNTY STREAM GAGE FREQUENCY ANALYSES

As presented in Appendix M, there were four tributary stream gages in Los Angeles County with relatively long records that were used to calibrate the HSPF Design Storm Model to provide tributary design storm peaks for the hydraulic modeling effort.

The HSPF model was calibrated to match each gage's peak 100-year frequency flow rate from the flow frequency analysis (FFA). The FFA was performed by Ventura County Watershed Protection District with the results for Aliso Canyon and the County Line being from the Santa Clara River 2006 Hydrology Update. A separate FFA was computed using the station skew factors and was used for the results at the Lang and I-5 runoff gages. The HEC-FFA output for the gages is provided in Appendix B along with HEC-SSP probability plots of the annual peak data and the log Pearson III fit. The data sets only include data through 2005. Figure 3.1 shows the stream gage locations in Los Angeles County.

Figure 3-1. Stream Gage Locations for Los Angeles County



3.2 FREQUENCY CURVES AND HSPF DATA COMPARISON

The 100-yr peak discharge data presented in Appendix B was used to calibrate the design storm HSPF model. Table 3-1 compares the HSPF model results with the FFA 100-yr peak discharge results of the four Los Angeles County gages. The table shows that the HSPF model results are within 9% or less of the FFA results.

Table 3-1. HSPF and FFA 100-Yr Flow Comparison for Los Angeles County

HSPF Reach Number	Location	SCR HSPF Results (cfs)	SCR FFA Results (cfs)	Percent Diff. (FFA vs HSPF)
23	Aliso Creek at Blum Ranch	4,680	4,720	0.8%
70	SCR at Lang Railroad Bridge	21,340	19,600	-8.9%
180	SCR at Interstate 5	52,860	52,300	-1.1%
320	SCR County Line Gage	66,260	66,600	0.5%

Average discharge frequency multipliers were developed from the Los Angeles County stream gages to provide other frequency peak flows from the calibrated HSPF 100-yr model. Table 2-2 summarizes the ratios developed to convert 100-yr peak discharges to other recurrence intervals.

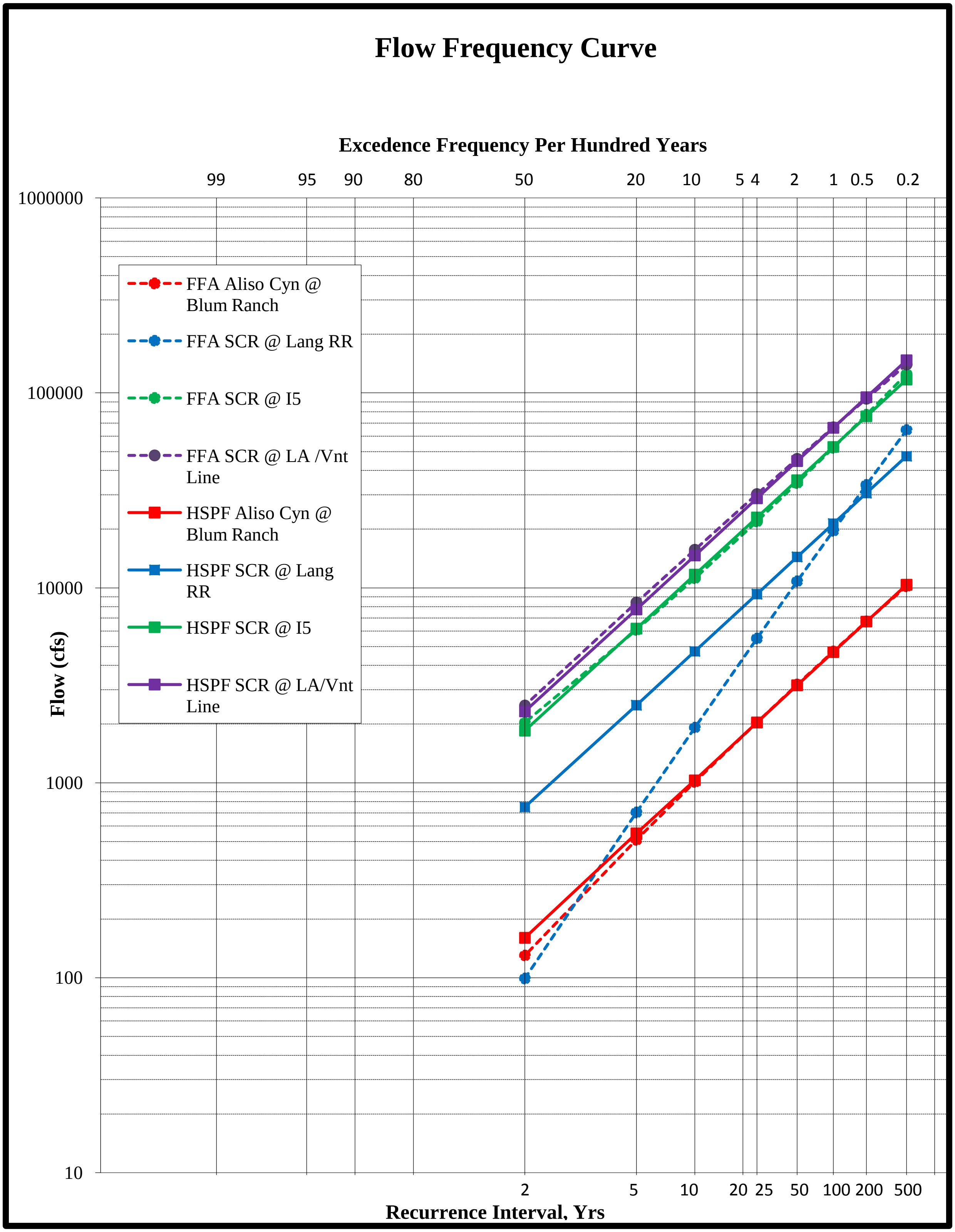
Table 3-2. Discharge Frequency Multipliers for Los Angeles County

Frequency	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
Frequency Multiplier	0.035	0.117	0.221	0.435	0.675	1.000	1.434	2.218

The frequency curves show good correlation between the gages with the exception of Lang Railroad Station. The results from Lang Railroad Station were disregarded in determining the discharge frequency multipliers due to inconsistent discharge results.

Figure 3-2 shows the frequency curves from Appendix B plotted against the HSPF model results using the discharge frequency multipliers.

Figure 3-2. Gage Frequency Curves and HSPF Design Storm Peaks



3.3 MAINSTEM PEAK FLOW MODELING

The HSPF report did not provide any design peak flow data for the Santa Clara River Mainstem. Table 3-3 summarizes the Mainstem 100-yr peak flows.

Table 3-3. Mainstem 100-Yr Peak Flows for Los Angeles County

HSPF Reach Number	Mainstem Location	SCR HSPF Results (cfs)	SCR FFA Results (cfs)	Percent Diff. (FFA vs HSPF)
20	SCR downstream Soledad Cyn	3,210	NA	NA
20	SCR downstream Trade Post and Aliso Cyn	8,080	NA	NA
30	SCR downstream Acton Cyn 2B	11,990	NA	NA
40	SCR	12,660	NA	NA
50	SCR	15,650	NA	NA
60	SCR upstream Agua Dulce Cyn	17,200	NA	NA
60	SCR downstream Agua Dulce Cyn	20,210	NA	NA
70	SCR at Lang Railroad Bridge	21,340	19,600	-8.9%
80	SCR downstream Tick Cyn	22,840	NA	NA
80	SCR downstream Oak Spring Cyn	23,970	NA	NA
80	SCR downstream Sand Cyn	25,830	NA	NA
90	SCR between Sand Cyn and Mint Cyn	25,810	NA	NA
100	SCR downstream Mint Cyn	29,620	NA	NA
110	SCR	29,390	NA	NA
120	SCR	28,140	NA	NA
130	SCR downstream Bouquet Cyn	36,620	NA	NA
150	SCR downstream South Fork	44,680	NA	NA
180	SCR at Interstate 5	52,860	52,300	-1.1%
190	SCR upstream Lower Castaic Ck	51,730	NA	NA
300	SCR upstream San Martinez Chiquito Cyn	64,280	NA	NA
310	SCR upstream San Martinez Grande Cyn	64,540	NA	NA
320	SCR County Line Gage	66,260	66,600	0.5%

3.4 DESIGN STORM PEAK SUMMARY TABLE

Table 3-4 shows the design storm peak flows for use in the hydraulic modeling, including any intermediate discharges calculated with the USGS regression equation discussed previously in Section 1.3 (name shown in red). The discharge frequency multipliers from Table 3-2 have been used to convert 100-yr peak discharges to other recurrence intervals.

Table 3-4. Design Storm Peak Flow Results for Los Angeles County

HSPF Sub-Area	Name	Cumulative Drainage Area (sq.mi)	Discharge (cfs)							
			0.035	0.117	0.221	0.435	0.675	1.000	1.434	2.218
			2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
10	Kentucky Springs Cyn	7.74	30	120	220	430	670	990	1,420	2,200
11	Soledad Canyon (Intermediate Rch 1)	4.09	40	130	250	500	780	1,150	1,650	2,550
11	Soledad Canyon	9.03	80	260	490	970	1,500	2,220	3,180	4,920
12	Trade Post (Intermediate Rch 1)	0.79	10	40	70	130	210	310	440	690
12	Trade Post	2.97	30	110	210	400	630	930	1,330	2,060
19	Acton Canyon (A) (Intermediate Rch 1)	1.76	20	60	110	220	340	510	730	1,130
19	Acton Canyon (A) (Intermediate Rch 2)	3.50	30	110	200	400	610	910	1,300	2,020
19	Acton Canyon (A)	4.62	40	130	250	500	770	1,140	1,630	2,530
20	SCR upstream Soledad Cyn	-	30	120	220	430	670	990	1,420	2,200
20	SCR downstream Soledad Cyn	-	110	380	710	1,400	2,170	3,210	4,600	7,120
20	SCR upstream Trade Post and Aliso Cyn	20.28	100	350	650	1,290	2,000	2,960	4,240	6,570
20	SCR downstream Trade Post and Aliso Cyn	49.84	280	950	1,790	3,510	5,450	8,080	11,590	17,920
22	Aliso Canyon	17.87	150	490	930	1,830	2,840	4,210	6,040	9,340
23	Aliso Canyon (Intermediate Rch 1)	23.79	150	500	940	1,860	2,880	4,270	6,120	9,470
23	Aliso Canyon	26.59	160	550	1,030	2,040	3,160	4,680	6,710	10,380
24	Red Rover Mine (Intermediate Rch 1)	0.75	10	30	60	120	180	270	390	600
24	Red Rover Mine	2.40	30	80	160	310	490	720	1,030	1,600
25	Escondido Creek (Intermediate Rch 1)	1.55	10	50	90	180	280	410	590	910
25	Escondido Creek (Intermediate Rch 2)	4.04	30	110	200	400	610	910	1,300	2,020
25	Escondido Creek	6.84	50	160	310	610	950	1,410	2,020	3,130
26	Escondido Creek (Intermediate Rch 1)	10.77	70	240	450	890	1,380	2,050	2,940	4,550
26	Escondido Creek	12.98	80	280	530	1,040	1,610	2,390	3,430	5,300
27	Acton Canyon 2B (Intermediate Rch 1)	1.04	10	30	50	100	160	230	330	510
27	Acton Canyon 2B (Intermediate Rch 2)	1.56	10	40	70	140	220	320	460	710
27	Acton Canyon 2B	1.82	10	40	80	160	240	360	520	800

28	Acton Canyon 2B	7.51	60	200	370	730	1,130	1,670	2,390	3,700
29	Acton Canyon 2B	20.86	140	480	900	1,770	2,750	4,080	5,850	9,050
30	SCR upstream Acton Cyn 2B	-	280	950	1,790	3,510	5,450	8,080	11,590	17,920
30	SCR downstream Acton Cyn 2B	-	420	1,400	2,650	5,220	8,090	11,990	17,190	26,590
30	SCR	84.99	340	1,120	2,120	4,170	6,470	9,580	13,740	21,250
40	SCR	99.09	440	1,480	2,800	5,510	8,550	12,660	18,150	28,080
50	SCR	106.06	550	1,830	3,460	6,810	10,560	15,650	22,440	34,710
60	SCR upstream Agua Dulce Cyn	120.19	600	2,010	3,800	7,480	11,610	17,200	24,660	38,150
60	SCR downstream Agua Dulce Cyn	149.71	710	2,360	4,470	8,790	13,640	20,210	28,980	44,830
62	Agua Dulce Canyon (Intermediate Rch 1)	8.30	40	130	250	500	780	1,150	1,650	2,550
62	Agua Dulce Canyon (Intermediate Rch 2)	10.03	50	160	300	580	900	1,340	1,920	2,970
62	Agua Dulce Canyon	14.27	60	210	400	780	1,220	1,800	2,580	3,990
63	Agua Dulce Canyon (Intermediate Rch 1)	15.60	60	210	390	770	1,190	1,770	2,540	3,930
63	Agua Dulce Canyon (Intermediate Rch 2)	28.45	100	340	650	1,270	1,970	2,920	4,190	6,480
63	Agua Dulce Canyon	29.52	110	350	670	1,310	2,030	3,010	4,320	6,680
70	SCR Nr Lang Railroad Bridge	157.10	750	2,500	4,720	9,280	14,400	21,340	30,600	47,330
80	SCR	-	750	2,500	4,720	9,280	14,400	21,340	30,600	47,330
80	SCR upstream Tick Canyon	-	750	2,500	4,720	9,280	14,400	21,340	30,600	47,330
80	SCR downstream Tick Canyon	-	800	2,670	5,050	9,940	15,420	22,840	32,750	50,660
80	SCR upstream Oak Spring Canyon	-	800	2,670	5,050	9,940	15,420	22,840	32,750	50,660
80	SCR downstream Oak Spring Canyon	-	840	2,800	5,300	10,430	16,180	23,970	34,370	53,170
80	SCR upstream Sand Canyon	179.58	840	2,800	5,300	10,430	16,180	23,970	34,370	53,170
80	SCR downstream Sand Canyon	192.33	900	3,020	5,710	11,240	17,440	25,830	37,040	57,290
81	Sand Canyon	6.34	200	660	1,240	2,440	3,790	5,610	8,040	12,440
82	Iron Canyon (Intermediate Rch 1)	2.17	30	90	160	320	500	740	1,060	1,640
82	Iron Canyon	2.96	30	110	210	410	640	950	1,360	2,110
84	Sand Canyon upstream Iron Canyon	6.34	200	660	1,240	2,440	3,790	5,610	8,040	12,440
84	Sand Canyon (Intermediate Rch 1)	11.31	250	840	1,590	3,130	4,850	7,190	10,310	15,950
84	Sand Canyon	12.75	280	930	1,750	3,450	5,360	7,940	11,390	17,610
85	Oak Spring Canyon	6.43	40	130	250	500	770	1,140	1,630	2,530

86	Tick Canyon (Intermediate Rch 1)	4.57	50	170	320	620	970	1,430	2,050	3,170
86	Tick Canyon	5.67	60	200	380	740	1,150	1,710	2,450	3,790
90	SCR between Sand Cyn and Mint Cyn	195.09	900	3,020	5,700	11,230	17,420	25,810	37,010	57,250
100	SCR upstream Mint Canyon	195.75	890	2,980	5,630	11,090	17,210	25,490	36,550	56,540
100	SCR downstream Mint Canyon	227.30	1,040	3,470	6,550	12,880	19,990	29,620	42,480	65,700
101	Mint Canyon	16.83	130	450	850	1,670	2,590	3,840	5,510	8,520
102	Mint Canyon	18.70	150	510	970	1,900	2,950	4,370	6,270	9,690
102	Mint Canyon	21.44	150	510	970	1,900	2,950	4,370	6,270	9,690
102	Mint Canyon	22.20	150	510	970	1,900	2,950	4,370	6,270	9,690
102	Mint Canyon	27.26	150	510	970	1,900	2,950	4,370	6,270	9,690
103	Mint Canyon	28.67	150	500	940	1,850	2,880	4,260	6,110	9,450
103	Mint Canyon	29.37	150	500	940	1,850	2,880	4,260	6,110	9,450
110	SCR	229.59	1,030	3,440	6,500	12,780	19,840	29,390	42,150	65,190
120	SCR	234.04	980	3,290	6,220	12,240	18,990	28,140	40,350	62,410
121	Texas Canyon	10.99	120	410	780	1,530	2,380	3,520	5,050	7,810
122	Vasquez Canyon (Intermediate Rch 1)	3.29	40	130	250	490	760	1,120	1,610	2,480
122	Vasquez Canyon	4.39	50	170	310	620	960	1,420	2,040	3,150
123	Plum Canyon	3.17	40	130	240	470	730	1,080	1,550	2,400
130	SCR upstream Bouquet Cyn	239.05	950	3,180	6,000	11,810	18,330	27,160	38,950	60,240
130	SCR downstream Bouquet Cyn	311.23	1,280	4,280	8,090	15,930	24,720	36,620	52,510	81,220
133	Bouquet Cyn (Intermediate Rch 1)	22.26	140	450	860	1,680	2,610	3,870	5,550	8,580
133	Bouquet Cyn	24.44	150	490	920	1,820	2,820	4,180	5,990	9,270
134	Bouquet Cyn upstream Vasquez Cyn	35.43	270	900	1,700	3,340	5,180	7,680	11,010	17,030
134	Bouquet Cyn (Intermediate Rch 1)	43.50	280	940	1,770	3,480	5,400	8,000	11,470	17,740
134	Bouquet Cyn	45.16	290	970	1,820	3,590	5,570	8,250	11,830	18,300
138	Bouquet Cyn upstream Plum Cyn	46.30	300	1,000	1,880	3,700	5,740	8,510	12,200	18,880
138	Bouquet Cyn	50.71	330	1,090	2,060	4,050	6,280	9,310	13,350	20,650
139	Bouquet Cyn upstream Haskell Cyn	50.86	330	1,090	2,060	4,060	6,300	9,340	13,390	20,720
142	Haskell Canyon (Intermediate Rch 1)	8.84	110	360	680	1,330	2,070	3,060	4,390	6,790
142	Haskell Canyon	9.76	120	390	730	1,440	2,240	3,320	4,760	7,360

143	Bouquet Cyn (Intermediate Rch 1)	61.39	480	1,610	3,030	5,970	9,270	13,730	19,690	30,450
143	Bouquet Cyn upstream Dry Cyn	60.62	440	1,460	2,750	5,410	8,400	12,440	17,840	27,590
143	Bouquet Cyn	72.18	550	1,840	3,470	6,830	10,600	15,700	22,510	34,820
146	Dry Canyon (Intermediate Rch 1)	7.25	90	290	550	1,070	1,670	2,470	3,540	5,480
146	Dry Canyon	8.44	100	330	620	1,220	1,890	2,800	4,020	6,210
147	Dry Canyon	9.48	110	370	700	1,380	2,140	3,170	4,550	7,030
148	Towsley Canyon	5.83	100	330	630	1,230	1,910	2,830	4,060	6,280
149	Lyon Canyon	1.50	20	80	150	300	470	690	990	1,530
150	SCR upstream South Fork SCR	311.96	1,280	4,280	8,090	15,930	24,720	36,620	52,510	81,220
150	SCR downstream South Fork SCR	357.26	1,560	5,230	9,870	19,440	30,160	44,680	64,070	99,100
153	South Fork SCR upstream Towsley Cyn	4.19	140	480	900	1,770	2,740	4,060	5,820	9,010
153	South Fork SCR upstream Lyon Cyn	11.37	170	580	1,100	2,160	3,350	4,960	7,110	11,000
154	South Fork SCR	14.14	190	630	1,190	2,350	3,650	5,400	7,740	11,980
156	Pico Canyon (Intermediate Rch 1)	3.33	40	120	230	450	700	1,040	1,490	2,310
156	Pico Canyon (Intermediate Rch 2)	6.34	60	210	390	770	1,190	1,770	2,540	3,930
156	Pico Canyon	6.93	70	220	420	830	1,290	1,910	2,740	4,240
159	South Fork SCR	23.37	290	990	1,860	3,660	5,680	8,420	12,070	18,680
161	Newhall Creek (Intermediate Rch 1)	5.70	30	110	210	420	650	970	1,390	2,150
161	Newhall Creek (Intermediate Rch 2)	7.65	40	150	270	540	840	1,240	1,780	2,750
161	Newhall Creek	17.72	90	290	550	1,080	1,670	2,480	3,560	5,500
164	Placerita Ck (Intermediate Rch 1)	6.79	60	210	390	770	1,190	1,770	2,540	3,930
164	Placerita Ck (Intermediate Rch 2)	8.87	80	260	490	960	1,490	2,210	3,170	4,900
164	Placerita Ck	9.53	80	270	520	1,020	1,580	2,340	3,360	5,190
168	South Fork SCR	43.86	370	1,240	2,340	4,620	7,160	10,610	15,210	23,530
169	South Fork SCR	45.30	380	1,270	2,400	4,720	7,320	10,840	15,540	24,040
170	SCR upstream San Francisquito Cyn	-	1,560	5,230	9,870	19,440	30,160	44,680	64,070	99,100
170	SCR downstream San Francisquito Cyn	409.29	1,880	6,300	11,890	23,410	36,320	53,810	77,160	119,350
173	San Francisquito Cyn	39.79	500	1,680	3,170	6,250	9,690	14,360	20,590	31,850
174	San Francisquito Cyn	-	480	1,600	3,020	5,940	9,210	13,650	19,570	30,280
174	San Francisquito Cyn	43.19	480	1,600	3,020	5,940	9,210	13,650	19,570	30,280

175	San Francisquito Cyn	-	490	1,620	3,060	6,030	9,360	13,860	19,880	30,740
175	San Francisquito Cyn	49.08	490	1,620	3,060	6,030	9,360	13,860	19,880	30,740
180	SCR at Interstate 5	410.62	1,850	6,180	11,680	22,990	35,680	52,860	75,800	117,240
190	SCR upstream Lion Cyn	419.23	1,810	6,050	11,420	22,480	34,880	51,680	74,110	114,630
190	SCR upstream Lower Castaic Creek	420.02	1,810	6,050	11,430	22,500	34,920	51,730	74,180	114,740
191	Lion Canyon	0.79	10	20	50	90	140	210	300	470
198	Violin Canyon	5.91	70	230	440	860	1,340	1,980	2,840	4,390
199	Marple Cyn	2.40	30	110	200	400	610	910	1,300	2,020
218	Marple Cyn (Intermediate Rch 1)	9.26	120	400	760	1,490	2,320	3,430	4,920	7,610
218	Marple Cyn	10.50	130	450	840	1,660	2,570	3,810	5,460	8,450
219	Lower Castaic Creek	11.53	410	1,380	2,610	5,150	7,990	11,830	16,960	26,240
223	Lower Castaic Creek (Intermediate Rch 1)	28.72	490	1,650	3,120	6,150	9,540	14,130	20,260	31,340
223	Lower Castaic Creek	29.58	510	1,690	3,200	6,300	9,770	14,480	20,760	32,120
224	Lower Castaic Creek	31.57	510	1,700	3,220	6,330	9,830	14,560	20,880	32,290
227	Hasley Canyon (Intermediate Rch 1)	4.44	20	50	100	200	310	460	660	1,020
227	Hasley Canyon (Intermediate Rch 2)	7.20	20	80	150	300	470	690	990	1,530
227	Hasley Canyon	7.99	30	90	170	330	510	750	1,080	1,660
228	Lower Castaic Creek (Intermediate Rch 1)	40.98	470	1,570	2,970	5,850	9,080	13,450	19,290	29,830
228	Lower Castaic Creek	41.31	470	1,580	2,990	5,890	9,140	13,540	19,420	30,030
300	SCR upstream San Martinez Chiquito Cyn	620.26	2,250	7,520	14,210	27,960	43,390	64,280	92,180	142,570
301	San Martinez Chiquito Cyn	2.31	10	30	50	100	160	240	340	530
302	San Martinez Chiquito Cyn (Intermediate Rch 1)	3.57	10	40	80	160	240	360	520	800
302	San Martinez Chiquito Cyn (Intermediate Rch 2)	4.58	20	50	100	200	300	450	650	1,000
302	San Martinez Chiquito Cyn	4.99	20	60	110	210	320	480	690	1,060
303	Long Canyon	0.95	10	20	40	70	110	170	240	380
303	Long Canyon	1.54	10	30	60	110	180	260	370	580
310	SCR upstream San Martinez Grande Cyn	-	2,260	7,550	14,260	28,070	43,560	64,540	92,550	143,150
304	San Martinez Grande Cyn	3.22	80	270	510	1,000	1,560	2,310	3,310	5,120
310	SCR upstream Potrero Cyn	631.33	2,280	7,630	14,420	28,380	44,040	65,250	93,570	144,720
311	Potrero Cyn	1.95	10	40	80	170	260	380	540	840

312	Potrero Cyn (Intermediate Rch 1)	3.63	60	190	360	700	1,090	1,620	2,320	3,590
312	Potrero Cyn	4.49	70	230	430	840	1,300	1,930	2,770	4,280
320	SCR at County Line	638.96	2,320	7,750	14,640	28,820	44,730	66,260	95,020	146,960

Note (1): Calculated 100-yr Discharges for Intermediate Reaches Have Names in Red Font.

SECTION 4 REFERENCES

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FEMA, 1997. Flood Insurance Study, Ventura County, California, Unincorporated Areas. Vol 1 of 2. Revised September 3, 1997. Community Number – 060413.

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USGS, 1982. Guidelines for Determining Flood Flow Frequency. Bulletin #17B of the Hydrology Subcommittee. U.S. Department of the Interior, Geological Survey. March, 1982.

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SECTION 5 APPENDIX A- VENTURA COUNTY FFA OUTPUT AND PROBABILITY PLOTS

5.1 HOPPER CREEK FFA

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************************************      *************************************
 *              FFA                 *      *                                   *
 *     FLOOD FREQUENCY ANALYSIS     *      *   U.S. ARMY CORPS OF ENGINEERS    *
 *     PROGRAM DATE:  FEB 1995      *      * THE HYDROLOGIC ENGINEERING CENTER *
 *          VERSION:  3.1           *      *         609 SECOND STREET         *
 *     RUN  DATE   AND   TIME:      *      *      DAVIS, CALIFORNIA 95616      *
 *        23 OCT 06    08:01:16     *      *          (916) 756-1104           *
 *                                  *      *                                   *
 ************************************      *************************************

  INPUT FILE NAME: 701_USWP.DAT
 OUTPUT FILE NAME: 701_USWP.FFO

 **TITLE RECORD(S)**
 TT   FLOOD FLOW FREQUENCY PROGRAM TEST 4-HOPPER CREEK NEAR PIRU MIX OF GS&WPD
 TT   REGIONAL SKEW -.3 TO DUPLICATE C.O.E. RESULTS AND BULL 17B MAP

 **STATION IDENTIFICATION**
 ID    1105 HOPPER CREEK NEAR PIRU (V.C. #701)   DA=23.6SQMI REC BEGAN:1933 TYPE:G

 **GENERALIZED SKEW**
      ISTN   GGMSE    SKEW
 GS   1105    .000    -.30

 **SYSTEMATIC EVENTS**
      70 EVENTS TO BE ANALYZED

 **END OF INPUT DATA**
 ED +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ   FINAL RESULTS    ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

 -PLOTTING POSITIONS-  1105 HOPPER CREEK NEAR PIRU (V.C. #701)   D
 ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
 º      EVENTS ANALYZED     ³          ORDERED EVENTS         º
 º                     FLOW   ³        WATER      FLOW   WEIBULL  º
 º MON DAY  YEAR     CFS    ³   RANK  YEAR       CFS    PLOT POS º
 ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
 º   0   0  1934     5300. ³     1   2005     17600.     1.41  º
 º   0   0  1935      750. ³     2   1998     17344.     2.82  º
 º   2   2  1936      810. ³     3   1969      8400.     4.23  º
 º   3   2  1938     8000. ³     4   1980      8120.     5.63  º
 º   1   5  1939     1250. ³     5   1938      8000.     7.04  º
 º   2  25  1940      221. ³     6   1995      7040.     8.45  º
 º   2  21  1941     1340. ³     7   1978      5460.     9.86  º
 º   1  22  1943     4200. ³     8   1934      5300.    11.27  º
 º   2  22  1944     1350. ³     9   1992      4799.    12.68  º
 º   2   2  1945     1020. ³    10   1967      4450.    14.08  º
 º  12  21  1945      710. ³    11   1983      4410.    15.49  º
 º  11  13  1946      578. ³    12   1943      4200.    16.90  º
 º   3  24  1948      100. ³    13   1958      3690.    18.31  º
 º   3  11  1949       90. ³    14   1986      3290.    19.72  º
 º   2   6  1950     1000. ³    15   1966      3000.    21.13  º
```

1	19	1951	18.	16	2004	2680.	22.54
1	15	1952	2200.	17	1952	2200.	23.94
12	1	1952	126.	18	1993	2140.	25.35
2	13	1954	146.	19	1962	1840.	26.76
2	27	1955	255.	20	1991	1680.	28.17
1	26	1956	992.	21	1973	1670.	29.58
1	13	1957	1160.	22	1971	1620.	30.99
4	3	1958	3690.	23	2001	1619.	32.39
2	16	1959	496.	24	1988	1460.	33.80
4	27	1960	249.	25	2000	1420.	35.21
11	6	1960	61.	26	1944	1350.	36.62
2	10	1962	1840.	27	1941	1340.	38.03
2	9	1963	470.	28	1939	1250.	39.44
11	20	1963	307.	29	1957	1160.	40.85
4	9	1965	504.	30	1979	1030.	42.25
12	29	1965	3000.	31	1945	1020.	43.66
12	6	1966	4450.	32	1950	1000.	45.07
11	20	1967	450.	33	1997	1000.	46.48
1	25	1969	8400.	34	1956	992.	47.89
2	28	1970	800.	35	1984	981.	49.30
11	29	1970	1620.	36	2003	812.	50.70
12	24	1971	691.	37	1936	810.	52.11
2	11	1973	1670.	38	1970	800.	53.52
1	7	1974	547.	39	1975	799.	54.93
12	4	1974	799.	40	1935	750.	56.34
2	9	1976	266.	41	1946	710.	57.75
1	3	1977	390.	42	1972	691.	59.15
2	9	1978	5460.	43	1947	578.	60.56
3	27	1979	1030.	44	1974	547.	61.97
2	16	1980	8120.	45	1982	527.	63.38
1	29	1981	311.	46	1965	504.	64.79
4	1	1982	527.	47	1959	496.	66.20
3	1	1983	4410.	48	1963	470.	67.61
12	25	1983	981.	49	1968	450.	69.01
12	16	1984	339.	50	1990	412.	70.42
2	14	1986	3290.	51	1994	406.	71.83
3	6	1987	210.	52	1996	400.	73.24
2	29	1988	1460.	53	1977	390.	74.65
12	21	1988	307.	54	1985	339.	76.06
2	17	1990	412.	55	1981	311.	77.46
3	19	1991	1680.	56	1989	307.	78.87
2	12	1992	4799.	57	1964	307.	80.28
2	23	1993	2140.	58	1976	266.	81.69
2	20	1994	406.	59	1955	255.	83.10
1	10	1995	7040.	60	1960	249.	84.51
2	20	1996	400.	61	1940	221.	85.92
12	22	1996	1000.	62	1987	210.	87.32
2	7	1998	17344.	63	1999	199.	88.73
2	9	1999	199.	64	2002	196.	90.14
2	20	2000	1420.	65	1954	146.	91.55
1	11	2001	1619.	66	1953	126.	92.96
11	24	2001	196.	67	1948	100.	94.37
3	15	2003	812.	68	1949	90.	95.77
2	26	2004	2680.	69	1961	61.	97.18
1	10	2005	17600.	70	1951	18.	98.59

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-OUTLIER TESTS -
ÄÄÄ

LOW OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

```
BASED ON  70 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.893

       0 LOW OUTLIER(S) IDENTIFIED BELOW TEST VALUE OF     17.9

ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
HIGH OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

BASED ON  70 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.893

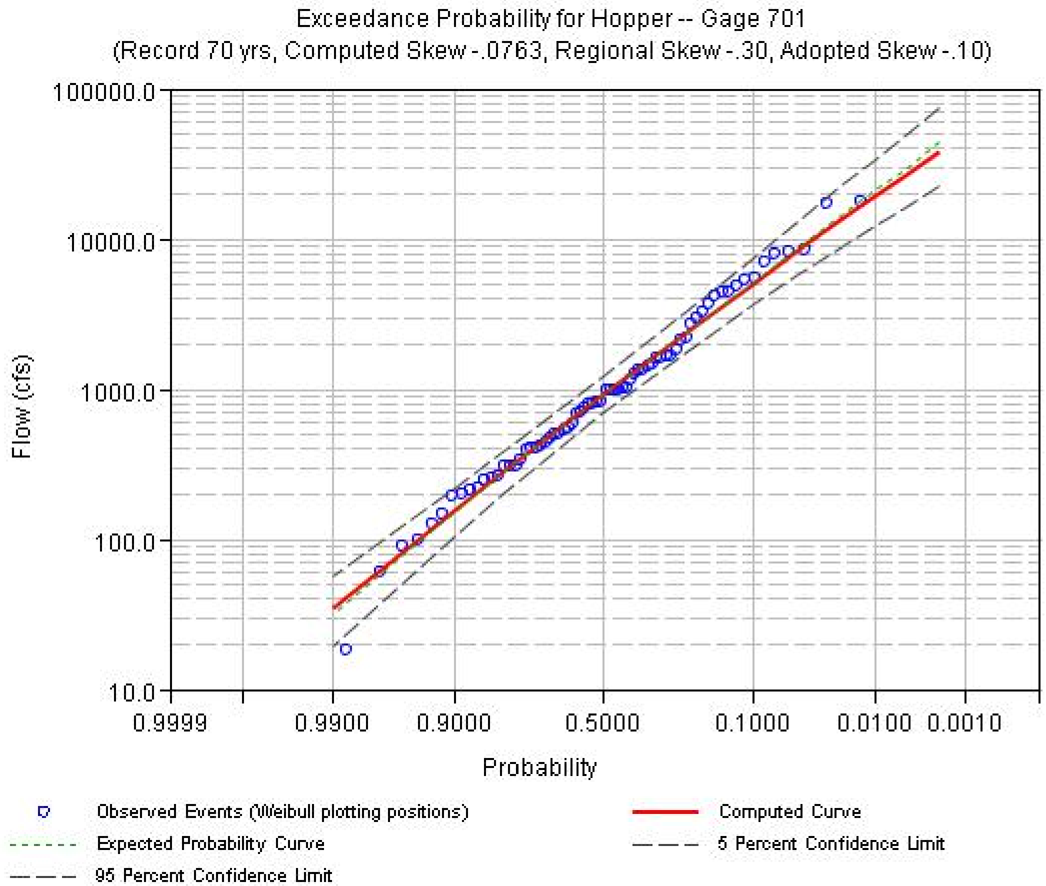
      0 HIGH OUTLIER(S) IDENTIFIED ABOVE TEST VALUE OF   45626.
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

-SKEW WEIGHTING -
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
BASED ON  70 EVENTS, MEAN-SQUARE ERROR OF STATION SKEW =   .079
DEFAULT OR INPUT MEAN-SQUARE ERROR OF GENERALIZED SKEW =   .302
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

FINAL RESULTS

-FREQUENCY CURVE-  1105 HOPPER CREEK NEAR PIRU (V.C. #701)   D
ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
º  COMPUTED   EXPECTED   ³   PERCENT   ³    CONFIDENCE LIMITS  º
º   CURVE   PROBABILITY  ³    CHANCE   ³      .05        .95   º
º      FLOW IN CFS       ³  EXCEEDANCE ³      FLOW IN CFS      º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º    37900.     44000.   ³        .2   ³    74300.     22500.  º
º    26100.     29300.   ³        .5   ³    48500.     16100.  º
º    19200.     21000.   ³       1.0   ³    34000.     12200.  º
º    13600.     14600.   ³       2.0   ³    23000.      8960.  º
º     8080.      8450.   ³       5.0   ³    12800.      5590.  º
º     5060.      5200.   ³      10.0   ³     7540.      3640.  º
º     2850.      2890.   ³      20.0   ³     3990.      2130.  º
º      925.       925.   ³      50.0   ³     1210.       707.  º
º      291.       287.   ³      80.0   ³      390.       208.  º
º      157.       152.   ³      90.0   ³      219.       105.  º
º       94.        89.   ³      95.0   ³      137.        59.  º
º       35.        32.   ³      99.0   ³       56.        19.  º
ÌÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¹
º                      SYSTEMATIC STATISTICS                   º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÂÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º LOG TRANSFORM: FLOW, CFS       ³      NUMBER OF EVENTS      º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º  MEAN                  2.9566  ³  HISTORIC EVENTS        0  º
º  STANDARD DEV           .5885  ³  HIGH OUTLIERS       0     º
º  COMPUTED SKEW         -.0763  ³  LOW OUTLIERS        0     º
º  REGIONAL SKEW         -.3000  ³  ZERO OR MISSING     0     º
º  ADOPTED SKEW          -.1000  ³  SYSTEMATIC EVENTS      70  º
ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼

+++++++++++++++++++++++++
+ END OF RUN            +
+ NORMAL STOP IN FFA    +
+++++++++++++++++++++++++
```



Exceedance Probability for Hopper -- Gage 701
(Record 70 yrs, Computed Skew -.0763, Regional Skew -.30, Adopted Skew -.10)
100000.0
10000.0
1000.0
100.0
10.0
Flow (cfs)
0.9999
0.9900
0.9000
0.5000
0.1000
0.0100
0.0010
Probability
Observed Events (Weibull plotting positions)
Computed Curve
Expected Probability Curve
5 Percent Confidence Limit
95 Percent Confidence Limit

5.2 SANTA PAULA CREEK FFA

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************************************      ************************************
 *             FFA                  *       *                                  *
 *     FLOOD FREQUENCY ANALYSIS     *       *   U.S. ARMY CORPS OF ENGINEERS   *
 *     PROGRAM DATE:  FEB 1995      *       * THE HYDROLOGIC ENGINEERING CENTER *
 *          VERSION:  3.1           *       *         609 SECOND STREET         *
 *     RUN  DATE   AND   TIME:      *       *      DAVIS, CALIFORNIA 95616      *
 *        28 AUG 07    10:37:36     *       *          (916) 756-1104           *
 *                                  *       *                                  *
 ************************************       ************************************

  INPUT FILE NAME: 709_USGS.DAT
 OUTPUT FILE NAME: 709_USGS.FFO

 **TITLE RECORD(S)**
 TT    FLOOD FLOW FREQUENCY SANTA PAULA CRK NEAR SANTA PAULA CR 709 SEASONAL PEAK
 TT    REGIONAL SKEW -.3 TO DUPLICATE C.O.E. AND BULL 17B MAP

 **STATION IDENTIFICATION**
 ID     709  SANTA PAULA CRK NEAR SANTA PAULA  DA=40 SQ MI RECORD BEGAN IN 1927

 **GENERALIZED SKEW**
      ISTN   GGMSE    SKEW
 GS    709    .000    -.30

 **SYSTEMATIC EVENTS**
      72 EVENTS TO BE ANALYZED

 **END OF INPUT DATA**
 ED ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄPRELIMINARY RESULTS ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

 -SKEW WEIGHTING -
 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
 BASED ON  72 EVENTS, MEAN-SQUARE ERROR OF STATION SKEW =   .097
 DEFAULT OR INPUT MEAN-SQUARE ERROR OF GENERALIZED SKEW =   .302
 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

  PRELIMINARY RESULTS

 -FREQUENCY CURVE-   709  SANTA PAULA CRK NEAR SANTA PAULA  DA=
```

COMPUTED CURVE FLOW IN CFS	EXPECTED PROBABILITY FLOW IN CFS	PERCENT CHANCE EXCEEDANCE	CONFIDENCE LIMITS .05 FLOW IN CFS	CONFIDENCE LIMITS .95 FLOW IN CFS
59800.	67500.	.2	122000.	34100.
43200.	47600.	.5	84400.	25500.
32700.	35300.	1.0	61400.	19800.
23700.	25200.	2.0	42700.	14800.
14300.	14900.	5.0	24100.	9320.
8850.	9100.	10.0	14100.	6000.
4780.	4860.	20.0	7160.	3370.
1320.	1320.	50.0	1820.	958.
311.	304.	80.0	439.	209.
137.	131.	90.0	204.	85.
67.	63.	95.0	107.	38.

16.	14.	99.0	30.	8.

SYSTEMATIC STATISTICS

LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	3.0722	HISTORIC EVENTS	0
STANDARD DEV	.7105	HIGH OUTLIERS	0
COMPUTED SKEW	-.4000	LOW OUTLIERS	0
REGIONAL SKEW	-.3000	ZERO OR MISSING	0
ADOPTED SKEW	-.4000	SYSTEMATIC EVENTS	72

FINAL RESULTS

-PLOTTING POSITIONS- 709 SANTA PAULA CRK NEAR SANTA PAULA DA=

EVENTS ANALYZED				ORDERED EVENTS			
			FLOW		WATER	FLOW	WEIBULL
MON	DAY	YEAR	CFS	RANK	YEAR	CFS	PLOT POS
1	19	1933	2650.	1	2005	27500.	1.37
12	31	1933	8500.	2	1969	21000.	2.74
1	5	1935	1530.	3	1978	16000.	4.11
2	12	1936	2900.	4	1938	13500.	5.48
2	14	1937	1350.	5	1973	13400.	6.85
3	2	1938	13500.	6	1980	11800.	8.22
3	9	1939	371.	7	1943	10000.	9.59
2	25	1940	364.	8	1992	10000.	10.96
3	4	1941	3150.	9	1958	9130.	12.33
12	29	1941	554.	10	1934	8500.	13.70
1	22	1943	10000.	11	1995	8140.	15.07
2	22	1944	1900.	12	1952	7300.	16.44
2	2	1945	2500.	13	1993	7130.	17.81
3	30	1946	1350.	14	1966	6480.	19.18
11	20	1946	850.	15	1983	4750.	20.55
3	24	1948	85.	16	1967	4500.	21.92
3	11	1949	147.	17	1979	3680.	23.29
2	9	1950	660.	18	1986	3550.	24.66
4	28	1951	8.	19	2001	3480.	26.03
1	15	1952	7300.	20	1941	3150.	27.40
12	20	1952	219.	21	1962	3150.	28.77
1	24	1954	977.	22	1936	2900.	30.14
4	30	1955	78.	23	1933	2650.	31.51
1	26	1956	835.	24	1971	2530.	32.88
1	13	1957	825.	25	1945	2500.	34.25
4	3	1958	9130.	26	2004	2410.	35.62
2	16	1959	954.	27	1997	2130.	36.99
2	2	1960	156.	28	1988	1950.	38.36
11	12	1960	178.	29	1982	1910.	39.73
2	10	1962	3150.	30	1944	1900.	41.10
2	9	1963	684.	31	1935	1530.	42.47
4	1	1964	572.	32	1975	1440.	43.84
4	9	1965	548.	33	2000	1410.	45.21
11	24	1965	6480.	34	1946	1350.	46.58
12	6	1966	4500.	35	1937	1350.	47.95
11	21	1967	345.	36	1984	1230.	49.32
2	25	1969	21000.	37	1996	1230.	50.68
2	28	1970	940.	38	1991	1010.	52.05
11	29	1970	2530.	39	1954	977.	53.42
12	25	1971	937.	40	1959	954.	54.79

```
º   2  11  1973    13400.  ³    41   1970       940.    56.16  º
º   1   6  1974      614.  ³    42   1972       937.    57.53  º
º  12   4  1974     1440.  ³    43   1947       850.    58.90  º
º   2   9  1976      458.  ³    44   1956       835.    60.27  º
º   1   2  1977      134.  ³    45   1957       825.    61.64  º
º   2  10  1978    16000.  ³    46   2003       782.    63.01  º
º   1  15  1979     3680.  ³    47   1994       698.    64.38  º
º   2  16  1980    11800.  ³    48   1963       684.    65.75  º
º   3   1  1981      527.  ³    49   1950       660.    67.12  º
º   4   1  1982     1910.  ³    50   1974       614.    68.49  º
º  11  30  1982     4750.  ³    51   1964       572.    69.86  º
º  12  25  1983     1230.  ³    52   1942       554.    71.23  º
º  12  19  1984       90.  ³    53   1965       548.    72.60  º
º   2  14  1986     3550.  ³    54   1981       527.    73.97  º
º   3   6  1987      170.  ³    55   1990       499.    75.34  º
º   2  28  1988     1950.  ³    56   1976       458.    76.71  º
º   2   9  1989      109.  ³    57   1939       371.    78.08  º
º   2  17  1990      499.  ³    58   1940       364.    79.45  º
º   3  18  1991     1010.  ³    59   1968       345.    80.82  º
º   2  12  1992    10000.  ³    60   1953       219.    82.19  º
º   1  14  1993     7130.  ³    61   1961       178.    83.56  º
º   2  20  1994      698.  ³    62   1987       170.    84.93  º
º   1  10  1995     8140.  ³    63   1960       156.    86.30  º
º   2  20  1996     1230.  ³    64   1949       147.    87.67  º
º  12  22  1996     2130.  ³    65   1977       134.    89.04  º
º   4  11  1999       97.  ³    66   1989       109.    90.41  º
º   2  23  2000     1410.  ³    67   1999        97.    91.78  º
º   3   5  2001     3480.  ³    68   1985        90.    93.15  º
º  11  24  2001       35.  ³    69   1948        85.    94.52  º
º   3  15  2003      782.  ³    70   1955        78.    95.89  º
º   2  26  2004     2410.  ³    71   2002        35.    97.26  º
º   1  10  2005    27500.  ³    72   1951         8.    98.63  º
ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼

-OUTLIER TESTS  -
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
LOW OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

BASED ON  72 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.903

       1 LOW OUTLIER(S) IDENTIFIED BELOW TEST VALUE OF     10.2

STATISTICS AND FREQUENCY CURVE ADJUSTED FOR  1 LOW OUTLIER(S)

ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
HIGH OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

BASED ON  71 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.897

      0 HIGH OUTLIER(S) IDENTIFIED ABOVE TEST VALUE OF  107817.
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

-SKEW WEIGHTING -
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
BASED ON  72 EVENTS, MEAN-SQUARE ERROR OF STATION SKEW =   .078
DEFAULT OR INPUT MEAN-SQUARE ERROR OF GENERALIZED SKEW =   .302
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

FINAL RESULTS
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-FREQUENCY CURVE- 709 SANTA PAULA CRK NEAR SANTA PAULA DA=

COMPUTED CURVE	EXPECTED PROBABILITY	PERCENT CHANCE EXCEEDANCE	CONFIDENCE LIMITS .05	CONFIDENCE LIMITS .95
FLOW IN CFS			FLOW IN CFS	
82800.	97300.	.2	174000.	46300.
54400.	61600.	.5	108000.	31800.
38400.	42400.	1.0	72400.	23300.
26100.	28200.	2.0	46700.	16400.
14600.	15300.	5.0	24100.	9670.
8600.	8870.	10.0	13400.	5970.
4510.	4580.	20.0	6550.	3260.
1280.	1280.	50.0	1720.	947.
348.	342.	80.0	481.	240.
174.	168.	90.0	251.	111.
97.	92.	95.0	148.	58.
32.	29.	99.0	54.	17.

SYNTHETIC STATISTICS

LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	3.0946	HISTORIC EVENTS	0
STANDARD DEV	.6613	HIGH OUTLIERS	0
COMPUTED SKEW	-.0943	LOW OUTLIERS	1
REGIONAL SKEW	-.3000	ZERO OR MISSING	0
ADOPTED SKEW	-.1000	SYSTEMATIC EVENTS	72

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+++++++++++++++++++++++++
+ END OF RUN            +
+ NORMAL STOP IN FFA    +
+++++++++++++++++++++++++
```
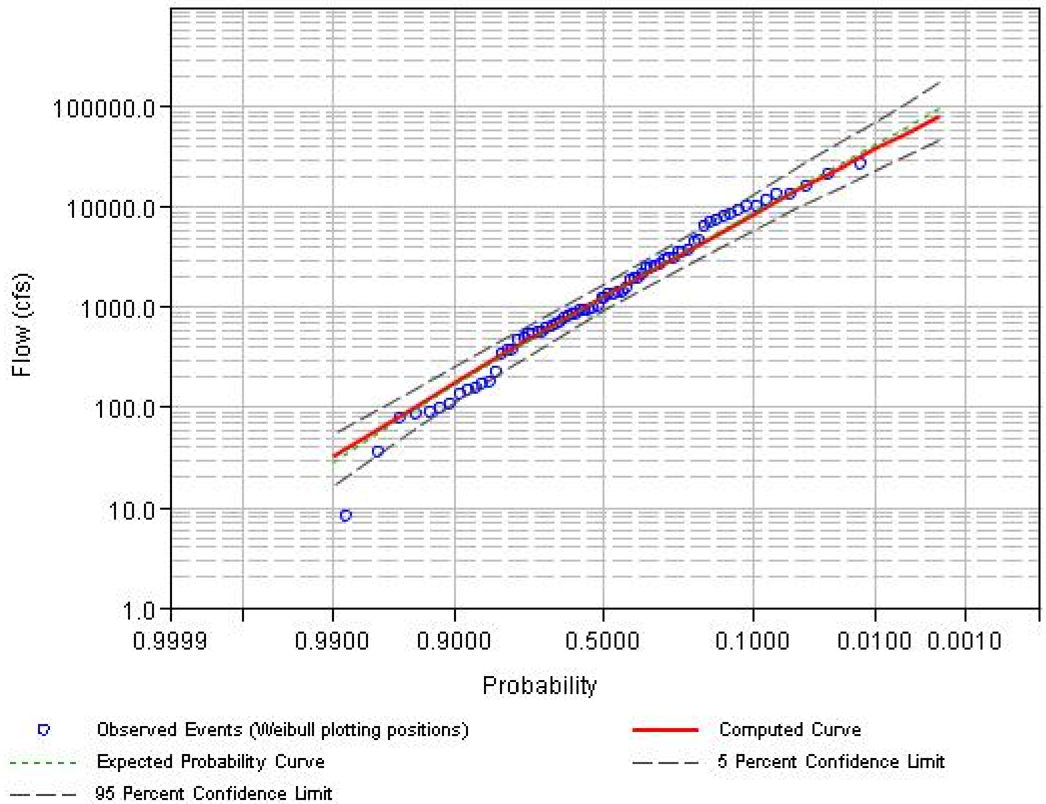

Exceedance Probability for Santa Paula Creek near Santa Paula - Gage 709
(Record 72 Yrs, Computed Skew -.0943, Regional Skew -.30, Adopted Skew -.10)



5.3 SESPE CREEK AT WHEELER SPRINGS FFA

```
************************************        ************************************
 *               FFA                 *       *                                  *
 *     FLOOD FREQUENCY ANALYSIS      *       *   U.S. ARMY CORPS OF ENGINEERS   *
 *     PROGRAM DATE:  FEB 1995       *       * THE HYDROLOGIC ENGINEERING CENTER *
 *          VERSION:  3.1            *       *        609 SECOND STREET         *
 *     RUN  DATE   AND   TIME:       *       *     DAVIS, CALIFORNIA 95616      *
 *        18 SEP 07    12:54:23      *       *         (916) 756-1104           *
 *                                   *       *                                  *
 ************************************        ************************************



  INPUT FILE NAME: 711_USGS.dat
 OUTPUT FILE NAME: 711_USGS.ffo



 **TITLE RECORD(S)**
 TT   FLOOD FLOW FREQUENCY PROGRAM-SESPE CREEK NEAR WHEELER SPRINGS
 TT   REGIONAL SKEW -.3 TO DUPLICATE C.O.E. RESULTS ON OTHER PROJECTS IN VENTURA CO
 TT    1115 SESPE CREEK NEAR WHEELER SPRINGS (VC #711)   DA= 50.0SQMI REC BEGAN:194

 **STATION IDENTIFICATION**
 ID   PROGRAM - SESPE CREEK NEAR WHEELER SPRINGS

 **GENERALIZED SKEW**
      ISTN   GGMSE    SKEW
 GS   1115    .000    -.30

 **SYSTEMATIC EVENTS**
      52 EVENTS TO BE ANALYZED

 **END OF INPUT DATA**
 ED ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ   FINAL RESULTS    ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

 -PLOTTING POSITIONS- PROGRAM - SESPE CREEK NEAR WHEELER SPRINGS
 ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
 º      EVENTS ANALYZED     ³           ORDERED EVENTS          º
 º                    FLOW  ³        WATER      FLOW   WEIBULL  º
 º MON DAY  YEAR      CFS   ³   RANK  YEAR      CFS    PLOT POS º
 ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
 º   3  10  1949       21.  ³      1   1983     11600.     1.89  º
 º   2   6  1950       53.  ³      2   1978     10700.     3.77  º
 º   3   1  1951       16.  ³      3   1969      9700.     5.66  º
 º   1  15  1952     3440.  ³      4   1995      8420.     7.55  º
 º  12   1  1952      151.  ³      5   1992      8400.     9.43  º
 º   2  13  1954      616.  ³      6   1980      6780.    11.32  º
 º  12   3  1954       69.  ³      7   2005      6660.    13.21  º
 º   1  26  1956      468.  ³      8   1993      5030.    15.09  º
 º   1  12  1957     1720.  ³      9   1986      4220.    16.98  º
 º   4   3  1958     3010.  ³     10   1967      3840.    18.87  º
```

2	16	1959	1880.	11	1991	3820.	20.75
1	10	1960	128.	12	1962	3800.	22.64
11	5	1960	674.	13	1952	3440.	24.53
2	10	1962	3800.	14	1966	3320.	26.42
2	9	1963	978.	15	1971	3150.	28.30
4	1	1964	376.	16	1958	3010.	30.19
4	16	1965	69.	17	1973	2960.	32.08
12	29	1965	3320.	18	1988	2900.	33.96
12	6	1966	3840.	19	1959	1880.	35.85
3	8	1968	179.	20	1957	1720.	37.74
1	25	1969	9700.	21	1975	1340.	39.62
2	28	1970	765.	22	2003	1280.	41.51
11	29	1970	3150.	23	1976	1010.	43.40
12	25	1971	381.	24	1984	1010.	45.28
2	11	1973	2960.	25	1963	978.	47.17
1	18	1974	172.	26	1979	877.	49.06
3	7	1975	1340.	27	2004	787.	50.94
9	29	1976	1010.	28	1970	765.	52.83
5	9	1977	194.	29	1961	674.	54.72
2	10	1978	10700.	30	1954	616.	56.60
3	28	1979	877.	31	1997	503.	58.49
2	16	1980	6780.	32	1956	468.	60.38
3	19	1981	228.	33	1972	381.	62.26
4	1	1982	371.	34	1964	376.	64.15
3	1	1983	11600.	35	1982	371.	66.04
12	25	1983	1010.	36	1996	296.	67.92
12	19	1984	33.	37	1994	252.	69.81
2	14	1986	4220.	38	1981	228.	71.70
3	6	1987	216.	39	1987	216.	73.58
2	29	1988	2900.	40	1977	194.	75.47
2	9	1989	50.	41	1968	179.	77.36
1	13	1990	38.	42	1974	172.	79.25
3	18	1991	3820.	43	1953	151.	81.13
2	12	1992	8400.	44	1960	128.	83.02
2	19	1993	5030.	45	1965	69.	84.91
2	7	1994	252.	46	1955	69.	86.79
3	10	1995	8420.	47	1950	53.	88.68
2	20	1996	296.	48	1989	50.	90.57
12	22	1996	503.	49	1990	38.	92.45
2	12	2003	1280.	50	1985	33.	94.34
2	25	2004	787.	51	1949	21.	96.23
2	21	2005	6660.	52	1951	16.	98.11

-OUTLIER TESTS -

LOW OUTLIER TEST

BASED ON 52 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.783

0 LOW OUTLIER(S) IDENTIFIED BELOW TEST VALUE OF 5.2

HIGH OUTLIER TEST

BASED ON 52 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.783

0 HIGH OUTLIER(S) IDENTIFIED ABOVE TEST VALUE OF 105727.

-SKEW WEIGHTING -

BASED ON 52 EVENTS, MEAN-SQUARE ERROR OF STATION SKEW = .122
DEFAULT OR INPUT MEAN-SQUARE ERROR OF GENERALIZED SKEW = .302

FINAL RESULTS

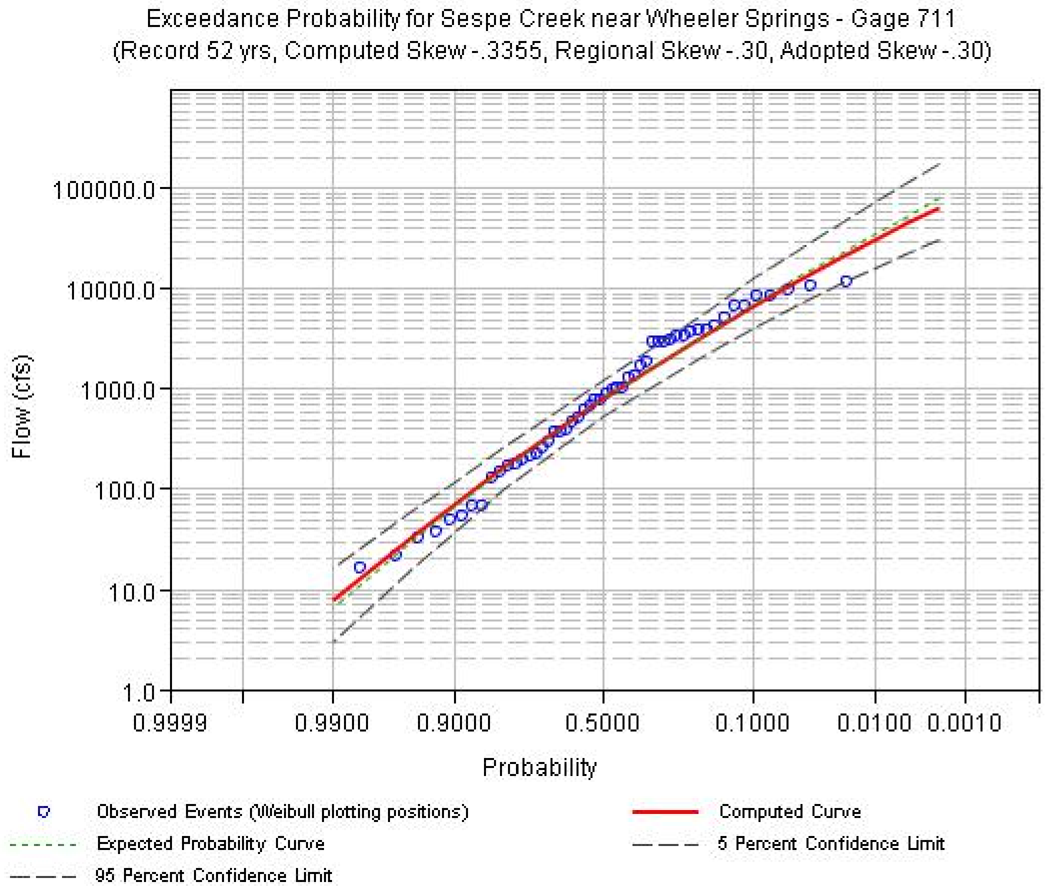
-FREQUENCY CURVE- PROGRAM - SESPE CREEK NEAR WHEELER SPRINGS

COMPUTED CURVE FLOW IN CFS	EXPECTED PROBABILITY FLOW IN CFS	PERCENT CHANCE EXCEEDANCE	CONFIDENCE LIMITS .05 FLOW IN CFS	CONFIDENCE LIMITS .95 FLOW IN CFS
65800.	81300.	.2	175000.	31600.
44200.	52200.	.5	110000.	22200.
31500.	36000.	1.0	73900.	16500.
21500.	23800.	2.0	47400.	11700.
11800.	12700.	5.0	23700.	6860.
6810.	7120.	10.0	12600.	4150.
3380.	3460.	20.0	5720.	2170.
808.	808.	50.0	1220.	536.
170.	165.	80.0	264.	101.
72.	67.	90.0	118.	38.
34.	31.	95.0	61.	16.
8.	6.	99.0	17.	3.

SYSTEMATIC STATISTICS

LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	2.8685	HISTORIC EVENTS	0
STANDARD DEV	.7746	HIGH OUTLIERS	0
COMPUTED SKEW	-.3355	LOW OUTLIERS	0
REGIONAL SKEW	-.3000	ZERO OR MISSING	0
ADOPTED SKEW	-.3000	SYSTEMATIC EVENTS	52

```
+++++++++++++++++++++++++
+ END OF RUN            +
+ NORMAL STOP IN FFA    +
+++++++++++++++++++++++++
```



Exceedance Probability for Sespe Creek near Wheeler Springs - Gage 711
(Record 52 yrs, Computed Skew -.3355, Regional Skew -.30, Adopted Skew -.30)
Flow (cfs)
100000.0
10000.0
1000.0
100.0
10.0
1.0
0.9999
0.9900
0.9000
0.5000
0.1000
0.0100
0.0010
Probability
Observed Events (Weibull plotting positions)
Computed Curve
Expected Probability Curve
5 Percent Confidence Limit
95 Percent Confidence Limit

5.4 SESPE CREEK AT FILLMORE FFA

```
************************************       *************************************
 *              FFA                 *       *                                   *
 *     FLOOD FREQUENCY ANALYSIS     *       *   U.S. ARMY CORPS OF ENGINEERS    *
 *     PROGRAM DATE:  FEB 1995      *       * THE HYDROLOGIC ENGINEERING CENTER *
 *          VERSION:  3.1           *       *        609 SECOND STREET          *
 *     RUN  DATE   AND   TIME:      *       *      DAVIS, CALIFORNIA 95616      *
 *        29 NOV 06    07:53:47     *       *          (916) 756-1104           *
 *                                  *       *                                   *
 ************************************       *************************************



  INPUT FILE NAME: 710USGSR.DAT
 OUTPUT FILE NAME: 710USGSR.FFO



 **TITLE RECORD(S)**
 TT   FLOOD FLOW FREQUENCY PROGRAM-SESPE CREEK NEAR FILLMORE
 TT   REGIONAL SKEW -.3 TO MATCH MAINSTEM VALUES FOR 2006 FEMA

 **STATION IDENTIFICATION**
 ID    1130 SESPE CREEK NEAR FILLMORE (VC #710) DA=251.0SQMI REC BEGAN:1932 TYPE:GD

 **GENERALIZED SKEW**
      ISTN   GGMSE    SKEW
 GS   1130    .000    -.30

 **SYSTEMATIC EVENTS**
      67 EVENTS TO BE ANALYZED

 **END OF INPUT DATA**
 ED ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++



 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄPRELIMINARY RESULTS ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ


 -SKEW WEIGHTING -
 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
 BASED ON  67 EVENTS, MEAN-SQUARE ERROR OF STATION SKEW =   .136
 DEFAULT OR INPUT MEAN-SQUARE ERROR OF GENERALIZED SKEW =   .302
 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ


  PRELIMINARY RESULTS

 -FREQUENCY CURVE-  1130 SESPE CREEK NEAR FILLMORE (VC #710) DA
 ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
 º  COMPUTED   EXPECTED   ³   PERCENT   ³    CONFIDENCE LIMITS  º
 º   CURVE   PROBABILITY  ³    CHANCE   ³      .05        .95   º
 º      FLOW IN CFS       ³  EXCEEDANCE ³      FLOW IN CFS      º
 ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
 º   171000.    185000.   ³       .2    ³   320000.    105000.  º
```

140000.	149000.	.5	254000.	87500.
117000.	123000.	1.0	206000.	74100.
93600.	98000.	2.0	161000.	60700.
64800.	67000.	5.0	106000.	43400.
44800.	45800.	10.0	70100.	30900.
27100.	27500.	20.0	40200.	19300.
8690.	8690.	50.0	11900.	6380.
2160.	2110.	80.0	3010.	1470.
938.	895.	90.0	1380.	583.
445.	412.	95.0	701.	251.
95.	79.	99.0	176.	43.

SYSTEMATIC STATISTICS

LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	3.8616	HISTORIC EVENTS	0
STANDARD DEV	.6672	HIGH OUTLIERS	0
COMPUTED SKEW	-.8182	LOW OUTLIERS	0
REGIONAL SKEW	-.3000	ZERO OR MISSING	0
ADOPTED SKEW	-.7000	SYSTEMATIC EVENTS	67

FINAL RESULTS

-PLOTTING POSITIONS- 1130 SESPE CREEK NEAR FILLMORE (VC #710) DA

EVENTS ANALYZED				ORDERED EVENTS			
			FLOW		WATER	FLOW	WEIBULL
MON	DAY	YEAR	CFS	RANK	YEAR	CFS	PLOT POS
1	19	1933	12000.	1	2005	85300.	1.47
12	31	1933	34000.	2	1978	73000.	2.94
1	5	1935	12500.	3	1995	65000.	4.41
2	12	1936	7200.	4	1998	62500.	5.88
2	14	1937	12800.	5	1969	60000.	7.35
3	2	1938	56000.	6	1938	56000.	8.82
3	9	1939	5000.	7	1983	56000.	10.29
2	25	1940	5500.	8	1943	44000.	11.76
3	4	1941	17300.	9	1992	44000.	13.24
12	28	1941	3150.	10	1980	40700.	14.71
1	23	1943	44000.	11	1973	38300.	16.18
2	22	1944	13000.	12	1934	34000.	17.65
2	2	1945	11500.	13	1958	28400.	19.12
3	30	1946	11300.	14	2001	25900.	20.59
12	25	1946	4850.	15	1962	25600.	22.06
3	24	1948	748.	16	1952	23200.	23.53
3	11	1949	725.	17	1971	22800.	25.00
2	6	1950	3000.	18	1966	21600.	26.47
1	11	1951	47.	19	1967	21600.	27.94
1	15	1952	23200.	20	1997	19800.	29.41
12	4	1952	3370.	21	2004	17700.	30.88
2	13	1954	4400.	22	1941	17300.	32.35
4	30	1955	785.	23	1991	16300.	33.82
1	26	1956	3900.	24	1944	13000.	35.29
1	13	1957	7650.	25	1937	12800.	36.76
4	3	1958	28400.	26	1935	12500.	38.24
2	16	1959	8280.	27	1933	12000.	39.71
1	10	1960	1330.	28	1945	11500.	41.18

º	11	6	1960	836.	³	29	1946	11300.	42.65	º
º	2	10	1962	25600.	³	30	1982	9660.	44.12	º
º	2	10	1963	4400.	³	31	1970	8800.	45.59	º
º	4	1	1964	2590.	³	32	1959	8280.	47.06	º
º	4	9	1965	2440.	³	33	1957	7650.	48.53	º
º	12	29	1965	21600.	³	34	2003	7630.	50.00	º
º	12	6	1966	21600.	³	35	1975	7210.	51.47	º
º	11	21	1967	1940.	³	36	1936	7200.	52.94	º
º	1	25	1969	60000.	³	37	1974	6860.	54.41	º
º	2	28	1970	8800.	³	38	1984	6330.	55.88	º
º	11	29	1970	22800.	³	39	1979	6300.	57.35	º
º	12	25	1971	4810.	³	40	1940	5500.	58.82	º
º	2	11	1973	38300.	³	41	1939	5000.	60.29	º
º	1	7	1974	6860.	³	42	2000	4900.	61.76	º
º	3	8	1975	7210.	³	43	1996	4870.	63.24	º
º	2	9	1976	3650.	³	44	1947	4850.	64.71	º
º	5	9	1977	1020.	³	45	1972	4810.	66.18	º
º	2	10	1978	73000.	³	46	1963	4400.	67.65	º
º	3	28	1979	6300.	³	47	1954	4400.	69.12	º
º	2	16	1980	40700.	³	48	1956	3900.	70.59	º
º	3	1	1981	2160.	³	49	1976	3650.	72.06	º
º	4	1	1982	9660.	³	50	1953	3370.	73.53	º
º	3	1	1983	56000.	³	51	1942	3150.	75.00	º
º	12	25	1983	6330.	³	52	1950	3000.	76.47	º
º	12	19	1984	1450.	³	53	1994	2590.	77.94	º
º	3	19	1991	16300.	³	54	1964	2590.	79.41	º
º	2	12	1992	44000.	³	55	1965	2440.	80.88	º
º	2	7	1994	2590.	³	56	1981	2160.	82.35	º
º	1	10	1995	65000.	³	57	1968	1940.	83.82	º
º	2	21	1996	4870.	³	58	1985	1450.	85.29	º
º	12	22	1996	19800.	³	59	1960	1330.	86.76	º
º	2	3	1998	62500.	³	60	1977	1020.	88.24	º
º	2	9	1999	445.	³	61	1961	836.	89.71	º
º	2	23	2000	4900.	³	62	1955	785.	91.18	º
º	3	6	2001	25900.	³	63	1948	748.	92.65	º
º	11	24	2001	93.	³	64	1949	725.	94.12	º
º	2	12	2003	7630.	³	65	1999	445.	95.59	º
º	2	25	2004	17700.	³	66	2002	93.	97.06	º
º	1	10	2005	85300.	³	67	1951	47.	98.53	º

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-OUTLIER TESTS -
ÄÄ
LOW OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

BASED ON 67 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.877

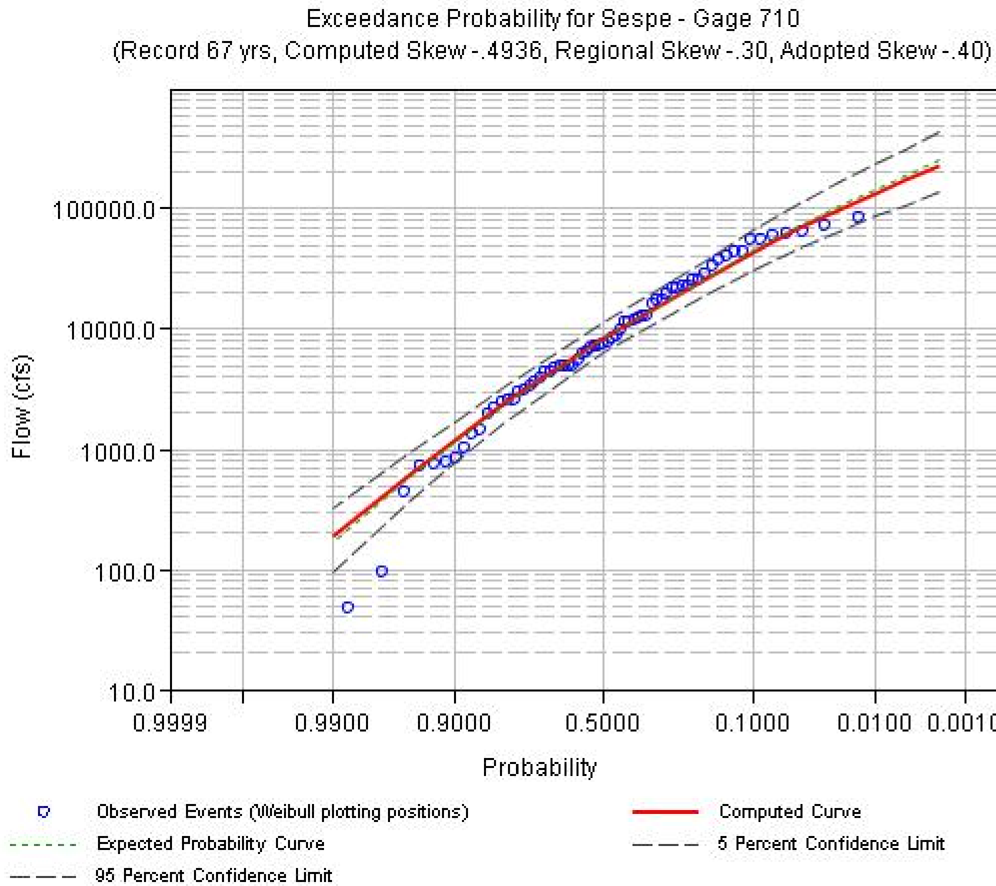
1 LOW OUTLIER(S) IDENTIFIED BELOW TEST VALUE OF 87.5

STATISTICS AND FREQUENCY CURVE ADJUSTED FOR 1 LOW OUTLIER(S)

ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
HIGH OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

BASED ON 66 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.871

```
      0 HIGH OUTLIER(S) IDENTIFIED ABOVE TEST VALUE OF  455008.
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ


-SKEW WEIGHTING -
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
BASED ON  67 EVENTS, MEAN-SQUARE ERROR OF STATION SKEW =   .109
DEFAULT OR INPUT MEAN-SQUARE ERROR OF GENERALIZED SKEW =   .302
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ



FINAL RESULTS

-FREQUENCY CURVE-  1130 SESPE CREEK NEAR FILLMORE (VC #710) DA
ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
º  COMPUTED   EXPECTED   ³   PERCENT   ³    CONFIDENCE LIMITS  º
º   CURVE   PROBABILITY  ³    CHANCE   ³       .05        .95   º
º      FLOW IN CFS       ³  EXCEEDANCE ³      FLOW IN CFS       º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º   227000.    254000.   ³        .2   ³   432000.    138000.  º
º   172000.    188000.   ³        .5   ³   313000.    107000.  º
º   135000.    145000.   ³       1.0   ³   238000.     86100.  º
º   102000.    108000.   ³       2.0   ³   173000.     67100.  º
º    66000.     68600.   ³       5.0   ³   106000.     45100.  º
º    43700.     44800.   ³      10.0   ³    66400.     30900.  º
º    25700.     26000.   ³      20.0   ³    36900.     18800.  º
º     8430.      8430.   ³      50.0   ³    11300.      6340.  º
º     2430.      2380.   ³      80.0   ³     3300.      1700.  º
º     1200.      1150.   ³      90.0   ³     1710.       776.  º
º      649.       610.   ³      95.0   ³      977.       389.  º
º      191.       166.   ³      99.0   ³      326.        96.  º
ÌÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¹
º                       SYNTHETIC STATISTICS                    º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÂÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º LOG TRANSFORM: FLOW, CFS       ³       NUMBER OF EVENTS       º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º  MEAN                  3.8853  ³  HISTORIC EVENTS        0  º
º  STANDARD DEV           .6130  ³  HIGH OUTLIERS       0      º
º  COMPUTED SKEW         -.4936  ³  LOW OUTLIERS        1      º
º  REGIONAL SKEW         -.3000  ³  ZERO OR MISSING     0      º
º  ADOPTED SKEW          -.4000  ³  SYSTEMATIC EVENTS      67  º
ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼




+++++++++++++++++++++++++
+ END OF RUN            +
+ NORMAL STOP IN FFA    +
+++++++++++++++++++++++++
```


Exceedance Probability for Sespe - Gage 710
(Record 67 yrs, Computed Skew -.4936, Regional Skew -.30, Adopted Skew -.40)
100000.0
10000.0
1000.0
100.0
10.0
Flow (cfs)
0.9999
0.9900
0.9000
0.5000
0.1000
0.0100
0.0010
Probability
Observed Events (Weibull plotting positions)
Computed Curve
Expected Probability Curve
5 Percent Confidence Limit
95 Percent Confidence Limit

5.5 SANTA CLARA RIVER AT MONTALVO FFA

```
 ************************************        *************************************
 *             FFA                  *        *                                   *
 *     FLOOD FREQUENCY ANALYSIS     *        *   U.S. ARMY CORPS OF ENGINEERS    *
 *     PROGRAM DATE:  FEB 1995      *        * THE HYDROLOGIC ENGINEERING CENTER *
 *          VERSION:  3.1           *        *         609 SECOND STREET         *
 *     RUN  DATE   AND   TIME:      *        *      DAVIS, CALIFORNIA 95616      *
 *        18 OCT 06    16:10:02     *        *          (916) 756-1104           *
 *                                  *        *                                   *
 ************************************        *************************************

  INPUT FILE NAME: 70805.txt
 OUTPUT FILE NAME: 70805.out

 **TITLE RECORD(S)**
 TT   FLOOD FLOW FREQUENCY PROGRAM - SANTA CLARA RIVER AT MONTALVO(HWY.101 BRIDGE)
 TT   PEAK VALUES FOR 1932-1955 GENERATED DURING HYDROLOGIC ANALYSIS W/ COE
 TT   REGIONAL SKEW -.3 TO DUPLICATE C.O.E. RESULTS IN VENTURA CO

 **STATION IDENTIFICATION**
 ID     708 SANTA CLARA RIVER AT MONTALVO  DA= 1624SQMI REC BEGAN:1932 TYPE RG/FW

 **GENERALIZED SKEW**
      ISTN   GGMSE    SKEW
 GS    708    .000    -.30

 **SYSTEMATIC EVENTS**
      68 EVENTS TO BE ANALYZED

 **END OF INPUT DATA**
 ED ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ   FINAL RESULTS    ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

 -PLOTTING POSITIONS-   708 SANTA CLARA RIVER AT MONTALVO  DA= 162
 ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
 º      EVENTS ANALYZED     ³          ORDERED EVENTS          º
 º                  FLOW    ³        WATER      FLOW   WEIBULL  º
 º MON DAY  YEAR     CFS    ³   RANK  YEAR      CFS    PLOT POS º
 ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
 º   0   0  1932    22000.  ³     1   1969    147000.     1.45  º
 º   0   0  1934    46000.  ³     2   2005    136000.     2.90  º
 º   0   0  1935    17000.  ³     3   1992    104000.     4.35  º
 º   0   0  1936    16000.  ³     4   1978    102200.     5.80  º
 º   0   0  1937    19000.  ³     5   1983    100000.     7.25  º
 º   0   0  1938    95000.  ³     6   1938     95000.     8.70  º
 º   0   0  1939     6400.  ³     7   1998     84000.    10.14  º
 º   0   0  1940     3300.  ³     8   1980     81400.    11.59  º
 º   0   0  1941    30000.  ³     9   1943     72000.    13.04  º
 º   0   0  1942     3600.  ³    10   1973     58200.    14.49  º
 º   0   0  1943    72000.  ³    11   1958     50000.    15.94  º
 º   0   0  1944    28000.  ³    12   1934     46000.    17.39  º
 º   0   0  1945    16000.  ³    13   1952     45000.    18.84  º
 º   0   0  1946    14000.  ³    14   1993     44300.    20.29  º
 º   0   0  1947     9000.  ³    15   1962     44000.    21.74  º
 º   0   0  1950     2280.  ³    16   1966     44000.    23.19  º
 º   0   0  1952    45000.  ³    17   1986     43700.    24.64  º
 º   0   0  1953     2700.  ³    18   1967     35000.    26.09  º
```

0	0	1954	5300.	19	2001	32900.	27.54
0	0	1955	500.	20	1941	30000.	28.99
0	0	1956	5550.	21	1971	28800.	30.43
0	0	1957	3780.	22	1944	28000.	31.88
0	0	1958	50000.	23	1991	25000.	33.33
0	0	1959	11000.	24	1932	22000.	34.78
0	0	1960	408.	25	1997	20500.	36.23
0	0	1961	216.	26	2004	19600.	37.68
0	0	1962	44000.	27	1937	19000.	39.13
0	0	1963	5060.	28	1979	18600.	40.58
0	0	1964	2350.	29	1935	17000.	42.03
0	0	1965	3360.	30	1996	17000.	43.48
0	0	1966	44000.	31	1936	16000.	44.93
0	0	1967	35000.	32	1945	16000.	46.38
0	0	1968	4000.	33	1974	14700.	47.83
0	0	1969	147000.	34	1946	14000.	49.28
0	0	1970	9960.	35	2003	13600.	50.72
0	0	1971	28800.	36	1988	13500.	52.17
0	0	1972	8350.	37	1959	11000.	53.62
0	0	1973	58200.	38	1975	10800.	55.07
0	0	1974	14700.	39	1970	9960.	56.52
0	0	1975	10800.	40	1947	9000.	57.97
0	0	1976	5420.	41	1982	8600.	59.42
0	0	1977	3850.	42	1972	8350.	60.87
0	0	1978	102200.	43	1939	6400.	62.32
0	0	1979	18600.	44	2000	6370.	63.77
0	0	1980	81400.	45	1956	5550.	65.22
0	0	1981	3620.	46	1976	5420.	66.67
0	0	1982	8600.	47	1954	5300.	68.12
0	0	1983	100000.	48	1963	5060.	69.57
0	0	1984	4930.	49	1984	4930.	71.01
0	0	1985	4040.	50	1985	4040.	72.46
0	0	1986	43700.	51	1994	4000.	73.91
0	0	1987	851.	52	1968	4000.	75.36
0	0	1988	13500.	53	1977	3850.	76.81
0	0	1990	1200.	54	1957	3780.	78.26
0	0	1991	25000.	55	1981	3620.	79.71
0	0	1992	104000.	56	1942	3600.	81.16
0	0	1993	44300.	57	1965	3360.	82.61
0	0	1994	4000.	58	1940	3300.	84.06
0	0	1996	17000.	59	1953	2700.	85.51
0	0	1997	20500.	60	1964	2350.	86.96
0	0	1998	84000.	61	1950	2280.	88.41
0	0	1999	763.	62	1990	1200.	89.86
0	0	2000	6370.	63	1987	851.	91.30
0	0	2001	32900.	64	1999	763.	92.75
0	0	2002	331.	65	1955	500.	94.20
0	0	2003	13600.	66	1960	408.	95.65
0	0	2004	19600.	67	2002	331.	97.10
0	0	2005	136000.	68	1961	216.	98.55

-OUTLIER TESTS -

LOW OUTLIER TEST

BASED ON 68 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.883

0 LOW OUTLIER(S) IDENTIFIED BELOW TEST VALUE OF 136.0

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ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
HIGH OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

BASED ON  68 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.883

      0 HIGH OUTLIER(S) IDENTIFIED ABOVE TEST VALUE OF  936603.
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

-SKEW WEIGHTING -
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
BASED ON  68 EVENTS, MEAN-SQUARE ERROR OF STATION SKEW =   .110
DEFAULT OR INPUT MEAN-SQUARE ERROR OF GENERALIZED SKEW =   .302
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

FINAL RESULTS

-FREQUENCY CURVE-   708 SANTA CLARA RIVER AT MONTALVO  DA= 162
ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
º  COMPUTED   EXPECTED   ³   PERCENT   ³    CONFIDENCE LIMITS  º
º   CURVE   PROBABILITY  ³    CHANCE   ³      .05        .95   º
º      FLOW IN CFS       ³  EXCEEDANCE ³      FLOW IN CFS      º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º   373000.    415000.   ³        .2   ³   727000.    222000.  º
º   286000.    311000.   ³        .5   ³   535000.    174000.  º
º   226000.    242000.   ³       1.0   ³   409000.    141000.  º
º   172000.    182000.   ³       2.0   ³   300000.    110000.  º
º   111000.    115000.   ³       5.0   ³   183000.     73900.  º
º    72800.     74700.   ³      10.0   ³   114000.     50200.  º
º    41900.     42600.   ³      20.0   ³    61900.     30000.  º
º    12800.     12800.   ³      50.0   ³    17500.      9430.  º
º     3270.      3200.   ³      80.0   ³     4560.      2230.  º
º     1490.      1420.   ³      90.0   ³     2180.       930.  º
º      744.       694.   ³      95.0   ³     1160.       426.  º
º      184.       156.   ³      99.0   ³      331.        86.  º
ÌÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¹
º                      SYSTEMATIC STATISTICS                   º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÂÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º LOG TRANSFORM: FLOW, CFS       ³       NUMBER OF EVENTS      º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º  MEAN                 4.0526  ³  HISTORIC EVENTS         0  º
º  STANDARD DEV           .6656  ³  HIGH OUTLIERS        0      º
º  COMPUTED SKEW        -.5154  ³  LOW OUTLIERS         0      º
º  REGIONAL SKEW        -.3000  ³  ZERO OR MISSING      0      º
º  ADOPTED SKEW         -.5000  ³  SYSTEMATIC EVENTS      68  º
ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼

+++++++++++++++++++++++++
+ END OF RUN            +
+ NORMAL STOP IN FFA    +
+++++++++++++++++++++++++
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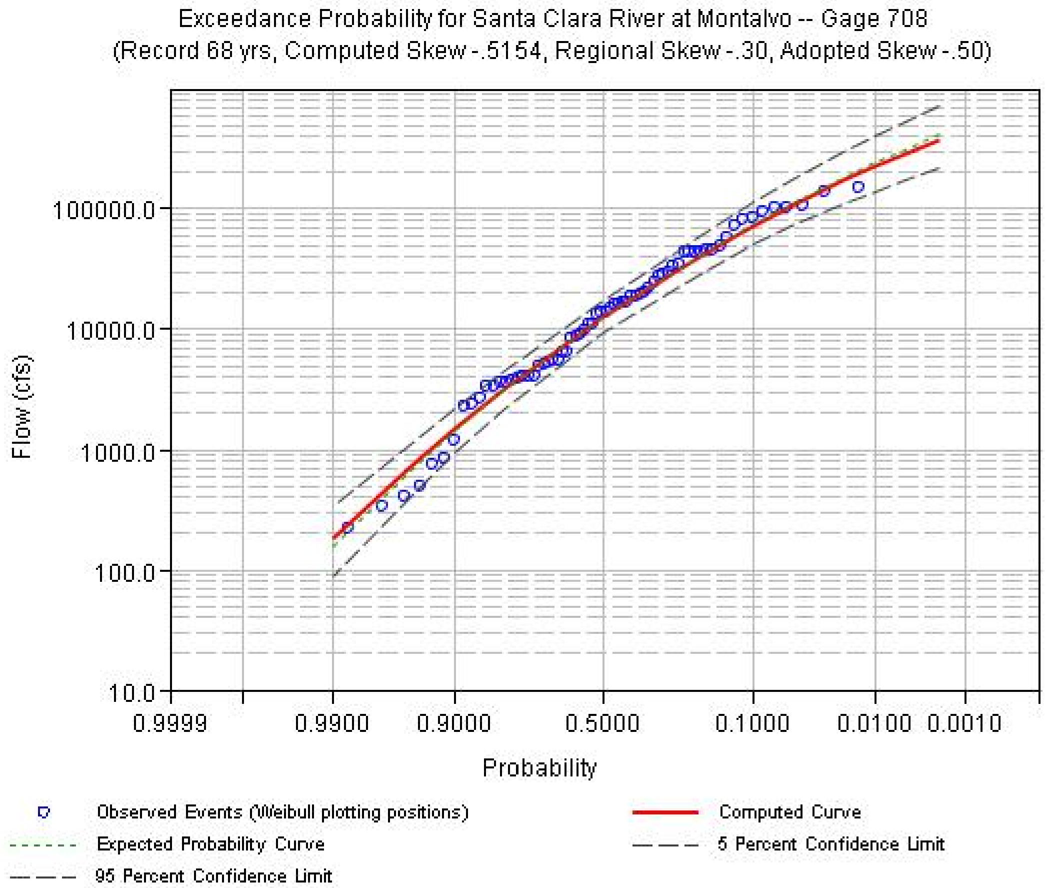

Exceedance Probability for Santa Clara River at Montalvo -- Gage 708
(Record 68 yrs, Computed Skew -.5154, Regional Skew -.30, Adopted Skew -.50)
100000.0
10000.0
1000.0
100.0
10.0
Flow (cfs)
0.9999
0.9900
0.9000
0.5000
0.1000
0.0100
0.0010
Probability
Observed Events (Weibull plotting positions)
Computed Curve
Expected Probability Curve
5 Percent Confidence Limit
95 Percent Confidence Limit

5.6 SANTA CLARA RIVER AT COUNTY LINE FFA

```
************************************       *************************************
*              FFA                 *       *                                   *
*     FLOOD FREQUENCY ANALYSIS     *       *   U.S. ARMY CORPS OF ENGINEERS    *
*     PROGRAM DATE:  FEB 1995      *       * THE HYDROLOGIC ENGINEERING CENTER *
*          VERSION:  3.1           *       *         609 SECOND STREET         *
*     RUN  DATE   AND   TIME:      *       *      DAVIS, CALIFORNIA 95616      *
*        18 OCT 06    16:22:09     *       *          (916) 756-1104           *
*                                  *       *                                   *
************************************       *************************************

 INPUT FILE NAME: 70705A.DAT
OUTPUT FILE NAME: 70705A.OUT
   DSS FILE NAME: 70705A.DSS

   -----DSS---ZOPEN:  Existing File Opened,  File: 70705A.DSS
                      Unit:  71;  DSS Version: 6-JB

**TITLE RECORD(S)**
TT   FLOOD FLOW FREQUENCY PROGRAM - SANTA CLARA RIVER AT VENTURA/LA COUNTY LINE
TT   PEAK VALUES FOR 1952-1997
TT   REGIONAL SKEW -.3 TO DUPLICATE C.O.E. RESULTS IN VENTURA CO

**STATION IDENTIFICATION**
ID     707 SANTA CLARA RIVER AT VENTURA/LA COUNTY LINE REC BEGAN:1952 TYPE RG/FW

**GENERALIZED SKEW**
     ISTN   GGMSE    SKEW
GS    707    .000    -.30

**SYSTEMATIC EVENTS**
     52 EVENTS TO BE ANALYZED

**END OF INPUT DATA**
ED +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ   FINAL RESULTS    ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

-PLOTTING POSITIONS-   707 SANTA CLARA RIVER AT VENTURA/LA COUNTY
ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
º      EVENTS ANALYZED     ³          ORDERED EVENTS          º
º                  FLOW    ³        WATER      FLOW   WEIBULL  º
º MON DAY  YEAR     CFS    ³   RANK  YEAR       CFS    PLOT POS º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º  11  15  1953      375.  ³     1   1969     49870.     1.89  º
º   2  13  1954      578.  ³     2   2005     32000.     3.77  º
º   1  18  1955      419.  ³     3   1983     30600.     5.66  º
º   1  26  1956      672.  ³     4   1978     22800.     7.55  º
º   3   1  1957     1209.  ³     5   1967     22213.     9.43  º
º   4   3  1958     5411.  ³     6   1995     17100.    11.32  º
º   1   6  1959     1561.  ³     7   1980     13900.    13.21  º
º   1   6  1960       83.  ³     8   1973     12800.    15.09  º
º  11   6  1961      145.  ³     9   1986     12300.    16.98  º
º   2  11  1962     6965.  ³    10   1992     12300.    18.87  º
º   3  16  1963     1026.  ³    11   1993     10700.    20.75  º
º   1  22  1964      411.  ³    12   1962      6965.    22.64  º
º   4   9  1965     1064.  ³    13   1991      6960.    24.53  º
º  12  29  1966    22213.  ³    14   1972      6949.    26.42  º
```

1	24	1967	4998.	15	1979	6020.	28.30
11	19	1967	2174.	16	1958	5411.	30.19
1	25	1969	49870.	17	1974	5150.	32.08
3	2	1970	759.	18	1967	4998.	33.96
11	29	1971	6949.	19	1996	4450.	35.85
12	27	1972	3410.	20	1989	3900.	37.74
2	11	1973	12800.	21	1973	3410.	39.62
1	7	1974	5150.	22	2004	2640.	41.51
12	4	1975	2210.	23	1981	2470.	43.40
2	9	1976	1700.	24	2000	2440.	45.28
5	8	1977	1880.	25	2003	2330.	47.17
2	9	1978	22800.	26	1986	2270.	49.06
3	27	1979	6020.	27	1976	2210.	50.94
2	16	1980	13900.	28	1968	2174.	52.83
1	28	1981	2470.	29	1977	1880.	54.72
3	17	1982	1730.	30	1990	1870.	56.60
3	1	1983	30600.	31	1982	1730.	58.49
12	25	1984	308.	32	1976	1700.	60.38
12	19	1985	2270.	33	1959	1561.	62.26
2	15	1986	12300.	34	1988	1460.	64.15
11	18	1987	1460.	35	1989	1340.	66.04
12	14	1988	1340.	36	2001	1230.	67.92
2	28	1989	3900.	37	1957	1209.	69.81
2	17	1990	1870.	38	1965	1064.	71.70
3	1	1991	6960.	39	1963	1026.	73.58
2	12	1992	12300.	40	1970	759.	75.47
2	18	1993	10700.	41	2002	729.	77.36
12	11	1994	597.	42	1956	672.	79.25
1	10	1995	17100.	43	1995	597.	81.13
2	20	1996	4450.	44	1954	578.	83.02
3	24	1997	303.	45	1955	419.	84.91
4	12	1999	277.	46	1964	411.	86.79
2	23	2000	2440.	47	1954	375.	88.68
3	6	2001	1230.	48	1985	308.	90.57
11	24	2001	729.	49	1997	303.	92.45
2	12	2003	2330.	50	1999	277.	94.34
2	26	2004	2640.	51	1962	145.	96.23
1	10	2005	32000.	52	1960	83.	98.11

```
-OUTLIER TESTS  -
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
LOW OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

BASED ON  52 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.783

       0 LOW OUTLIER(S) IDENTIFIED BELOW TEST VALUE OF     40.6

ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
HIGH OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

BASED ON  52 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.783

      0 HIGH OUTLIER(S) IDENTIFIED ABOVE TEST VALUE OF  145291.
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

-SKEW WEIGHTING -
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
BASED ON  52 EVENTS, MEAN-SQUARE ERROR OF STATION SKEW =   .100
```

DEFAULT OR INPUT MEAN-SQUARE ERROR OF GENERALIZED SKEW = .302

FINAL RESULTS

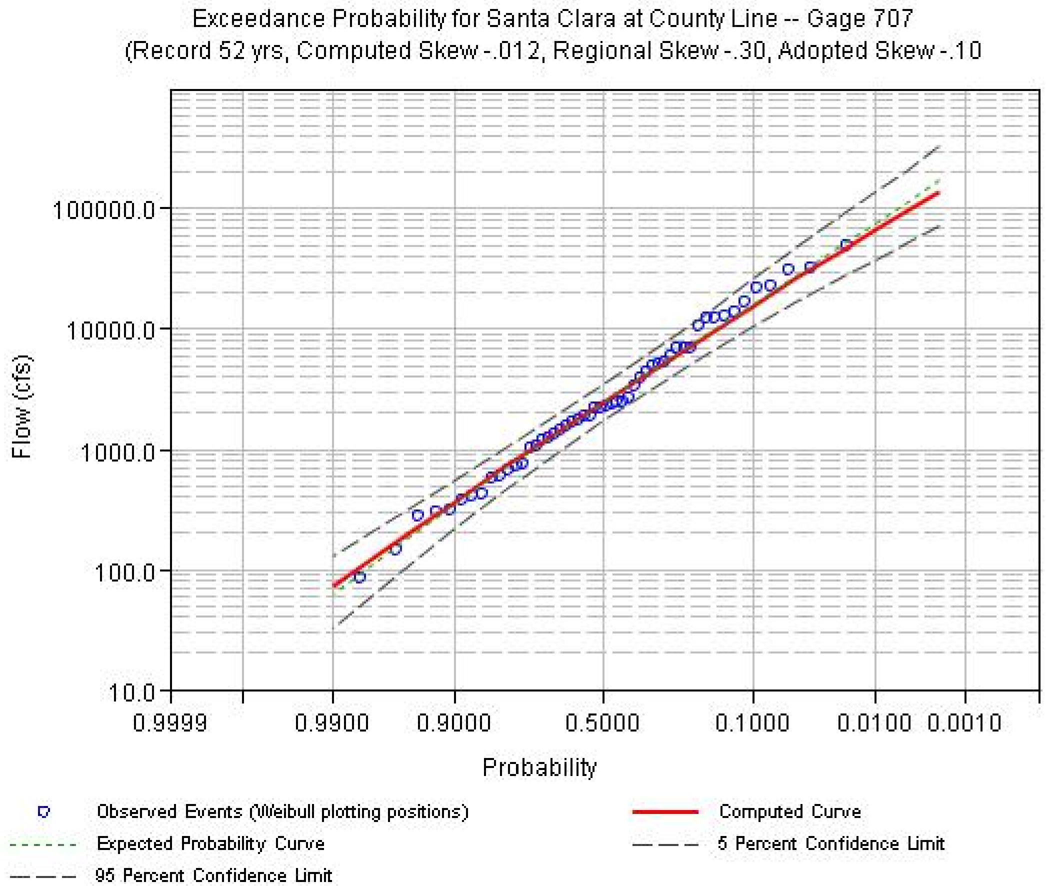
-FREQUENCY CURVE- 707 SANTA CLARA RIVER AT VENTURA/LA COUNTY

COMPUTED CURVE	EXPECTED PROBABILITY	PERCENT CHANCE	CONFIDENCE LIMITS .05	CONFIDENCE LIMITS .95
FLOW IN CFS		EXCEEDANCE	FLOW IN CFS	
140000.	174000.	.2	333000.	73100.
93300.	110000.	.5	207000.	51300.
66600.	76100.	1.0	140000.	38100.
45900.	50800.	2.0	90500.	27400.
26100.	27900.	5.0	47000.	16500.
15700.	16400.	10.0	26200.	10400.
8420.	8610.	20.0	13000.	5850.
2490.	2490.	50.0	3500.	1770.
710.	694.	80.0	1020.	462.
364.	347.	90.0	550.	217.
208.	193.	95.0	331.	114.
71.	61.	99.0	128.	33.

SYSTEMATIC STATISTICS

LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	3.3853	HISTORIC EVENTS	0
STANDARD DEV	.6385	HIGH OUTLIERS	0
COMPUTED SKEW	-.0120	LOW OUTLIERS	0
REGIONAL SKEW	-.3000	ZERO OR MISSING	0
ADOPTED SKEW	-.1000	SYSTEMATIC EVENTS	52

```
+++++++++++++++++++++++++
+ END OF RUN            +
+ NORMAL STOP IN FFA    +
+++++++++++++++++++++++++
```


Exceedance Probability for Santa Clara at County Line -- Gage 707
(Record 52 yrs, Computed Skew -.012, Regional Skew -.30, Adopted Skew -.10
100000.0
10000.0
1000.0
100.0
10.0
Flow (cfs)
0.9999
0.9900
0.9000
0.5000
0.1000
0.0100
0.0010
Probability
Observed Events (Weibull plotting positions)
Computed Curve
Expected Probability Curve
5 Percent Confidence Limit
95 Percent Confidence Limit

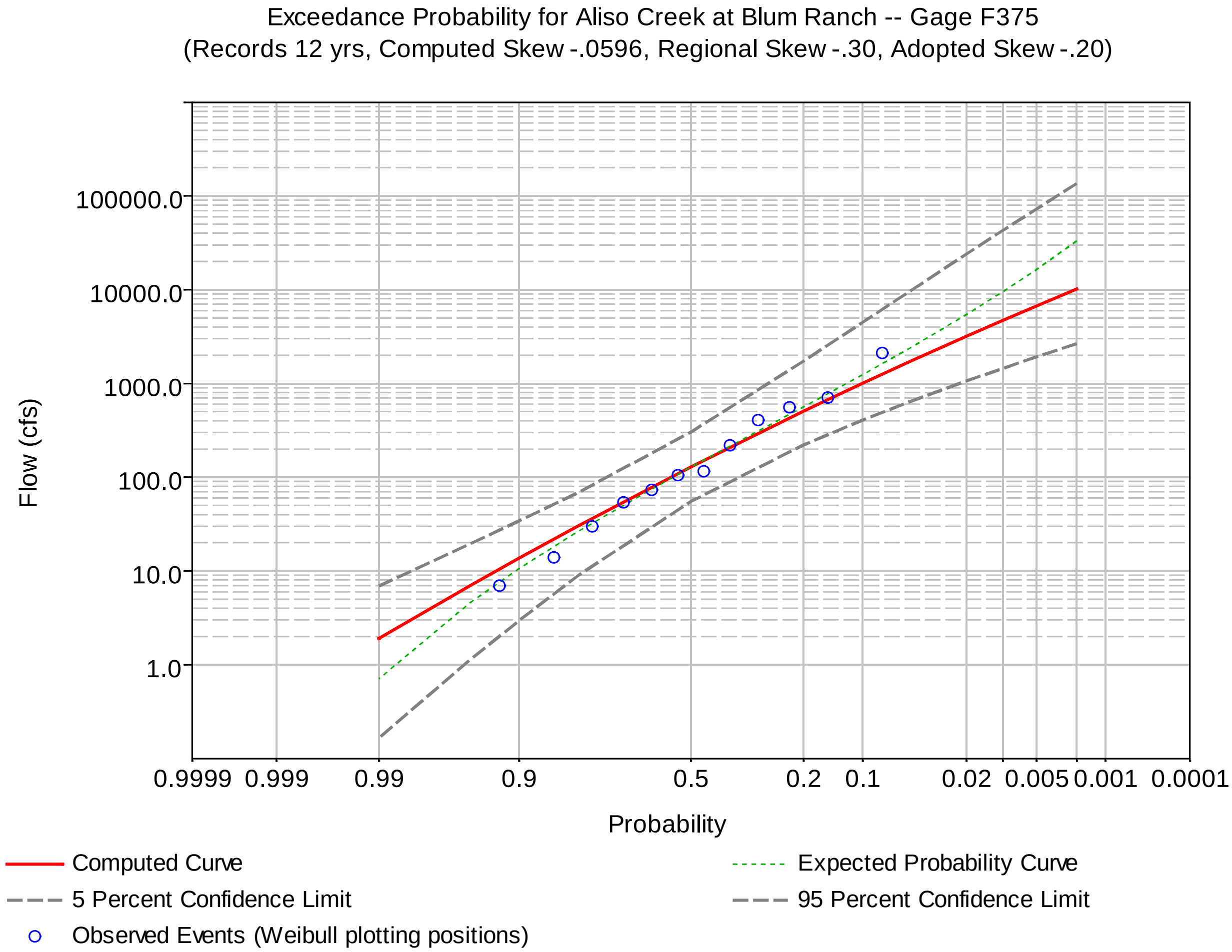
SECTION 6 APPENDIX B- LOS ANGELES COUNTY FFA OUTPUT AND PROBABILITY PLOTS

6.1 ALISO CREEK AT BLUM RANCH FFA

```
 ************************************      ************************************
 *               FFA                *      *                                  *
 *     FLOOD FREQUENCY ANALYSIS     *      *   U.S. ARMY CORPS OF ENGINEERS   *
 *     PROGRAM DATE:  FEB 1995      *      * THE HYDROLOGIC ENGINEERING CENTER *
 *          VERSION:  3.1           *      *        609 SECOND STREET         *
 *     RUN  DATE   AND   TIME:      *      *      DAVIS, CALIFORNIA 95616     *
 *        05 MAY 10    14:27:37     *      *          (916) 756-1104          *
 *                                  *      *                                  *
 ************************************      ************************************

  INPUT FILE NAME: ALISO.DAT
 OUTPUT FILE NAME: ALISO.OUT
    DSS FILE NAME: ALISO.DSS

    -----DSS---ZOPEN:  Existing File Opened,  File: ALISO.DSS
                       Unit:  71;  DSS Version: 6-JB

 **TITLE RECORD(S)**
 TT   FLOOD FLOW FREQUENCY PROGRAM - ALISO CREEK AT BLUM RANCH
 TT   REGIONAL SKEW -0.3

 **GENERALIZED SKEW**
      ISTN   GGMSE    SKEW
 GS  F375     .000    -.30

 **STATION IDENTIFICATION**
 ID    F375 ALISO CREEK AT BLUM RANCH  DA=23.7 SQMI REC BEGAN:1965

 **SYSTEMATIC EVENTS**
      12 EVENTS TO BE ANALYZED

 **END OF INPUT DATA**
 ED +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ   FINAL RESULTS    ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

 -PLOTTING POSITIONS-  F375 ALISO CREEK AT BLUM RANCH  DA=23.7 SQM
 ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
 º      EVENTS ANALYZED     ³          ORDERED EVENTS          º
 º                    FLOW  ³       WATER      FLOW   WEIBULL  º
 º MON DAY  YEAR     CFS    ³   RANK  YEAR      CFS    PLOT POS º
 ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
 º  12  29  1965      555.  ³     1   1969      2110.     7.69  º
 º  12   6  1966      219.  ³     2   1973       704.    15.38  º
 º  11  19  1967      116.  ³     3   1966       555.    23.08  º
 º   1  25  1969     2110.  ³     4   1971       406.    30.77  º
 º   3   2  1970      105.  ³     5   1967       219.    38.46  º
 º  11  29  1970      406.  ³     6   1968       116.    46.15  º
 º  12  24  1971       54.  ³     7   1970       105.    53.85  º
 º   2  11  1973      704.  ³     8   1974        73.    61.54  º
 º   3   2  1974       73.  ³     9   1972        54.    69.23  º
 º   3   8  1975       30.  ³    10   1975        30.    76.92  º
 º   2   9  1976        7.  ³    11   1977        14.    84.62  º
```

```
º   5   9  1977       14.  ³    12   1976         7.    92.31  º
ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼

-OUTLIER TESTS  -
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
LOW OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

BASED ON  12 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.134

       0 LOW OUTLIER(S) IDENTIFIED BELOW TEST VALUE OF      3.4

ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
HIGH OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

BASED ON  12 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.134

      0 HIGH OUTLIER(S) IDENTIFIED ABOVE TEST VALUE OF    4384.
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

-SKEW WEIGHTING -
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
BASED ON  12 EVENTS, MEAN-SQUARE ERROR OF STATION SKEW =   .400
DEFAULT OR INPUT MEAN-SQUARE ERROR OF GENERALIZED SKEW =   .302
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

FINAL RESULTS

-FREQUENCY CURVE-  F375 ALISO CREEK AT BLUM RANCH  DA=23.7 SQM
ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
º  COMPUTED   EXPECTED   ³   PERCENT   ³    CONFIDENCE LIMITS  º
º   CURVE   PROBABILITY  ³    CHANCE   ³      .05        .95   º
º      FLOW IN CFS       ³  EXCEEDANCE ³     FLOW IN CFS       º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º    10200.      33300.  ³        .2   ³    136000.      2660. º
º     6720.      16400.  ³        .5   ³     72500.      1920. º
º     4720.       9530.  ³       1.0   ³     42900.      1450. º
º     3190.       5410.  ³       2.0   ³     24000.      1060. º
º     1750.       2430.  ³       5.0   ³      9930.       648. º
º     1010.       1240.  ³      10.0   ³      4500.       408. º
º      507.        565.  ³      20.0   ³      1730.       222. º
º      128.        128.  ³      50.0   ³       304.        55. º
º       30.         27.  ³      80.0   ³        69.         9. º
º       14.         11.  ³      90.0   ³        34.         3. º
º        7.          5.  ³      95.0   ³        20.         1. º
º        2.          1.  ³      99.0   ³         7.         0. º
ÌÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¹
º                      SYSTEMATIC STATISTICS                   º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÂÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º LOG TRANSFORM: FLOW, CFS       ³       NUMBER OF EVENTS      º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º  MEAN                   2.0846 ³  HISTORIC EVENTS         0  º
º  STANDARD DEV            .7297 ³  HIGH OUTLIERS       0      º
º  COMPUTED SKEW          -.0596 ³  LOW OUTLIERS        0      º
º  REGIONAL SKEW          -.3000 ³  ZERO OR MISSING     0      º
º  ADOPTED SKEW           -.2000 ³  SYSTEMATIC EVENTS      12  º
ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼
```

```
+++++++++++++++++++++++++
+ END OF RUN            +
+ NORMAL STOP IN FFA    +
+++++++++++++++++++++++++
```



6.2 SANTA CLARA RIVER AT LANG RAILROAD BRIDGE FFA

```
 ************************************       **************************************
 *               FFA                *       *                                    *
 *     FLOOD FREQUENCY ANALYSIS     *       *   U.S. ARMY CORPS OF ENGINEERS     *
 *     PROGRAM DATE:  FEB 1995      *       * THE HYDROLOGIC ENGINEERING CENTER *
 *          VERSION:  3.1           *       *         609 SECOND STREET          *
 *     RUN  DATE   AND   TIME:      *       *      DAVIS, CALIFORNIA 95616       *
 *        10 JUL 08    10:13:16     *       *          (916) 756-1104            *
 *                                  *       *                                    *
 ************************************       **************************************

  INPUT FILE NAME: LAF93STN.TXT
 OUTPUT FILE NAME: LAF93STN.OUT

 **TITLE RECORD(S)**
 TT   FLOOD FLOW FREQUENCY PROGRAM - SANTA CLARA RIVER AT LANG RR STATION
 TT   PEAK VALUES FROM LA COUNTY
 TT   STATION SKEW -.07

 **STATION IDENTIFICATION**
 ID     F93 SANTA CLARA RIVER AT LANG RR STATION DA= 157SQMI REC BEGAN:1949

 **GENERALIZED SKEW**
      ISTN   GGMSE    SKEW
 GS    F93    .000    -.07

 **SYSTEMATIC EVENTS**
      30 EVENTS TO BE ANALYZED

 **END OF INPUT DATA**
 ED ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ   FINAL RESULTS    ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

 -PLOTTING POSITIONS-   F93 SANTA CLARA RIVER AT LANG RR STATION D
 ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
 º      EVENTS ANALYZED     ³          ORDERED EVENTS          º
 º                  FLOW    ³        WATER      FLOW   WEIBULL  º
 º MON DAY  YEAR     CFS    ³   RANK  YEAR      CFS    PLOT POS º
 ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
 º   0   0  1949        6.  ³      1   1968      5900.     3.23  º
 º   0   0  1950        2.  ³      2   1951      4200.     6.45  º
 º   0   0  1951     4200.  ³      3   1965      4040.     9.68  º
 º   0   0  1952       39.  ³      4   2004      2510.    12.90  º
 º   0   0  1953       29.  ³      5   1957      1260.    16.13  º
 º   0   0  1954        6.  ³      6   1972       953.    19.35  º
 º   0   0  1955        5.  ³      7   1970       620.    22.58  º
 º   0   0  1956        2.  ³      8   1960       500.    25.81  º
 º   0   0  1957     1260.  ³      9   1961       500.    29.03  º
 º   0   0  1958       40.  ³     10   1966       265.    32.26  º
 º   0   0  1959        1.  ³     11   1973       264.    35.48  º
 º   0   0  1960      500.  ³     12   1967       200.    38.71  º
 º   0   0  1961      500.  ³     13   1969       200.    41.94  º
 º   0   0  1962       60.  ³     14   2003        87.    45.16  º
 º   0   0  1963       70.  ³     15   1971        79.    48.39  º
 º   0   0  1964       35.  ³     16   1963        70.    51.61  º
 º   0   0  1965     4040.  ³     17   1962        60.    54.84  º
 º   0   0  1966      265.  ³     18   1974        59.    58.06  º
```

```
º   0   0  1967      200.  ³    19   1958         40.    61.29  º
º   0   0  1968     5900.  ³    20   1952         39.    64.52  º
º   0   0  1969      200.  ³    21   1976         38.    67.74  º
º   0   0  1970      620.  ³    22   1964         35.    70.97  º
º   0   0  1971       79.  ³    23   1953         29.    74.19  º
º   0   0  1972      953.  ³    24   1975         24.    77.42  º
º   0   0  1973      264.  ³    25   1954          6.    80.65  º
º   0   0  1974       59.  ³    26   1949          6.    83.87  º
º   0   0  1975       24.  ³    27   1955          5.    87.10  º
º   0   0  1976       38.  ³    28   1950          2.    90.32  º
º   0   0  2003       87.  ³    29   1956          2.    93.55  º
º   0   0  2004     2510.  ³    30   1959          1.    96.77  º
ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼

-OUTLIER TESTS  -
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
LOW OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

BASED ON  30 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.563

       0 LOW OUTLIER(S) IDENTIFIED BELOW TEST VALUE OF       .2

ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
HIGH OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

BASED ON  30 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.563

      0 HIGH OUTLIER(S) IDENTIFIED ABOVE TEST VALUE OF   40823.
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

-SKEW WEIGHTING -
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
BASED ON  30 EVENTS, MEAN-SQUARE ERROR OF STATION SKEW =   .172
DEFAULT OR INPUT MEAN-SQUARE ERROR OF GENERALIZED SKEW =   .302
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

FINAL RESULTS

-FREQUENCY CURVE-   F93 SANTA CLARA RIVER AT LANG RR STATION D
ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
º  COMPUTED   EXPECTED   ³   PERCENT   ³    CONFIDENCE LIMITS  º
º   CURVE   PROBABILITY  ³    CHANCE   ³       .05        .95   º
º      FLOW IN CFS       ³  EXCEEDANCE ³      FLOW IN CFS       º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º    64600.    122000.  ³        .2    ³  461000.     17100.  º
º    33700.     54800.  ³        .5    ³  204000.      9870.  º
º    19600.     28700.  ³       1.0    ³  104000.      6210.  º
º    10800.     14400.  ³       2.0    ³   49600.      3720.  º
º     4350.      5230.  ³       5.0    ³   16200.      1690.  º
º     1920.      2160.  ³      10.0    ³    6020.       822.  º
º      704.       748.  ³      20.0    ³    1830.       330.  º
º       99.        99.  ³      50.0    ³     205.        48.  º
º       13.        12.  ³      80.0    ³      28.         5.  º
º        4.         4.  ³      90.0    ³      11.         1.  º
º        2.         1.  ³      95.0    ³       5.         0.  º
º        0.         0.  ³      99.0    ³       1.         0.  º
ÌÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¹
º                      SYSTEMATIC STATISTICS                    º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÂÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
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º LOG TRANSFORM: FLOW, CFS        ³        NUMBER OF EVENTS       º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º   MEAN                  1.9788  ³  HISTORIC EVENTS         0  º
º   STANDARD DEV          1.0269  ³  HIGH OUTLIERS       0      º
º   COMPUTED SKEW         -.0704  ³  LOW OUTLIERS        0      º
º   REGIONAL SKEW         -.0700  ³  ZERO OR MISSING     0      º
º   ADOPTED SKEW          -.1000  ³  SYSTEMATIC EVENTS      30  º
ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼

+++++++++++++++++++++++++
+ END OF RUN            +
+ NORMAL STOP IN FFA    +
+++++++++++++++++++++++++
```
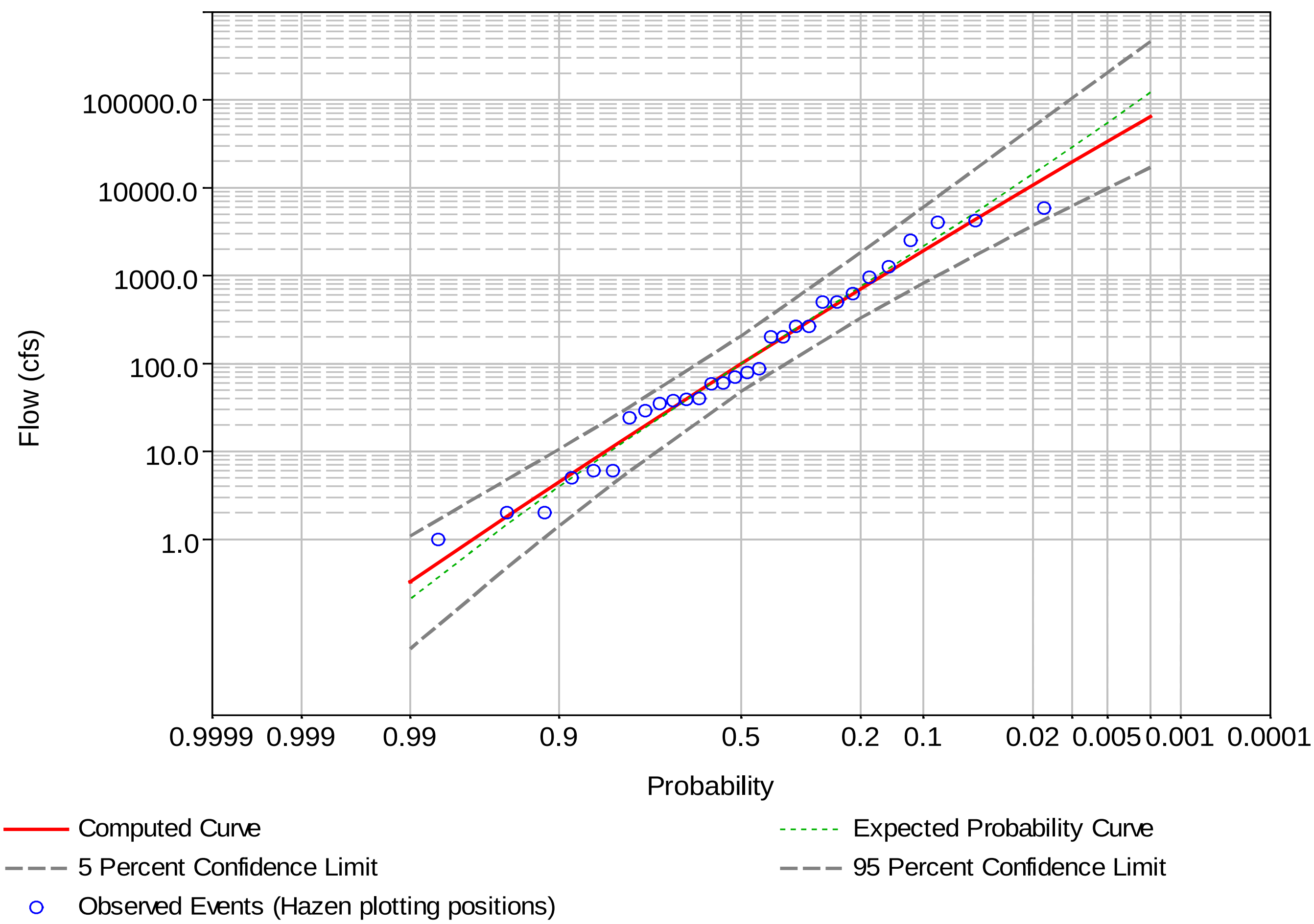

Exceedance Probability for Santa Clara at Lang Railroad Bridge -- Gage F93
(Records 30 yrs, Computed Skew -.0704, Regional Skew -.07, Adopted Skew -.10)

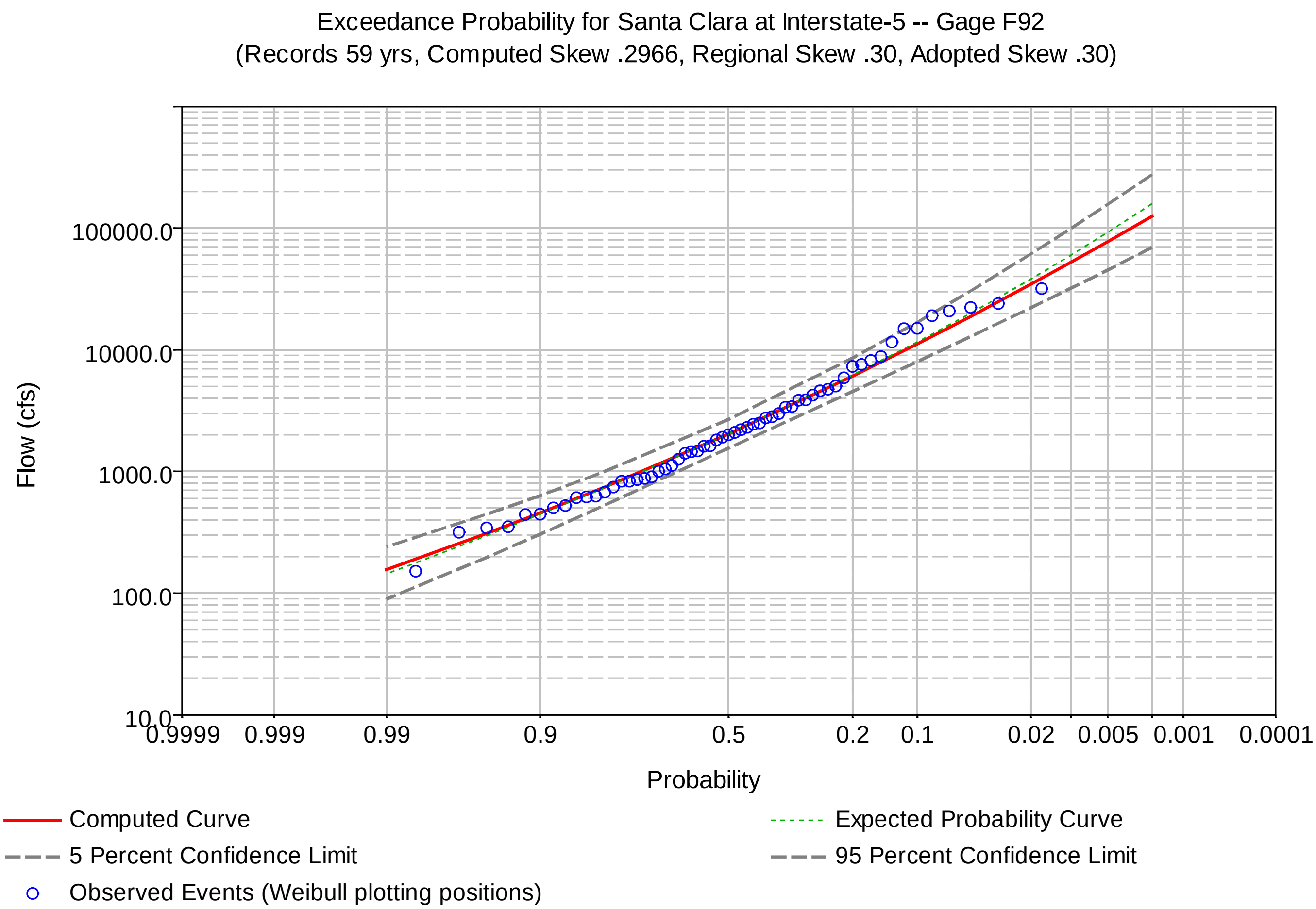


6.3 SANTA CLARA RIVER AT INTERSTATE 5 FFA

```
 ***********************************        *************************************
 *              FFA                *        *                                   *
 *     FLOOD FREQUENCY ANALYSIS    *        *   U.S. ARMY CORPS OF ENGINEERS    *
 *     PROGRAM DATE:  FEB 1995     *        * THE HYDROLOGIC ENGINEERING CENTER *
 *          VERSION:  3.1          *        *         609 SECOND STREET         *
 *     RUN  DATE   AND   TIME:     *        *      DAVIS, CALIFORNIA 95616      *
 *        10 JUL 08    10:33:48    *        *          (916) 756-1104           *
 *                                 *        *                                   *
 ***********************************        *************************************


 INPUT FILE NAME: I5NOUTST.TXT
OUTPUT FILE NAME: I5NOUTST.OUT

**TITLE RECORD(S)**
TT   FLOOD FLOW FREQUENCY PROGRAM - SANTA CLARA RIVER AT I-5
TT   STATION SKEW .2966 5 LOWEST FLOWS REMOVED

**STATION IDENTIFICATION**
ID     F92 SANTA CLARA RIVER AT I-5  DA= 410SQMI REC BEGAN:1931

**GENERALIZED SKEW**
     ISTN   GGMSE    SKEW
GS    F92    .000     .30

**SYSTEMATIC EVENTS**
     59 EVENTS TO BE ANALYZED

**END OF INPUT DATA**
ED ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ   FINAL RESULTS    ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

-PLOTTING POSITIONS-   F92 SANTA CLARA RIVER AT I-5  DA= 410SQMI
ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
º      EVENTS ANALYZED     ³         ORDERED EVENTS          º
º                    FLOW  ³      WATER      FLOW   WEIBULL  º
º MON DAY  YEAR      CFS   ³   RANK  YEAR      CFS    PLOT POS º
ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
º   0   0  1931     2310.  ³     1   1969     31800.      1.67  º
º   0   0  1932     2090.  ³     2   1938     24000.      3.33  º
º   0   0  1933      618.  ³     3   1944     22200.      5.00  º
º   0   0  1934     3870.  ³     4   2005     20900.      6.67  º
º   0   0  1935      608.  ³     5   1998     19000.      8.33  º
º   0   0  1936      833.  ³     6   1943     15000.     10.00  º
º   0   0  1937     3410.  ³     7   1983     14925.     11.67  º
º   0   0  1938    24000.  ³     8   1966     11600.     13.33  º
º   0   0  1939     4620.  ³     9   2000      8770.     15.00  º
º   0   0  1940      676.  ³    10   1971      8150.     16.67  º
º   0   0  1941     5050.  ³    11   1952      7600.     18.33  º
º   0   0  1942      443.  ³    12   2003      7290.     20.00  º
º   0   0  1943    15000.  ³    13   2004      5900.     21.67  º
```

```
º   0   0  1944    22200.  ³    14   1941      5050.    23.33  º
º   0   0  1945      317.  ³    15   1973      4760.    25.00  º
º   0   0  1946      500.  ³    16   1939      4620.    26.67  º
º   0   0  1947     1620.  ³    17   1962      4250.    28.33  º
º   0   0  1948      350.  ³    18   1934      3870.    30.00  º
º   0   0  1952     7600.  ³    19   1958      3850.    31.67  º
º   0   0  1954      626.  ³    20   1937      3410.    33.33  º
º   0   0  1955      746.  ³    21   1979      3370.    35.00  º
º   0   0  1956      344.  ³    22   1967      3000.    36.67  º
º   0   0  1957     1920.  ³    23   1968      2810.    38.33  º
º   0   0  1958     3850.  ³    24   1991      2750.    40.00  º
º   0   0  1959     1410.  ³    25   1977      2510.    41.67  º
º   0   0  1960      151.  ³    26   1974      2440.    43.33  º
º   0   0  1961      830.  ³    27   1931      2310.    45.00  º
º   0   0  1962     4250.  ³    28   1972      2200.    46.67  º
º   0   0  1963     1470.  ³    29   1932      2090.    48.33  º
º   0   0  1964      860.  ³    30   1997      2000.    50.00  º
º   0   0  1965     1260.  ³    31   1957      1920.    51.67  º
º   0   0  1966    11600.  ³    32   1985      1820.    53.33  º
º   0   0  1967     3000.  ³    33   1947      1620.    55.00  º
º   0   0  1968     2810.  ³    34   1999      1610.    56.67  º
º   0   0  1969    31800.  ³    35   1963      1470.    58.33  º
º   0   0  1970      900.  ³    36   1988      1450.    60.00  º
º   0   0  1971     8150.  ³    37   1959      1410.    61.67  º
º   0   0  1972     2200.  ³    38   1965      1260.    63.33  º
º   0   0  1973     4760.  ³    39   1975      1120.    65.00  º
º   0   0  1974     2440.  ³    40   1986      1050.    66.67  º
º   0   0  1975     1120.  ³    41   1976       999.    68.33  º
º   0   0  1976      999.  ³    42   1970       900.    70.00  º
º   0   0  1977     2510.  ³    43   1989       876.    71.67  º
º   0   0  1979     3370.  ³    44   1964       860.    73.33  º
º   0   0  1983    14925.  ³    45   1936       833.    75.00  º
º   0   0  1985     1820.  ³    46   1961       830.    76.67  º
º   0   0  1986     1050.  ³    47   1955       746.    78.33  º
º   0   0  1987      444.  ³    48   1940       676.    80.00  º
º   0   0  1988     1450.  ³    49   1954       626.    81.67  º
º   0   0  1989      876.  ³    50   1933       618.    83.33  º
º   0   0  1990      523.  ³    51   1935       608.    85.00  º
º   0   0  1991     2750.  ³    52   1990       523.    86.67  º
º   0   0  1997     2000.  ³    53   1946       500.    88.33  º
º   0   0  1998    19000.  ³    54   1987       444.    90.00  º
º   0   0  1999     1610.  ³    55   1942       443.    91.67  º
º   0   0  2000     8770.  ³    56   1948       350.    93.33  º
º   0   0  2003     7290.  ³    57   1956       344.    95.00  º
º   0   0  2004     5900.  ³    58   1945       317.    96.67  º
º   0   0  2005    20900.  ³    59   1960       151.    98.33  º
ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼

-OUTLIER TESTS  -
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
LOW OUTLIER TEST
ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

BASED ON  59 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.831
```

```
       0 LOW OUTLIER(S) IDENTIFIED BELOW TEST VALUE OF     62.8

 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
 HIGH OUTLIER TEST
 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

 BASED ON  59 EVENTS, 10 PERCENT OUTLIER TEST VALUE K(N) = 2.831

      0 HIGH OUTLIER(S) IDENTIFIED ABOVE TEST VALUE OF   74860.
 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

 -SKEW WEIGHTING -
 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
 BASED ON  59 EVENTS, MEAN-SQUARE ERROR OF STATION SKEW =   .107
 DEFAULT OR INPUT MEAN-SQUARE ERROR OF GENERALIZED SKEW =   .302
 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ

 FINAL RESULTS

 -FREQUENCY CURVE-   F92 SANTA CLARA RIVER AT I-5  DA= 410SQMI
 ÉÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
 º  COMPUTED   EXPECTED   ³   PERCENT   ³    CONFIDENCE LIMITS  º
 º   CURVE   PROBABILITY  ³    CHANCE   ³       .05        .95   º
 º      FLOW IN CFS       ³  EXCEEDANCE ³      FLOW IN CFS       º
 ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
 º   125000.    159000.   ³         .2  ³   276000.     69300.  º
 º    77300.     92200.   ³         .5  ³   157000.     45200.  º
 º    52300.     59800.   ³        1.0  ³    99400.     32000.  º
 º    34500.     38100.   ³        2.0  ³    61300.     22100.  º
 º    18800.     19900.   ³        5.0  ³    30500.     12800.  º
 º    11200.     11600.   ³       10.0  ³    16800.      7990.  º
 º     6080.      6190.   ³       20.0  ³     8540.      4540.  º
 º     2040.      2040.   ³       50.0  ³     2670.      1550.  º
 º      746.       735.   ³       80.0  ³      999.       529.  º
 º      456.       444.   ³       90.0  ³      633.       305.  º
 º      310.       297.   ³       95.0  ³      444.       197.  º
 º      156.       144.   ³       99.0  ³      240.        89.  º
 ÌÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¹
 º                      SYSTEMATIC STATISTICS                    º
 ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÂÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
 º LOG TRANSFORM: FLOW, CFS       ³       NUMBER OF EVENTS      º
 ÇÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¶
 º  MEAN                   3.3360 ³  HISTORIC EVENTS        0  º
 º  STANDARD DEV            .5434 ³  HIGH OUTLIERS       0      º
 º  COMPUTED SKEW           .2966 ³  LOW OUTLIERS        0      º
 º  REGIONAL SKEW           .2966 ³  ZERO OR MISSING     0      º
 º  ADOPTED SKEW            .3000 ³  SYSTEMATIC EVENTS      59  º
 ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼

 +++++++++++++++++++++++++
 + END OF RUN            +
 + NORMAL STOP IN FFA    +
 +++++++++++++++++++++++++
```


Exceedance Probability for Santa Clara at Interstate-5 -- Gage F92
(Records 59 yrs, Computed Skew .2966, Regional Skew .30, Adopted Skew .30)
Flow (cfs)
100000.0
10000.0
1000.0
100.0
10.0
0.9999
0.999
0.99
0.9
0.5
0.2
0.1
0.02
0.005
0.001
0.0001
Probability
Computed Curve
Expected Probability Curve
5 Percent Confidence Limit
95 Percent Confidence Limit
Observed Events (Weibull plotting positions)