

## **APPENDIX H**

**OUTPUT OF THE PEAKFQ RUNS  
FOR OBSERVED REGULATED PEAK AND ONE-DAY FLOWS  
IN THE SKAGIT RIVER NEAR MOUNT VERNON**



## Appendix H1 Output of PEAKFQ Run for Observed Regulated Peak Flows at Skagit River near Mount Vernon

U. S. GEOLOGICAL SURVEY  
 ANNUAL PEAK FLOW FREQUENCY ANALYSIS  
 Following Bulletin 17-B Guidelines  
 Program peakfq  
 (Version 4.1, February, 2002)

--- PROCESSING DATE/TIME ---  
 2005 OCT 12 17:35:04

--- PROCESSING OPTIONS ---  
 Plot option = None  
 Basin char output = None  
 Print option = Yes  
 Debug print = No  
 Input peaks listing = Long  
 Input peaks format = WATSTORE peak file

1

U. S. GEOLOGICAL SURVEY  
 ANNUAL PEAK FLOW FREQUENCY ANALYSIS  
 Following Bulletin 17-B Guidelines  
 Program peakfq  
 (Version 4.1, February, 2002)

Station - 12200500 Annual Peak at SKAGIT RIVER NEAR MOUNT VERNON, W  
 2005 OCT 12 17:35:04

### I N P U T D A T A S U M M A R Y

Number of peaks in record	=	49
Peaks not used in analysis	=	0
Systematic peaks in analysis	=	49
Historic peaks in analysis	=	0
Years of historic record	=	49
Generalized skew	=	0.000
Standard error of generalized skew	=	0.550
Skew option	=	WEIGHTED
Gage base discharge	=	0.0
User supplied high outlier threshold	=	--
User supplied low outlier criterion	=	--
Plotting position parameter	=	0.00

\*\*\*\*\* NOTICE -- Preliminary machine computations. \*\*\*\*\*  
 \*\*\*\*\* User responsible for assessment and interpretation. \*\*\*\*\*

WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE.	0.0
WCF195I-NO LOW OUTLIERS WERE DETECTED BELOW CRITERION.	23673.7
WCF163I-NO HIGH OUTLIERS OR HISTORIC PEAKS EXCEEDED HHBASE.	190322.6
**WCF164W-HISTORIC PERIOD IGNORED.	49.0
WCF002J-CALCS COMPLETED. RETURN CODE = 2	

Appendix H

Station - 12200500 Annual Peak at SKAGIT RIVER NEAR MOUNT VERNON, W  
2005 OCT 12 17:35:04

ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE		LOGARITHMIC		
	DISCHARGE	EXCEEDANCE PROBABILITY	MEAN	STANDARD DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	4.8269	0.1640	0.143
BULL.17B ESTIMATE	0.0	1.0000	4.8269	0.1640	0.103

ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL LIMITS	EXCEEDANCE ESTIMATES	BULL.17B ESTIMATE	SYSTEMATIC RECORD	'EXPECTED	95-PCT CONFIDENCE	
				PROBABILITY'	FOR BULL. 17B	LOWER
0.9950	26330.0	26690.0	25140.0	21290.0	30830.0	
0.9900	28700.0	29020.0	27670.0	23570.0	33260.0	
0.9500	36480.0	36640.0	35830.0	31200.0	41170.0	
0.9000	41550.0	41630.0	41090.0	36260.0	46310.0	
0.8000	48760.0	48740.0	48480.0	43470.0	53700.0	
0.5000	66690.0	66530.0	66690.0	60940.0	72960.0	
0.2000	92050.0	91970.0	92620.0	83610.0	103200.0	
0.1000	109300.0	109500.0	110700.0	98030.0	125500.0	
0.0400	131700.0	132400.0	134800.0	116000.0	155700.0	
0.0200	148800.0	150000.0	153700.0	129200.0	179500.0	
0.0100	166300.0	168100.0	173600.0	142500.0	204500.0	
0.0050	184200.0	186700.0	194700.0	155800.0	230800.0	
0.0020	208700.0	212500.0	224700.0	173800.0	267600.0	
0.6667	56766.7	( 1.50-year flood )				
0.4292	71313.1	( 2.33-year flood )				

Station - 12200500 Annual Peak at SKAGIT RIVER NEAR MOUNT VERNON, W  
2005 OCT 12 17:35:04

I N P U T D A T A L I S T I N G

WATER YEAR	DISCHARGE	CODES	WATER YEAR	DISCHARGE	CODES
1956	107000.0		1981	114000.0	
1957	64000.0		1982	55800.0	
1958	43900.0		1983	71600.0	
1959	92300.0		1984	88200.0	
1960	91600.0		1985	43700.0	
1961	76000.0		1986	72800.0	

1962	61600.0	1987	70700.0
1963	83200.0	1988	43500.0
1964	72100.0	1989	56700.0
1965	59300.0	1990	97800.0
1966	38700.0	1991	152000.0
1967	72000.0	1992	43500.0
1968	72700.0	1993	37900.0
1969	54300.0	1994	38800.0
1970	37900.0	1995	58600.0
1971	70300.0	1996	141000.0
1972	80600.0	1997	76300.0
1973	53600.0	1998	64800.0
1974	77600.0	1999	58200.0
1975	51400.0	2000	78600.0
1976	130000.0	2001	29500.0
1977	52800.0	2002	80800.0
1978	65600.0	2003	59400.0
1979	40300.0	2004	135000.0
1980	112000.0		

## Explanation of peak discharge qualification codes

PEAKFQ CODE	WATSTORE CODE	DEFINITION
D	3	Dam failure, non-recurrent flow anomaly
G	8	Discharge greater than stated value
X	3+8	Both of the above
L	4	Discharge less than stated value
K	6 OR C	Known effect of regulation or urbanization
H	7	Historic peak

1

Station - 12200500 Annual Peak at SKAGIT RIVER NEAR MOUNT VERNON, W  
2005 OCT 12 17:35:04

## EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	BULL.17B ESTIMATE
1991	152000.0	0.0200	0.0200
1996	141000.0	0.0400	0.0400
2004	135000.0	0.0600	0.0600
1976	130000.0	0.0800	0.0800
1981	114000.0	0.1000	0.1000
1980	112000.0	0.1200	0.1200
1956	107000.0	0.1400	0.1400
1990	97800.0	0.1600	0.1600
1959	92300.0	0.1800	0.1800
1960	91600.0	0.2000	0.2000

1984	88200.0	0.2200	0.2200
1963	83200.0	0.2400	0.2400
2002	80800.0	0.2600	0.2600
1972	80600.0	0.2800	0.2800
2000	78600.0	0.3000	0.3000
1974	77600.0	0.3200	0.3200
1997	76300.0	0.3400	0.3400
1961	76000.0	0.3600	0.3600
1986	72800.0	0.3800	0.3800
1968	72700.0	0.4000	0.4000
1964	72100.0	0.4200	0.4200
1967	72000.0	0.4400	0.4400
1983	71600.0	0.4600	0.4600
1987	70700.0	0.4800	0.4800
1971	70300.0	0.5000	0.5000
1978	65600.0	0.5200	0.5200
1998	64800.0	0.5400	0.5400
1957	64000.0	0.5600	0.5600
1962	61600.0	0.5800	0.5800
2003	59400.0	0.6000	0.6000
1965	59300.0	0.6200	0.6200
1995	58600.0	0.6400	0.6400
1999	58200.0	0.6600	0.6600
1989	56700.0	0.6800	0.6800
1982	55800.0	0.7000	0.7000
1969	54300.0	0.7200	0.7200
1973	53600.0	0.7400	0.7400
1977	52800.0	0.7600	0.7600
1975	51400.0	0.7800	0.7800
1958	43900.0	0.8000	0.8000
1985	43700.0	0.8200	0.8200
1988	43500.0	0.8400	0.8400
1992	43500.0	0.8600	0.8600
1979	40300.0	0.8800	0.8800
1994	38800.0	0.9000	0.9000
1966	38700.0	0.9200	0.9200
1970	37900.0	0.9400	0.9400
1993	37900.0	0.9600	0.9600
2001	29500.0	0.9800	0.9800

1

U. S. GEOLOGICAL SURVEY  
 ANNUAL PEAK FLOW FREQUENCY ANALYSIS  
 Following Bulletin 17-B Guidelines  
 Program peakfq  
 (Version 4.1, February, 2002)

End PEAKFQ analysis.  
 Stations processed : 1  
 Number of errors : 0  
 Stations skipped : 0  
 Station years : 49

## Appendix H2 – Output of PEAKFQ Run for Observed Regulated One-Day Flows at Skagit River near Mount Vernon

U. S. GEOLOGICAL SURVEY  
 ANNUAL PEAK FLOW FREQUENCY ANALYSIS  
 Following Bulletin 17-B Guidelines  
 Program peakfq  
 (Version 4.1, February, 2002)

--- PROCESSING DATE/TIME ---  
 2005 OCT 12 17:35:42

--- PROCESSING OPTIONS ---  
 Plot option = None  
 Basin char output = None  
 Print option = Yes  
 Debug print = No  
 Input peaks listing = Long  
 Input peaks format = WATSTORE peak file

1

U. S. GEOLOGICAL SURVEY  
 ANNUAL PEAK FLOW FREQUENCY ANALYSIS  
 Following Bulletin 17-B Guidelines  
 Program peakfq  
 (Version 4.1, February, 2002)

Station - 12200500 1-Day Peak at SKAGIT RIVER NEAR MOUNT VERNON, WA  
 2005 OCT 12 17:35:42

### I N P U T D A T A S U M M A R Y

Number of peaks in record	=	49
Peaks not used in analysis	=	0
Systematic peaks in analysis	=	49
Historic peaks in analysis	=	0
Years of historic record	=	49
Generalized skew	=	-0.040
Standard error of generalized skew	=	0.550
Skew option	=	WEIGHTED
Gage base discharge	=	0.0
User supplied high outlier threshold	=	--
User supplied low outlier criterion	=	--
Plotting position parameter	=	0.00

\*\*\*\*\* NOTICE -- Preliminary machine computations. \*\*\*\*\*  
 \*\*\*\*\* User responsible for assessment and interpretation. \*\*\*\*\*

WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE.	0.0
WCF195I-NO LOW OUTLIERS WERE DETECTED BELOW CRITERION.	18506.5
WCF163I-NO HIGH OUTLIERS OR HISTORIC PEAKS EXCEEDED HHBASE.	183230.6
**WCF164W-HISTORIC PERIOD IGNORED. 49.0	
WCF002J-CALCS COMPLETED. RETURN CODE = 2	

Appendix H

Station - 12200500 1-Day Peak at SKAGIT RIVER NEAR MOUNT VERNON, WA  
2005 OCT 12 17:35:42

ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE		LOGARITHMIC		
	DISCHARGE	EXCEEDANCE PROBABILITY	MEAN	STANDARD DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	4.7652	0.1804	0.048
BULL.17B ESTIMATE	0.0	1.0000	4.7652	0.1804	0.025

ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL LIMITS	EXCEEDANCE PROBABILITY	BULL.17B ESTIMATE	SYSTEMATIC RECORD	'EXPECTED	95-PCT CONFIDENCE	
				PROBABILITY'	FOR BULL. 17B	LOWER
	0.9950	20170.0	20360.0	19100.0	15880.0	24090.0
	0.9900	22330.0	22490.0	21390.0	17900.0	26340.0
	0.9500	29500.0	29580.0	28900.0	24800.0	33720.0
	0.9000	34240.0	34270.0	33800.0	29460.0	38590.0
	0.8000	41030.0	41020.0	40770.0	36170.0	45620.0
	0.5000	58130.0	58040.0	58130.0	52650.0	64180.0
	0.2000	82560.0	82510.0	83110.0	74270.0	93650.0
	0.1000	99270.0	99360.0	100600.0	88060.0	115400.0
	0.0400	120900.0	121300.0	123800.0	105200.0	145000.0
	0.0200	137400.0	138100.0	142100.0	117900.0	168400.0
	0.0100	154200.0	155300.0	161300.0	130500.0	192800.0
	0.0050	171400.0	173000.0	181500.0	143200.0	218400.0
	0.0020	194900.0	197200.0	210100.0	160200.0	254300.0
	0.6667	48635.3	( 1.50-year flood )			
	0.4292	62591.7	( 2.33-year flood )			

1

Station - 12200500 1-Day Peak at SKAGIT RIVER NEAR MOUNT VERNON, WA  
2005 OCT 12 17:35:42

I N P U T D A T A L I S T I N G

WATER YEAR	DISCHARGE	CODES	WATER YEAR	DISCHARGE	CODES
1956	98700.0		1981	101000.0	
1957	53600.0		1982	53900.0	
1958	39800.0		1983	63200.0	
1959	61800.0		1984	81300.0	
1960	83800.0		1985	27400.0	



1961	72200.0	1986	63400.0
1962	52800.0	1987	65100.0
1963	69400.0	1988	32100.0
1964	67900.0	1989	47200.0
1965	55000.0	1990	88200.0
1966	31100.0	1991	142000.0
1967	58600.0	1992	40100.0
1968	65800.0	1993	27600.0
1969	47300.0	1994	36400.0
1970	30400.0	1995	55700.0
1971	65700.0	1996	132000.0
1972	48700.0	1997	73800.0
1973	44000.0	1998	60600.0
1974	70900.0	1999	51900.0
1975	41400.0	2000	76800.0
1976	123000.0	2001	26700.0
1977	42200.0	2002	73700.0
1978	60300.0	2003	53000.0
1979	34900.0	2004	115000.0
1980	97600.0		

## Explanation of peak discharge qualification codes

PEAKFQ CODE	WATSTORE CODE	DEFINITION
D	3	Dam failure, non-recurrent flow anomaly
G	8	Discharge greater than stated value
X	3+8	Both of the above
L	4	Discharge less than stated value
K	6 OR C	Known effect of regulation or urbanization
H	7	Historic peak

1

Station - 12200500 1-Day Peak at SKAGIT RIVER NEAR MOUNT VERNON, WA  
2005 OCT 12 17:35:42

## EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	BULL.17B ESTIMATE
1991	142000.0	0.0200	0.0200
1996	132000.0	0.0400	0.0400
1976	123000.0	0.0600	0.0600
2004	115000.0	0.0800	0.0800
1981	101000.0	0.1000	0.1000
1956	98700.0	0.1200	0.1200
1980	97600.0	0.1400	0.1400
1990	88200.0	0.1600	0.1600
1960	83800.0	0.1800	0.1800
1984	81300.0	0.2000	0.2000
2000	76800.0	0.2200	0.2200

1997	73800.0	0.2400	0.2400
2002	73700.0	0.2600	0.2600
1961	72200.0	0.2800	0.2800
1974	70900.0	0.3000	0.3000
1963	69400.0	0.3200	0.3200
1964	67900.0	0.3400	0.3400
1968	65800.0	0.3600	0.3600
1971	65700.0	0.3800	0.3800
1987	65100.0	0.4000	0.4000
1986	63400.0	0.4200	0.4200
1983	63200.0	0.4400	0.4400
1959	61800.0	0.4600	0.4600
1998	60600.0	0.4800	0.4800
1978	60300.0	0.5000	0.5000
1967	58600.0	0.5200	0.5200
1995	55700.0	0.5400	0.5400
1965	55000.0	0.5600	0.5600
1982	53900.0	0.5800	0.5800
1957	53600.0	0.6000	0.6000
2003	53000.0	0.6200	0.6200
1962	52800.0	0.6400	0.6400
1999	51900.0	0.6600	0.6600
1972	48700.0	0.6800	0.6800
1969	47300.0	0.7000	0.7000
1989	47200.0	0.7200	0.7200
1973	44000.0	0.7400	0.7400
1977	42200.0	0.7600	0.7600
1975	41400.0	0.7800	0.7800
1992	40100.0	0.8000	0.8000
1958	39800.0	0.8200	0.8200
1994	36400.0	0.8400	0.8400
1979	34900.0	0.8600	0.8600
1988	32100.0	0.8800	0.8800
1966	31100.0	0.9000	0.9000
1970	30400.0	0.9200	0.9200
1993	27600.0	0.9400	0.9400
1985	27400.0	0.9600	0.9600
2001	26700.0	0.9800	0.9800

1

U. S. GEOLOGICAL SURVEY  
 ANNUAL PEAK FLOW FREQUENCY ANALYSIS  
 Following Bulletin 17-B Guidelines  
 Program peakfq  
 (Version 4.1, February, 2002)

End PEAKFQ analysis.  
 Stations processed : 1  
 Number of errors : 0  
 Stations skipped : 0  
 Station years : 49